

**New Directions for
Child and
Adolescent
Development**

Baptiste Barbot
EDITOR-IN-CHIEF

William Damon
FOUNDING EDITOR

Early Attachment Networks to Multiple Caregivers

Or Dagan
Abraham Sagi-Schwartz
Marinus H. van IJzendoorn
EDITORS

Number 180 • November 2021
Jossey-Bass
San Francisco

Early Attachment Networks to Multiple Caregivers

Or Dagan, Abraham Sagi-Schwartz and Marinus H. van IJzendoorn (Eds.)

New Directions for Child and Adolescent Development, no. 180

Editor-in-Chief: Baptiste Barbot

New Directions for Child and Adolescent Development (Print ISSN: 1520-3247; Online ISSN: 1534-8687), is published quarterly by Wiley Subscription Services, Inc., a Wiley Company, 111 River St., Hoboken, NJ 07030-5774 USA.

Postmaster: Send all address changes to *New Directions for Child and Adolescent Development*, John Wiley & Sons Inc., C/O The Sheridan Press, PO Box 465, Hanover, PA 17331 USA.

Copyright and Copying (in any format)

Copyright © 2021 Wiley Periodicals LLC, a Wiley Company. All rights reserved. No part of this publication may be reproduced, stored or transmitted in any form or by any means without the prior permission in writing from the copyright holder. Authorization to copy items for internal and personal use is granted by the copyright holder for libraries and other users registered with their local Reproduction Rights Organisation (RRO), e.g. Copyright Clearance Center (CCC), 222 Rosewood Drive, Danvers, MA 01923, USA (www.copyright.com), provided the appropriate fee is paid directly to the RRO. This consent does not extend to other kinds of copying such as copying for general distribution, for advertising or promotional purposes, for republication, for creating new collective works or for resale. Permissions for such reuse can be obtained using the RightsLink "Request Permissions" link on Wiley Online Library. Special requests should be addressed to: permissions@wiley.com

Information for subscribers

New Directions for Child and Adolescent Development is published in 4 issues per year. Institutional subscription prices for 2021 are:

Print & Online: US\$660 (US), US\$660 (Canada & Mexico), US\$777 (Rest of World), €509 (Europe), £408 (UK). Prices are exclusive of tax. Asia-Pacific GST, Canadian GST/HST and European VAT will be applied at the appropriate rates. For more information on current tax rates, please go to <https://onlinelibrary.wiley.com/library-info/products/price-lists/payment>. The price includes online access to the current and all online back-files to January 1st 2015, where available. For other pricing options, including access information and terms and conditions, please visit <https://onlinelibrary.wiley.com/library-info/products/price-lists>. Terms of use can be found here: <https://onlinelibrary.wiley.com/terms-and-conditions>.

Delivery Terms and Legal Title

Where the subscription price includes print issues and delivery is to the recipient's address, delivery terms are **Delivered at Place (DAP)**; the recipient is responsible for paying any import duty or taxes. Title to all issues transfers FOB our shipping point, freight prepaid. We will endeavour to fulfill claims for missing or damaged copies within six months of publication, within our reasonable discretion and subject to availability.

Back issues: Single issues from current and recent volumes are available at the current single issue price from cs-journals@wiley.com.

Disclaimer

The Publisher and Editors cannot be held responsible for errors or any consequences arising from the use of information contained in this journal; the views and opinions expressed do not necessarily reflect those of the Publisher and Editors, neither does the publication of advertisements constitute any endorsement by the Publisher and Editors of the products advertised.

Publisher: *New Directions for Child and Adolescent Development* is published by Wiley Periodicals LLC, 350 Main St., Malden, MA 02148-5020.

Journal Customer Services: For ordering information, claims and any enquiry concerning your journal subscription please go to <https://hub.wiley.com/community/support/onlinelibrary> or contact your nearest office.

Americas: Email: cs-journals@wiley.com; Tel: +1 781 388 8598 or +1 800 835 6770 (toll free in the USA & Canada).

Europe, Middle East and Africa: Email: cs-journals@wiley.com; Tel: +44 (0) 1865 778315.

Asia Pacific: Email: cs-journals@wiley.com; Tel: +65 6511 8000.

Japan: For Japanese speaking support, Email: cs-japan@wiley.com.

Visit our Online Customer Help available in 7 languages at <https://hub.wiley.com/community/support/onlinelibrary>

Production Editor: Amir Hussain (email: amhussain@wiley.com).

Wiley's Corporate Citizenship initiative seeks to address the environmental, social, economic, and ethical challenges faced in our business and which are important to our diverse stakeholder groups. Since launching the initiative, we have focused on sharing our content with those in need, enhancing community philanthropy, reducing our carbon impact, creating global guidelines and best practices for paper use, establishing a vendor code of ethics, and engaging our colleagues and other stakeholders in our efforts. Follow our progress at www.wiley.com/go/citizenship

View this journal online at onlinelibrary.wiley.com/journal/cad

Wiley is a founding member of the UN-backed HINARI, AGORA, and OARE initiatives. They are now collectively known as Research4Life, making online scientific content available free or at nominal cost to researchers in developing countries. Please visit Wiley's Content Access - Corporate Citizenship site: <http://www.wiley.com/WileyCDA/Section/id-390082.html>

Printed in the USA by The Sheridan Group.

Address for Editorial Correspondence: Editor-in-chief, Baptiste Barbot, *New Directions for Child and Adolescent Development*, Email: baptiste.barbot@uclouvain.be

Abstracting and Indexing Services

The Journal is indexed by Academic Search Alumni Edition (EBSCO Publishing); ASSIA: Applied Social Sciences Index & Abstracts (ProQuest); Environmental Sciences & Pollution Management (ProQuest); ERA: Educational Research Abstracts Online (T&F); ERIC: Educational Resources Information Center (CSC); Health & Safety Science Abstracts (ProQuest); Linguistics & Language Behavior Abstracts (ProQuest); MEDLINE/PubMed (NLM); Pollution Abstracts (ProQuest); Professional Development Collection (EBSCO Publishing); PsycINFO/Psychological Abstracts (APA); Safety Science & Risk Abstracts (ProQuest); Social Services Abstracts (ProQuest); SocINDEX (EBSCO Publishing); Sociological Abstracts (ProQuest).

Cover design: Wiley

Cover Image: © Bart Sadowski/iStockphoto

For submission instructions, subscription and all other information visit: onlinelibrary.wiley.com/journal/cad

Baptiste Barbot, Editor-in-Chief
UCLouvain, Belgium

Associate Editors

Jens F. Beckmann, *Durham University, UK*
Johanna Bick, *University of Houston, USA*
Elisabetta Crocetti, *Alma Mater Studiorum
University of Bologna, Italy*

Luc Goossens, *KU Leuven, Belgium*
Sascha Hein, *Freie Universität Berlin,
Germany*
Chris Trentacosta, *Wayne State University,
USA*

Developmental Methods Issue Editor

Christian Geiser, *Utah State University, USA*

Editorial Board Members

Jeffrey Arnett, *Clark University, USA*
Drew Bailey, *University of California, Irvine,
USA*
Marc Bornstein, *NICHD/IFS, USA*
William Bukowski, *Concordia University,
Canada*
Avshalom Caspi, *Duke university, USA &
King's College London, UK*
Thomas D. Cook, *George Washington
University, USA*
Catherine R. Cooper, *University of California,
Santa Cruz, USA*
James Côté, *University of Western Ontario,
Canada*
Jacqueline Eccles, *University of California,
Irvine, USA*
Michael Eid, *Freie Universität Berlin,
Germany*
Sylvia Fernandez Rao, *Behavioral Science
Unit, National Institute of Nutrition, India*
Sara Harkness, *University of Connecticut,
USA*
Kazuo Hiraki, *University of Tokyo, Japan*
Mark Johnson, *Cambridge University, UK*
Linda Juang, *University of Potsdam, Germany*
Nicole Landi, *University of Connecticut &
Haskins Laboratories, USA*

James Leckman, *Yale University, USA*
Jeffrey Liew, *Texas A&M University, USA*
Yangyang Liu, *Tianjin University, China*
Peggy McCardle, *Haskins Laboratories, USA*
Kelly Lynn Mulvey, *North Carolina State
University, USA*
Geertjan Overbeek, *University of Amsterdam,
The Netherlands*
Alex Piquero, *University of Texas at Dallas &
Monash University, USA*
Angelica Ponguta, *Yale University, USA*
David D. Preiss, *Pontificia Universidad
Católica de Chile, Chile*
Herbert Scheithauer, *Freie Universität Berlin,
Germany*
Robert Siegler, *Teachers College, Columbia
University, USA*
Bart Soenens, *Ghent University, Belgium*
Charles M. Super, *University of Connecticut,
USA*
Jennifer Tackett, *Northwestern University,
USA*
Marinus van IJzendoorn, *Erasmus University
Rotterdam, The Netherlands*
Aisha Yousafzai, *T.H. Chan School of Public
Health, Harvard University, USA*

CONTENTS

Attachment networks to multiple caregivers: An introduction to a special issue <i>Or Dagan, Abraham Sagi-Schwartz, Marinus H. van IJzendoorn</i>	5
Early attachment networks to multiple caregivers: History, assessment models, and future research recommendations <i>Or Dagan, Abraham Sagi-Schwartz</i>	9
Parenting costs time: Changes in pair bond maintenance across pregnancy and infant rearing in a monogamous primate (<i>Plecturocebus cupreus</i>) <i>Chloe L. Karaskiewicz, Lynea R. Witczak, Allison R. Lau, Madison E. Dufek, Karen L. Bales</i>	21
Child-father attachment in early childhood and behavior problems: A meta-analysis <i>Audrey-Ann Deneault, Marian J. Bakermans-Kranenburg, Ashley M. Groh, Pasco R. M. Fearon, Sheri Madigan</i>	43
Configurations of mother-child and father-child attachment as predictors of internalizing and externalizing behavioral problems: An individual participant data (IPD) meta-analysis <i>Or Dagan, Carlo Schuengel, Marije L. Verhage, Marinus H. van IJzendoorn, Abraham Sagi-Schwartz, Sheri Madigan, Robbie Duschinsky, Glenn I. Roisman, Kristin Bernard, Marian Bakermans-Kranenburg, Jean-François Bureau, Brenda L. Volling, Maria S. Wong, Cristina Colonnese, Geoffrey L. Brown, Rina D. Eiden, R.M. Pasco Fearon, Mirjam Oosterman, Ora Aviezer, E Mark Cummings, The Collaboration on Attachment to Multiple Parents and Outcomes Synthesis</i>	67
Grandmothers are part of the parenting network, too! A longitudinal study on coparenting, maternal sensitivity, child attachment and behavior problems in a Chinese sample <i>Xi Liang, Yige Lin, Marinus H. Van IJzendoorn, Zhengyan Wang</i>	95
The limits of the attachment network <i>Marian J. Bakermans-Kranenburg</i>	117
Admissibility of attachment theory, research and assessments in child custody decision-making? Yes and No! <i>Tommie Forslund, Mårten Hammarlund, Pehr Granqvist</i>	125
A society that values its children should cherish their parents: A move to considering the attachment network <i>Miriam Steele, Howard Steele</i>	141
Attachment networks and the future of attachment theory <i>Ross A. Thompson</i>	149

Attachment networks to multiple caregivers: An introduction to a special issue

This special issue aims to bolster important research that has been inconsistently and rather scarcely conducted in the past 35 years: the role that multiple caregivers jointly play in the developmental trajectories of children. Despite theoretically and empirically driven calls to assess children's development through the lenses of simultaneous and independent attachment relationships (van IJzendoorn & Tavecchio et al., 1987; van IJzendoorn et al., 1992), attachment research has predominantly focused on mother-child relationships, deeming other caretakers, at best, as subsidiary attachment figures with a marginal influence on the child's development. This special issue aims to expand on the topic by providing historical, ethological, cross-cultural, clinical, methodological, and legal perspectives on the matter.

This special issue opens with a review paper by Dagan and Sagi-Schwartz (2021), who briefly present an historical account of the nonlinear shift in attachment theory and research, from a wide interest in assessing almost exclusively mother-child attachment relationships, to assessing father-child attachment patterns, and leading up to the current increase in interest and empirical work on attachment network to multiple caregivers. The authors also revisit their recent proposed attachment network assessment models (Dagan & Sagi-Schwartz, 2018, 2020).

Karaskiewicz et al. (2021) present an ethological study on the network of attachment in mother-father-infant titi monkey (*Plecturocebus cupreus*) triads. The authors assessed the change in pair bonding quality before and after the couples' first offspring birth. They show that affiliation between the parents significantly decreased after birth of the first offspring and stayed relatively low even after infants' transition to behavioral independence, with multiple factors contributing to variability in such pair bonding trajectories. Importantly, Karaskiewicz and colleagues highlight a unique perspective on how new members of the attachment network (i.e., newborns) can influence the relationship quality between its existing members (e.g., mothers and fathers).

The meta-analysis by Deneault et al. (2021) quantifies the associations between father-child attachment and behavior problems across 15 studies. The authors report two intriguing results. The first is that insecure child-father attachment is significantly associated with higher internalizing and externalizing behavior problems compared with secure dyads. The second surprising finding revealed that the effect sizes for insecure child-father attachment are equivalent to those reported in previous meta-analyses on child-mother attachment in relation to behavior problems.

The individual participant data meta-analysis by Dagan et al. (2021) expands on Deneault and colleagues' study-level meta-analysis by examining the associations between attachment networks to mothers *and* fathers and behavior problems. This study indicates

that it takes two secure attachments and at least one nondisorganized attachment to buffer children from an increased vulnerability to internalizing and externalizing behavioral problems, respectively. In addition, this study supports the Deneault et al. (2021) conclusion that the quality of attachment patterns to mothers and fathers are equally important in predicting behavioral problems.

The fifth paper by Liang et al. (2021) expands the scope of early caregiving networks to examine grandmothers' role in the children's attachment bonds with their mothers—a role that has rarely been acknowledged, let alone studied, in developmental science. Moreover, the authors expand previous research on multiple caregivers by studying mother–grandmother–child triads in China. Liang and colleagues show that mother–grandmother coparenting network, in particular nonjudgmental grandparenting, may predict more secure mother–infant attachment and less externalizing problems.

Next, Bakermans-Kranenburg (2021) brings together evidence from residential care facilities and SOS villages to warn us that despite the evolutionary wired readiness of children to attach to multiple caregivers and the benefits that networks confer (compared, for example, with a single caregiver–child attachment), such networks cannot be stretched too much. The frequent shifts of caregivers that characterizes 24/7 institutionalized care, for example, exposes children to too many “nonemotionally significant” caregivers, which in turn damages their ability to develop attachment bonds, let alone secure ones.

Forslund et al. (2021) discuss how attachment theory and research in general, and attachment networks in particular, may inform courts' decision-making on child custody. Using Faigman et al.'s (2014) admissibility criteria for scientific evidence and testimony, the authors argue that findings on attachment networks, should be admissible as framework evidence and conceptual guidelines (though not as a diagnostic testimony) in child custody settings. They contend that evidence for the socioemotional benefits that children derive from continuous interactions with multiple caregivers is scientifically valid, relevant, and helpful, and should replace misunderstood and misused applications of attachment theory and instruments in court procedures.

This special issue is concluded by two commentaries. The first—by Steele and Steele (2021)—highlights some of the potential clinical applications of moving attachment research to the level of attachment networks. Specifically, the authors emphasize the clinical need to consider the attachment network when assessing children's mental health and intervention strategies. In the second commentary, Thompson (2021) proposes that incorporating the qualitative characteristics of the different attachment relationships within a network, as well as considering how relationships within the family influence the qualities of these attachment relationships, can significantly expand the specificity of predicting different developmental outcomes.

Across domains of parenting and their influence on child development, a focus on relational networks might be indispensable for understanding the complexities of ecologies in which children thrive or wither away. As guest editors, we hope that this special issue on early attachment networks to multiple caregivers will significantly contribute to such understanding.

Or Dagan¹

Abraham Sagi-Schwartz²

Marinus H. van IJzendoorn³

¹ *Department of Psychology, Stony Brook University, Stony Brook, New York, USA*

² *Center for the Study of Child Development and School of Psychological Sciences, University of Haifa, Haifa, Israel*

³ *Research Department of Clinical, Education and Health Psychology, Faculty of Brain Sciences, University College London, London, UK*

Correspondence

Or Dagan, Department of Psychology, Stony Brook University, Stony Brook, NY 11794, USA.

Email: or.dagan@stonybrook.edu

REFERENCES

- Bakermans-Kranenburg, M. J. (2021). The limits of the attachment network. *New Directions for Child and Adolescent Development*, 2021, 117–124. <https://doi.org/10.1002/cad.20432>
- Dagan, O., & Sagi-Schwartz, A. (2018). Early attachment network with mother and father: An unsettled issue. *Child Development Perspectives*, 12(2), 115–121. <https://doi.org/10.1111/cdep.12272>
- Dagan, O., & Sagi-Schwartz, A. (2020). Infant attachment (to mother and father) and its place in human development: Five decades of promising research (and an unsettled issue). In J. J. Lockman & C. Tamis-LeMonda (Eds.), *The Cambridge handbook of infant development* (pp. 687–714). Cambridge University Press.
- Dagan, O., & Sagi-Schwartz, A. (2021). Early attachment networks to multiple caregivers: History, assessment models, and future research recommendations. *New Directions for Child and Adolescent Development*, 2021, 9–19. <https://doi.org/10.1002/cad.20446>
- Dagan, O., Schuengel, C., Verhage, M. L., van IJzendoorn, M. H., Sagi-Schwartz, A., Madigan, S., Duschinsky, R., Roisman, G. I., Bernard, K., Bakermans-Kranenburg, M., Bureau, J.-F., Volling, B. L., Wong, M. S., Colonnesi, C., Brown, G. L., Eiden, R. D., Fearon, R. M. P., Oosterman, M., Aviezer, O., ... The Collaboration on Attachment to Multiple Parents and Outcomes Synthesis. (2021). Configurations of mother-child and father-child attachment as predictors of internalizing and externalizing behavioral problems: An individual participant data (IPD) meta-analysis. *New Directions for Child and Adolescent Development*, 2021, 67–94. <https://doi.org/10.1002/cad.20450>
- Deneault, A.-A., Bakermans-Kranenburg, M. J., Groh, A. M., Fearon, P. R. M., & Madigan, S. (2021). Child-father attachment in early childhood and behavior problems: A meta-analysis. *New Directions for Child and Adolescent Development*, 2021, 43–66. <https://doi.org/10.1002/cad.20434>
- Faigman, D. L., Monahan, J., & Slobogin, C. (2014). Group to individual (G2i) inference in scientific expert testimony. *The University of Chicago Law Review, SSRN Electronic Journal*, 81(2), 417–480
- Forslund, T., Hammarlund, M., & Granqvist, P. (2021). Admissibility of attachment theory, research and assessments in child custody decision-making? *Yes and No! New Directions for Child and Adolescent Development*, 2021, 125–140. <https://doi.org/10.1002/cad.20447>
- Karaskiewicz, C. L., Witzak, L. R., Lau, A. R., Dufek, M. E., & Bales, K. L. (2021). Parenting costs time: Changes in pair bond maintenance across pregnancy and infant rearing in a monogamous primate (*Plecturocebus cupreus*). *New Directions for Child and Adolescent Development*, 2021, 21–42. <https://doi.org/10.1002/cad.20438>
- Liang, X., Lin, Y., Van IJzendoorn, M. H., & Wang, Z. (2021). Grandmothers are part of the parenting network, too! A longitudinal study on coparenting, maternal sensitivity, child attachment and behavior problems in a Chinese sample. *New Directions for Child and Adolescent Development*, 2021, 95–116. <https://doi.org/10.1002/cad.20442>
- Steele, M., & Steele, H. (2021). A society that values its children should cherish their parents: A move to considering the attachment network. *New Directions for Child and Adolescent Development*, 2021, 141–147.
- Thompson, R. A. (2021). Attachment networks and the future of attachment theory. *New Directions for Child and Adolescent Development*, 2021, 149–156.
- van IJzendoorn, M. H., Sagi, A., & Lambermon, M. W. E. (1992). The multiple caretaker paradox: Data from Holland and Israel. *New Directions for Child and Adolescent Development*, 1992(57), 5–24. <https://doi.org/10.1002/cad.23219925703>
- van IJzendoorn, M. H., & Tavecchio, L. W. C. (1987). The development of attachment theory as a Lakatosian research program: Philosophical and methodological aspects. In L. W. C. Tavecchio, & M. H. Van IJzendoorn (Eds.), *Attachment in social networks: Contributions to the Bowlby-Ainsworth attachment theory*. Elsevier Science.

REVIEW

Early attachment networks to multiple caregivers: History, assessment models, and future research recommendations

Or Dagan¹  | Abraham Sagi-Schwartz²

¹ Department of Psychology, Stony Brook University, Stony Brook, New York, USA

² Center for the Study of Child Development and School of Psychological Sciences, University of Haifa, Haifa, Israel

Correspondence

Or Dagan, PhD, Department of Psychology, Stony Brook University, Stony Brook, NY, 11794, USA.
Email: or.dagan@stonybrook.edu

Abstract

Early attachment has been commonly hypothesized to predict children's future developmental outcomes, and robust evidence relying on assessments of single caregiver-child attachment patterns has corroborated this hypothesis. Nevertheless, most often children are raised by multiple caregivers, and they tend to form attachment bonds with more than one of them. In this paper, we briefly describe the conceptual and empirical roots underlying the notion of attachment networks to multiple caregivers. We detail potential reasons for research focusing on a single caregiver (most often mothers, but recently also fathers) and the historical attempts to establish a more ecologically valid assessment of attachment to multiple caregivers. Finally, we describe a recently developed organizational framework that includes testable models on which future research may rely for assessing the predictive power of attachment networks to multiple caregivers on children's developmental outcomes.

KEYWORDS

attachment, caregiver, child, father, mother, network

I want to emphasize that, despite voices to the contrary, looking after babies and young children is no job for a single person.

John Bowlby, *A Secure Base*, 1988

1 | INTRODUCTION: ATTACHMENT TO MULTIPLE CAREGIVERS

Children often develop attachment relationships not only to mothers but to multiple non-maternal caregivers (i.e., allomothers) and non-biologically related caregivers (i.e., alloparents) who usually interact with them daily. In fact, anthropologist and primatologist Sarah Hrdy, recently concluded that “[w]ithout alloparenting, there never would have been a human species” (2011, p. 109) because cooperative breeding has been essential in increasing the survival rates of children.

Such an evolutionary emphasis on the importance of multiple caregiving for the survival and development of children naturally extends to attachment theory as well. As can be inferred from the epigraph, Bowlby (1969, 1988) suggested that children are likely to become attached to more than a single caregiver, and Ainsworth (1963, 1967, 1985) fully acknowledged the role of both mothers and fathers in children’s developmental trajectories. Despite this theoretical understanding, with a few notable exceptions, attachment research has yet to fully catch up with the notion of attachment to multiple caregivers, which we refer to as “attachment network.” How can one understand such discrepancy between the acknowledgment of various scholars—including Bowlby and Ainsworth—of the importance of children’s attachment network on one hand, and the scarcity of research on the potential joint effect of attachment to multiple caregivers on children’s developmental outcomes on the other?

1.1 | Mothers, only

It has been argued that the little effort invested in research on attachment networks to multiple caregivers may have to do with historical and cultural values about caregiving roles (Howes & Spieker, 2016). In many Western cultures, in which attachment research has been conducted (e.g., the US and Europe), the primary caregiver was frequently the mother, and attachment quality to mothers was thought to be the main contributor to child development. Non-maternal caregivers, mainly fathers, were researched, if at all, with respect to their *absence* rather than their active role in the children’s development (both within and outside of attachment research; Cowan & Cowan, 2019).

Practical research considerations were also crucial in choosing to focus exclusively on mothers as attachment figures. Mothers were easier for researchers to access, and they more readily consented to participate than did fathers and nonparental caregivers. For example, fathers were unavailable during the daytime, when research procedures with parents and their children were conducted (Duschinsky, 2020). Furthermore, researchers wanted to be sure that their sample of children had sufficient experience of care with a particular parent to form attachment-relevant expectations, and it was not clear that such experience was in place with non-maternal caregivers (Sroufe, 1982).

It has also been suggested that the historical tendency to focus on mothers as the sole attachment figures may be ascribed to a wide misinterpretation of Bowlby’s terminology, specifically, the concept of “monotropy” (Bowlby, 1951, 1988). Bowlby intended the term “monotropy” to denote infants’ inborn tendency to seek proximity to familiar caregivers in general, mothers and others, providing a building block for the formation of attachment relationships (Duschinsky, 2020). This meaning was not well understood, however. Taken literally, the prefix “mono” denotes “one” or “single,” and the word root “tropo” denotes “turning to,” therefore the meaning that was generally inferred from the two components was “turning to one.” In an attachment context, such terminology may easily be interpreted as the inborn tendency to seek proximity to a single caregiver,

usually the mother. Inherently, such interpretation positions other potential caregivers, such as fathers and grandparents, as subsidiary attachment figures, with a marginal influence on the child's development. However, by using the term "monotropy" Bowlby intended to denote a infants' direction of instinctual emotional bonds toward a *group* of individuals, so to be contrasted with promiscuously directing such behavior toward many (Duschinsky, 2020).

1.2 | (Separately) Assessing attachment to other caregivers

Interest in other, non-maternal attachment figures has nevertheless been present. Research has focused on *comparing* qualities of children's attachment to mothers and to non-maternal caregivers (e.g., care providers; for a meta-analytic review, see Ahnert et al., 2006), or identifying their different roles in predicting developmental outcomes (e.g., mothers and fathers; Bretherton, 2010). Recently, there has been a surge in researching father-child attachment (Ahnert & Schoppe-Sullivan, 2020; Cowan & Cowan, 2019), and some have identified aspects of the attachment bond to be uniquely related to fathers (i.e., supporting exploration) as opposed to mothers (i.e., providing a haven of safety when distressed; Grossmann & Grossmann, 2020).

Studies comparing multiple caregivers on the dimension of child attachment qualities and their predictive power on developmental outcome relied on the independence hypothesis (Van IJzendoorn et al., 1992). According to this hypothesis, the quality of attachment relationships a child develops with multiple caregivers may influence *different* developmental outcomes, or affect them uniquely rather than jointly. But studying nonmaternal caregivers in isolation from the maternal caregivers fails to incorporate a crucial evolutionary aspect of human development: human beings are a product of joint care, which often constitutes an attachment network.

1.3 | Mothers and others: The integrative hypothesis

A level of analysis that takes into account attachment networks must integrate children's attachment relationships to multiple caregivers as *jointly* predicting developmental outcomes. The first to formally acknowledge the need for such research were Van IJzendoorn and Tavecchio (1987). Based on empirical evidence indicating that children tend to form attachment relationships with multiple caregivers, they argued that monotropy should be replaced with what they termed the "extension hypothesis." According to this hypothesis, "an optimal caregiving arrangement consists of a network of more or less stable attachment relationships between the child and several different caregivers" (Van IJzendoorn & Tavecchio, 1987, p. 24).

Half a decade later, Van IJzendoorn et al. (1992) followed up on the extension hypothesis with what they termed the *multiple caretaker paradox*: "How can attachment be predictive of socioemotional development if the child is attached in different ways to different caretakers?" (pp. 21–22). Logically, one aspect of such a paradox may be understood as follows. If (a) secure and insecure attachment patterns are qualitatively opposite, so that secure attachment predicts more positive outcomes than does insecure attachment; and (b) attachment to mother and father are equally significant in predicting certain developmental outcomes; then (c) it is impossible to predict outcomes of a certain quality given that children often form secure attachment to one caregiver *and* insecure attachment to another.

To overcome the conceptual and methodological deficiency that the multiple caretaker paradox exposed, a new hypothesis was needed. Rephrasing the extension hypothesis, Van IJzendoorn et al. (1992) proposed the *integrative hypothesis*, suggesting that attachment to either parent may be equally important, and the two together jointly predict children's developmental outcomes. They suggested operationalizing the integrative hypothesis as *two* child attachment patterns (i.e., an attachment network), that is, one attachment pattern with each parent (e.g., secure with both parents, or secure with mother and insecure with father). In many cultures, rearing practices have regarded multiple caregivers to be essential for children's development (e.g., see the pivotal role grandmothers play in raising Chinese children; Liang et al., 2021 [this issue]). Recently, even Westernized cultures that used to have clear expectations that the mother should be the sole caretaker, have gradually shifted toward an expectation about child rearing practices that often involves multiple caregivers in a variety of family structures, whose influences on children's development are similar in magnitude (Cabrera et al., 2018; Fagan et al., 2014; Kalil et al., 2014). These multiple caregiving practices have rendered the integrative hypothesis more ecologically valid than hypotheses that stress the role of a single caregiver in the child's developmental trajectory.

Despite calls to evaluate the combined effect of children's attachment to multiple caregivers, little research has assessed the integrative hypothesis. Most large-scale, attachment-oriented longitudinal studies did not incorporate assessments of attachment patterns to non-maternal caregivers (e.g., the Minnesota Longitudinal Study of Risk and Adaptation; Sroufe et al., 2005; and the NICHD Study of Early Child Care and Youth Development, <https://www.nichd.nih.gov/research/supported/secycd>). The vast majority of the studies that did assess children's attachment to multiple caregivers were either not a priori designed to test the integrative hypothesis, or used the collected mother-child and father-child attachment data to test the independence, but not the integrative hypothesis. Only recently has the unresolved issue of early attachment networks to multiple caregivers been revisited in a systematic manner, based on research conducted on this topic.

2 | RESEARCH ON ATTACHMENT NETWORKS: A BRIEF HISTORY

Schaffer and Emerson (1964) were two of the first scholars to assess the potential presence of multiple attachment relationships that children develop early in life. In a series of in-depth interviews and laboratory observations that over a year evaluated infants' reactions to separation from their caregivers, Schaffer and Emerson found that the vast majority of infants become initially attached to mothers. Nevertheless, they showed that by 18 months most infants established a network of attachments to multiple caregivers, which included, for the most part, mothers and fathers. Schaffer and Emerson's study indicated that infants become attached to multiple caregivers based on quantitative analyses that tested the *strength* of the attachment bond. Later studies assessed the *quality* of infants' attachment patterns to multiple caregivers, using what has become the gold standard observational assessment of such emotional bonds: the Strange Situation Procedure (SSP; Ainsworth et al., 1978).

One of the earliest studies to use the SSP to assess infants' attachment to multiple caregivers was that of Main and Weston (1981), which indicated that infants form attachment patterns with mothers and fathers simultaneously and independently. Other studies reported similar findings, with either weak or no associations between mother-child and father-child attachment patterns (Easterbrooks & Goldberg, 1984; Grossmann et al., 2002; Grossmann et al., 1981; Lamb, 1978; Lamb et al., 1982; Sagi-Schwartz & Aviezer, 2005; Van

IJzendoorn & De Wolff, 1997; but see Fox et al., 1991; Steele et al., 1996). Moreover, in two samples from Israel and the Netherlands (Goossens & Van IJzendoorn, 1990; Sagi-Schwartz et al., 1985), attachment patterns with professional caregivers were found to be independent of those that the children formed with parental caregivers.

An overview of the different outcomes that were assessed in the studies that tested attachment network using the SSP, as well as other common methodologies (e.g., the Attachment Q-Sort [Waters & Deane, 1985] and a modified SSP for older children [Cassidy et al., 1992]), has revealed divergent findings, leading to inconsistent conclusions. Whereas some studies indicated that being securely attached to both parents may lead to more favorable outcomes than being securely attached to only one parent (e.g., when assessing social competence; Suess et al., 1992; Van IJzendoorn et al., 1992), others suggested that being securely attached to only one parent but not to the other predicted equally optimal outcomes to being securely attached to both parents (e.g., when assessing externalizing behavior problems; Bureau et al., 2020).

Contradictory findings were also reported by studies that compared the significance of the parent's identity on the child's developmental outcomes. Some studies showed that secure attachment to mothers only may confer more favorable outcomes than secure attachment to fathers only (e.g., when assessing cortisol output; Kuo et al., 2019). Yet other studies indicated that the difference in the predictive power of having a single secure attachment to mothers as opposed to fathers is immaterial (e.g., when assessing externalizing behavior problems; Kochanska & Kim, 2013).

Taken together, the studies that assessed attachment networks to date were based on samples of small sizes, ranging from 20 to 186 mother-child/father-child triads, and produced mixed findings. The accumulating evidence has led to theoretical inconsistencies and *post hoc* hypotheses regarding whether and how the configuration of children's attachment patterns to multiple caregivers, mostly mothers and fathers, predicts future developmental outcomes. Thus, it has become clear that there was a need for a systematic approach to testing questions pertaining to the joint effect of attachment relationships with multiple caregivers on developmental outcomes.

3 | TESTABLE MODELS OF ATTACHMENT NETWORKS

The need to take stock of past research on attachment networks and to create an organizational framework for further research has been addressed recently (Dagan & Sagi-Schwartz, 2018, 2020). Whereas attachment literature makes it clear that children often develop attachment relationships with non-parental caregivers, the majority of research regarding attachment networks has focused on children's attachment relationships with mothers and fathers. Given such empirical concentration, we (Dagan & Sagi-Schwartz, 2018) reviewed all studies that assessed the integrative hypothesis and formulated two research questions and four attachment network models to describe the potential influence of the attachment network to mother and father (which in principle can be extended to other caregivers as well) on developmental outcomes.

The first research question is quantitative in nature and pertains to the number of secure attachments within an attachment network: *Does the number of secure attachment relationships matter in predicting developmental outcomes?* (Figure 1, Research Question 1). Because virtually all previous research indicated that children who are insecurely attached to both parents tend to show worse outcomes than those who have at least one secure attachment with either parent, we focused on the comparison between children with two secure attachments and those with only one. We hypothesized that one of two mutually

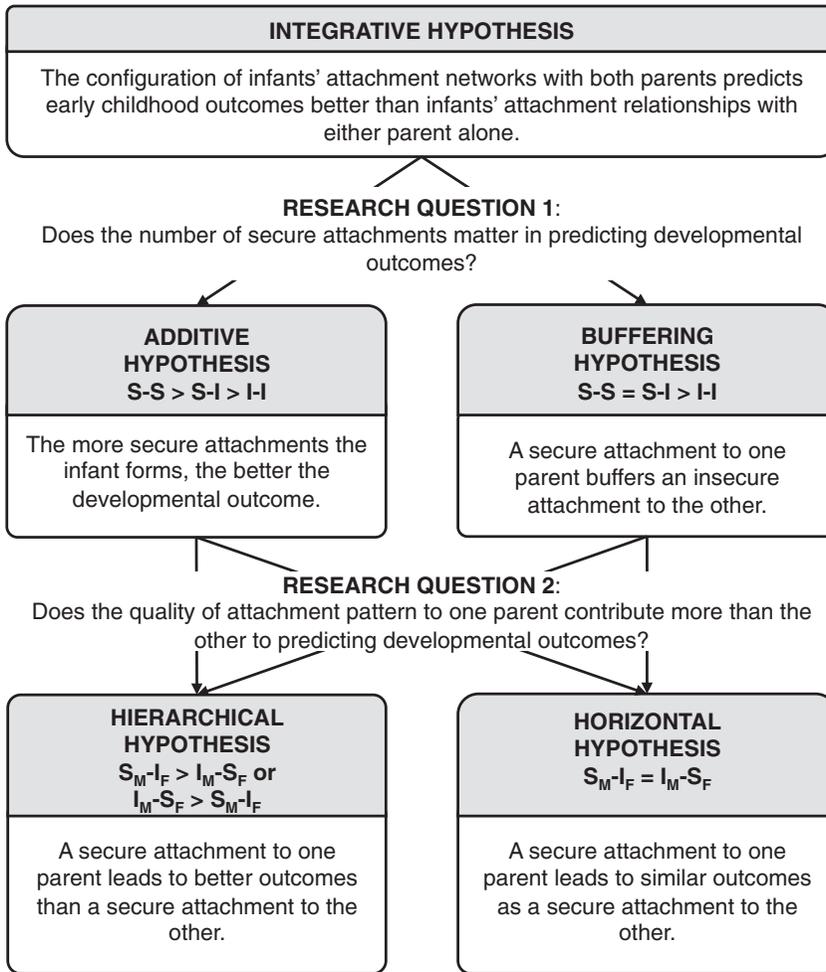


FIGURE 1 Four competing hypotheses ordered according to the issue they address (based on Dagan & Sagi-Schwartz, 2018). *Note.* S-S, secure attachment to mother and father; I-I, insecure attachment to mother and father; S_M, secure attachment to mother; S_F, secure attachment to father; I_M, insecure attachment to mother; I_F, insecure attachment to father

exclusive scenarios proves accurate. The prediction of the first scenario, which we termed the *Additive Hypothesis*, is that children with two secure attachments fare better than those with a single secure attachment. The second scenario predicts that children with a single secure attachment do not show significantly different outcomes than do those with two secure attachments. In a scenario of this type, a secure attachment with one parent may be thought of as offsetting the negative effect of the insecure attachment with the other parent, therefore we termed this scenario the *Buffering Hypothesis*.

The second research question regarding the potential influence of attachment networks on developmental outcomes is qualitative in nature, with a specific focus on children who form one secure attachment to either the mother or the father: *Does the quality of attachment pattern to one parent contribute more than the other to predicting developmental outcomes?* (Figure 1, Research Question 2). This question pertains to the large group of children who form discordant attachment patterns (e.g., secure attachment to one parent and insecure to the other). Similar to the first research question, the hypothesis is that one of

TABLE 1 Model-based outcome predictions (from Dagan & Sagi-Schwartz, 2018)

Integrative model	Prediction	Brief description
(a) Additive-Hierarchical	S-S > S _M -I _F > I _M -S _F > I-I OR S-S > I _M -S _F > S _M -I _F > I-I	Secure attachment to only one parent (but not the other) leads to better outcomes than insecure attachment to both parents, but poorer outcomes than secure attachment to both parents.
(b) Additive-Horizontal	S-S > S _M -I _F = I _M -S _F > I-I	Secure attachment to one parent (but not the other) leads to better outcomes than insecure attachment to both parents, but poorer outcomes than secure attachment to both parents.
(c) Buffering-Hierarchical	S-S = S _M -I _F > I _M -S _F > I-I OR S-S = I _M -S _F > S _M -I _F > I-I	Secure attachment to only one parent (but not the other) leads to as good outcomes as secure attachment to both parents.
(d) Buffering-Horizontal	S-S = S _M -I _F = I _M -S _F > I-I	Secure attachment to one parent (but not the other) leads to as good outcomes as secure attachment to both parents does, all better than insecure attachment to both parents.

Note. Greater than symbols represent better developmental outcomes.

Abbreviations: S-S, secure attachment to mother and father; I-I, insecure attachment to mother and father; S_M, secure attachment to mother; S_F, secure attachment to father; I_M, insecure attachment to mother; I_F, insecure attachment to father.

two mutually exclusive scenarios will be corroborated. The first scenario predicts that a secure attachment with one parent leads to more optimal developmental outcomes than secure attachment with the other parent, reflecting a hierarchy of caregiving significance. Because in such a scenario one caregiver is ranked higher than the other as far as predictive power is concerned, we termed it the *Hierarchical Hypothesis*. Given that mothers were assumed to be (and in many cases indeed have been) more involved in child rearing than other caregivers, children's attachment relationship with their mothers may enhance the effect of these attachment patterns on developmental outcomes. However, the prediction inferred from the second scenario is that children who are securely attached to only one parent show similar quality of developmental outcomes whether the attachment is with the mother or the father. Because this scenario shows a relative equilibrium between the significance of caregiving of each parent, we termed it the *Horizontal Hypothesis*. Conceptually, this hypothesis derives its power from a long-standing assumption in attachment research that parental sensitivity is one of the most important, although by no means the only predictor of attachment security. Thus, it is the quality of parenting, rather than the parent's (or attachment figure's) identity that matters when it comes to determining the quality of attachment. Indeed, the Horizontal Hypothesis has been recently corroborated with respect to behavioral problem outcomes (see this issue, Dagan et al., 2021 [this issue]).

Finally, combining the first (quantitative) and second (qualitative) research questions results in four integrative models. Each model integrates a quantitative hypothesis with a qualitative one to form a unique prediction about the relations between four configuration groups: children who are securely attached to both parents, children who are securely attached only to mothers, children who are securely attached only to fathers, and children who are insecurely attached to both parents (Table 1). This approach enables a systematic evaluation of the following question: Which integrative model empirically prevails when assessing different developmental outcomes?

4 | RECOMMENDATIONS FOR FUTURE RESEARCH

To examine the proposed integrative models with precision, current and future research should use two supplementary methodological paradigms. The first is obtaining, harmonizing, and synthesizing data from studies that evaluated early attachment patterns to multiple caregivers. This can be achieved by using the gold standard method of meta-analysis, that is, individual participant data (IPD) meta-analyses (Verhage et al., 2020). Attachment research lends itself well to IPD meta-analysis because it has long relied on a gold standard in the observational assessment of attachment patterns (i.e., SSP), and on other, well-calibrated observational instruments (e.g., the AQS), which in turn makes the harmonization of the independent variable relatively straightforward. Harmonization of multiple developmental outcomes, however, such as social competence or effortful control, will need to undergo careful conceptual and statistical synthesis because multiple studies used different instruments, which may entail different assumptions about the construct that they measure (Flake & Fried, 2020). A framework for addressing such a problem via an IPD meta-analysis in attachment research has already been created (Verhage et al., under review) and applied (Dagan et al., 2021 [this issue]).

The second, more labor-intensive approach is launching a large longitudinal birth cohort study (for a proposed methodological approach, see Dagan & Sagi-Schwartz, 2018). We recommend that researchers who design such a study consider variables that may moderate the effects for the anticipated links between attachment network and multiple outcomes. For example, given that risk conditions have been found to moderate the association between children's attachment patterns and multiple developmental outcomes (e.g., Groh et al., 2014), family risk status may moderate the effects that the number of secure attachment relationships may have on developmental outcomes. Parental involvement in caregiving may be another important moderating factor, as it is reasonable to expect that in families where one parent interacts with the child significantly more than the other, the Hierarchical hypothesis, rather than the Horizontal Hypothesis, will be supported. Additionally, as in much of attachment research, it is less clear what mediates the expected associations between early attachment patterns and later developmental outcomes. Thus, careful consideration of mediating variables will be useful in assessing attachment networks. For example, evidence suggests that attachment-based parenting interventions, which have been shown to enhance attachment security, affect diurnal cortisol regulation (i.e., higher morning cortisol and steeper morning-to-evening rhythms observed in children who received attachment-based interventions than in controls; Bakermans-Kranenburg et al., 2008; Bernard et al., 2015). Diurnal cortisol regulation, in turn, predicts later socioemotional outcomes (e.g., anger regulation and externalizing behaviors; Bernard et al., 2015; Salis et al., 2016), which supports the hypothesis that physiological stress regulation mediates the anticipated pathways from attachment networks to socioemotional outcomes.

5 | CONCLUSION

The developmental history of the concept of attachment network is by no means linear. As often is the case in other psychological research arenas, assessment of whether and how multiple attachment figures *jointly* influence children's development has been pushed and pulled in different directions. This was the case due to the critical misunderstanding of Bowlby's original terms, research designs with compromising considerations, and possibly premature satisfaction with assessing a children's attachment to a single caregiver. Despite a history of comparatively few and inconsistent empirical findings, the accumulation of

studies that have been conducted to date have laid the groundwork for generating important testable hypotheses about the predictive power of attachment networks to multiple caregivers on developmental outcomes. Assessing the integrative attachment networks models that we present here is likely to help attachment theory overcome what has long been regarded as one of the main challenges it has faced since its conception.

ORCID

Or Dagan  <https://orcid.org/0000-0002-4674-5425>

REFERENCES

- Ahnert, L., Pinquart, M., & Lamb, M. E. (2006). Security of children's relationships with nonparental care providers: A meta-analysis. *Child Development, 77*(3), 664–679. <https://doi.org/10.1111/j.1467-8624.2006.00896.x>
- Ahnert, L., & Schoppe-Sullivan, S. J. (2020). Fathers from an attachment perspective. *Attachment & Human Development, 22*(1), 1–3. <https://doi.org/10.1080/14616734.2019.1589054>
- Ainsworth, M. D. S. (1963). The development of infant–mother interaction among the Ganda. In (B. M. Foss Ed.), *Determinants of infant behavior* (pp. 67–104). Wiley.
- Ainsworth, M. D. S. (1967). *Infancy in Uganda: Infant care and the growth of love*. Johns Hopkins University Press.
- Ainsworth, M. D. S. (1985). *Attachments across the life span*. Bulletin of the New York Academy of Medicine, 61(9), pp. 792–812. <https://pubmed.ncbi.nlm.nih.gov/3864511>
- Bakermans-Kranenburg, M. J., van IJzendoorn, M. H., Mesman, J., Alink, L. R., & Juffer, F. (2008). Effects of an attachment-based intervention on daily cortisol moderated by dopamine receptor D4: A randomized control trial on 1- to 3-year-olds screened for externalizing behavior. *Development and Psychopathology, 20*(3), 805–820. <https://doi.org/10.1017/S0954579408000382>
- Bernard, K., Zwerling, J., & Dozier, M. (2015). Effects of early adversity on young children's diurnal cortisol rhythms and externalizing behavior. *Developmental Psychobiology, 57*(8), 935–947. <https://doi.org/10.1002/dev.21324>
- Bowlby, J. (1951). Maternal care and mental health. In *World Health Organization Monograph Series. (Serial No. 2)*.
- Bowlby, J. (1969). *Attachment and loss, Vol. 1*. Basic Books.
- Bowlby, J. (1988). *A secure base: Parent-child attachment and healthy human development*. Basic Books.
- Bretherton, I. (2010). Fathers in attachment theory and research: A review. *Early Child Development and Care, 180*(1/2), 9–23. <https://doi.org/10.1080/03004430903414661>
- Bureau, J.-F., Deneault, A.-A., & Yurkowski, K. (2020). Preschool father-child attachment and its relation to self-reported child socioemotional adaptation in middle childhood. *Attachment & Human Development, 22*(1), 90–104. <https://doi.org/10.1080/14616734.2019.1589065>
- Cabrera, N. J., Volling, B. L., & Barr, R. (2018). Fathers are parents, too! Widening the lens on parenting for children's development. *Child Development Perspectives, 12*(3), 152–157. <https://doi.org/10.1111/cdep.12275>
- Cassidy, J., & Marvin, R. S., & the MacArthur working group on attachment (1992). *Attachment organisation in 2 1/2 to 4 1/2 years olds: Coding manual (Unpublished coding manual)*. University of Virginia.
- Cowan, P. A., & Cowan, C. P. (2019). Introduction: Bringing dads back into the family. *Attachment & Human Development, 21*(5), 419–425. <https://doi.org/10.1080/14616734.2019.1582594>
- Dagan, O., & Sagi-Schwartz, A. (2018). Early attachment network with mother and father: An unsettled issue. *Child Development Perspectives, 12*(2), 115–121. <https://doi.org/10.1111/cdep.12272>
- Dagan, O., & Sagi-Schwartz, A. (2020). *Infant attachment (to mother and father) and its place in human development: Five decades of promising research (and an unsettled issue)*. In (J. J. Lockman & C. Tamis-LeMonda Eds.), *The Cambridge Handbook of Infant Development* (pp. 687–714). Cambridge University Press.
- Dagan, O., Schuengel, C., Verhage, M., Van IJzendoorn, M. H., Sagi-Schwartz, A., Madigan, S., ... The Collaboration on Attachment to Multiple Parents and Outcomes Synthesis (2021). Configurations of Mother-Child and Father-Child Attachment as Predictors of Internalizing and Externalizing Behavioral Problems: An Individual Participant Data (IPD) Meta-Analysis. <https://doi.org/10.31234/osf.io/x4td2>.
- Duschinsky, R. (2020). *Cornerstones of attachment research*. Oxford University Press.
- Easterbrooks, M. A., & Goldberg, W. A. (1984). Toddler development in the family: Impact of father involvement and parenting characteristics. *Child Development, 55*(3), 740–752. <https://doi.org/10.2307/1130126>
- Fagan, J., Day, R., Lamb, M. E., & Cabrera, N. J. (2014). Should researchers conceptualize differently the dimensions of parenting for fathers and mothers? *Journal of Family Theory & Review, 6*(4), 390–405. <https://doi.org/10.1111/jftr.12044>
- Flake, J. K., & Fried, E. I. (2020). Measurement schmeasurement: Questionable measurement practices and how to avoid them. *Advances in Methods and Practices in Psychological Science, 3*(4), 456–465. <https://doi.org/10.1177/2515245920952393>

- Fox, N. A., Kimmerly, N. L., & Schafer, W. D. (1991). Attachment to mother/attachment to father: A meta-analysis. *Child Development, 62*(1), 210–225. <https://doi.org/10.1111/j.1467-8624.1991.tb01526.x>
- Goossens, A., & van IJzendoorn, M. H. (1990). Quality of infants' attachments to professional caregivers: Relation to infant-parent attachment and day-care characteristics. *Child Development, 61*(3), 832–837. <https://doi.org/10.2307/1130967>
- Groh, A. M., Fearon, R. P., Bakermans-Kranenburg, M. J., van IJzendoorn, M. H., Steele, R. D., & Roisman, G. I. (2014). The significance of attachment security for children's social competence with peers: A meta-analytic study. *Attachment & Human Development, 16*(2), 103–136.
- Grossmann, K., Grossmann, K. E., Fremmer-Bombik, E., Kindler, H., Scheuerer-Englisch, H., & Zimmermann, P. (2002). The uniqueness of the child-father attachment relationship: Fathers' sensitive and challenging play as a pivotal variable in a 16-year longitudinal study. *Social Development, 11*(3), 301–337. <https://doi.org/10.1111/1467-9507.00202>
- Grossmann, K., & Grossmann, K. E. (2020). Essentials when studying child-father attachment: A fundamental view on safe haven and secure base phenomena. *Attachment & Human Development, 22*(1), 9–14. <https://doi.org/10.1080/14616734.2019.1589056>
- Grossmann, K. E., Grossmann, K., Huber, F., & Wartner, U. (1981). German children's behavior towards their mothers at 12 months and their fathers at 18 months in Ainsworth's Strange Situation. *International Journal of Behavioral Development, 4*, 157–181. <https://doi.org/10.1177/016502548100400202>
- Howes, C., & Spieker, S. (2016). Attachment relationships in the context of multiple caregivers. In (J. Cassidy & P. R. Shaver Eds.), *Handbook of attachment: Theory, research and clinical applications* (3rd ed., pp. 314–328). Guilford Press.
- Kalil, A., Ryan, R., & Chor, E. (2014). Time investments in children across family structures. *The ANNALS of the American Academy of Political and Social Science, 654*(1), 150–168. <https://doi.org/10.1177/0002716214528276>
- Kochanska, G., & Kim, S. (2013). Early attachment organization with both parents and future behavior problems: From infancy to middle childhood. *Child Development, 84*(1), 283–296. <https://doi.org/10.1111/j.1467-8624.2012.01852.x>
- Kuo, P. X., Saini, E. K., Tengeltisch, E., & Volling, B. L. (2019). Is one secure attachment enough? Infant cortisol reactivity and the security of infant-mother and infant-father attachments at the end of the first year. *Attachment & Human Development, 21*(5), 426–444. <https://doi.org/10.1080/14616734.2019.1582595>
- Lamb, M. E. (1978). Qualitative aspects of mother- and father-infant attachments. *Infant Behavior and Development, 1*, 265–275. [https://doi.org/10.1016/S0163-6383\(78\)80038-1](https://doi.org/10.1016/S0163-6383(78)80038-1)
- Lamb, M. E., Hwang, C. P., Frodi, A. M., & Frodi, M. (1982). Security of mother- and father-infant attachment and its relation to sociability with strangers in traditional and nontraditional Swedish families. *Infant Behavior and Development, 5*(2–4), 355–367. [https://doi.org/10.1016/S0163-6383\(82\)80046-5](https://doi.org/10.1016/S0163-6383(82)80046-5)
- Liang, X., Lin, Y., Van IJzendoorn, M. H., & Wang, Z. (2021). Grandmothers are part of the parenting network, too! A longitudinal study on coparenting, maternal sensitivity, child attachment and behavior problems in a Chinese sample. *New Directions for Child and Adolescent Development, 2021*(180), 95–116. <https://doi.org/10.1002/cad.20442>
- Main, M., & Weston, D. R. (1981). The quality of the toddler's relationship to mother and to father: Related to conflict behavior and the readiness to establish new relationships. *Child Development, 52*(3), 932–940. <https://doi.org/10.2307/1129097>
- Sagi-Schwartz, A., & Aviezer, O. (2005). Correlates of attachment to multiple caregivers in kibbutz children from birth to emerging adulthood: The Haifa longitudinal study. In (K. E. Grossmann, K. Grossmann, & E. Waters Eds.), *Attachment from infancy to adulthood* (pp. 165–197). Guilford Press.
- Sagi-Schwartz, A., Lamb, M. E., Lewkowicz, K. S., Shoham, R., Dvir, R., & Estes, D. (1985). Security of infant-mother, -father, and -metapelet attachments among kibbutz-reared Israeli children. *Monographs of the Society for Research in Child Development, 50*(1–2), 257–275. <https://doi.org/10.2307/3333837>
- Salis, K. L., Bernard, K., Black, S. R., Dougherty, L. R., & Klein, D. (2016). Examining the concurrent and longitudinal relationship between diurnal cortisol rhythms and conduct problems during childhood. *Psychoneuroendocrinology, 71*, 147–154. <https://doi.org/10.1016/j.psyneuen.2016.05.021>
- Schaffer, H. R., & Emerson, P. E. (1964). The development of social attachments in infancy. *Monographs of the Society for Research in Child Development, 29*(3), 1–77. <https://doi.org/10.2307/11657275>
- Sroufe, L. A. (1982). Letter to mary ainsworth, february 16th, 1982. Mary Ainsworth Papers, Drs. Nicholas and Dorothy cummings center for the history of psychology. *Box M3173, Folder, 3*.
- Sroufe, L. A., Egeland, B., Carlson, E., & Collins, W. A. (2005). *The development of the person: The Minnesota study of risk and adaptation from birth to adulthood*. Guilford.
- Steele, H., Steele, M., & Fonagy, P. (1996). Associations among attachment classifications of mothers, fathers, and their infants. *Child Development, 67*(2), 541–555. <https://doi.org/10.1111/j.1467-8624.1996.tb01750.x>
- Suess, G. J., Grossmann, K. E., & Sroufe, L. (1992). Effects of infant attachment to mother and father on quality of adaptation in preschool: From dyadic to individual organisation of self. *International Journal of Behavioral Development, 15*(1), 43–65. <https://doi.org/10.1177/016502549201500103>

- Van IJzendoorn, M. H., & De Wolff, M. S. (1997). In search of the absent father—meta-analysis of infant-father attachment: A rejoinder to our discussants. In *Child Development* (Vol., 68, Issue (4), pp. 604–609). <https://doi.org/10.1111/j.1467-8624.1997.tb04223.x>
- Van IJzendoorn, M. H., Sagi, A., & Lambermon, M. W. E. (1992). The multiple caretaker paradox: Data from Holland and Israel. *New Directions for Child and Adolescent Development*, 1992(57), 5–24. <https://doi.org/10.1002/cd.23219925703>
- Van IJzendoorn, M. H., & Tavecchio, L. W. C. (1987). The development of attachment theory as a Lakatosian research program: Philosophical and methodological aspects. In (L. W. C. Tavecchio & M. H. Van IJzendoorn Eds.), *Attachment in social networks: Contributions to the Bowlby-Ainsworth attachment theory*. Elsevier Science.
- Verhage, M. L., Schuengel, C., Duschinsky, R., IJzendoorn, M. H. V., Fearon, R. M. P., Madigan, S., Roisman, G. I., & Bakermans-Kranenburg, M. J. (2020). The collaboration on attachment transmission synthesis (CATS): A move to the level of individual-participant-data. *Current Directions in Psychological Science*, 29(2), 199–206. <https://doi.org/10.1177/0963721420904967>
- Verhage, M. L., Schuengel, C., Holopainen, A., Bakermans-Kranenburg, M. J., Bernier, A., Brown, G. L., Madigan, S., Roisman, G. I., Vaever, M. S. & Wong, M. S. The Collaboration on Attachment Transmission Synthesis (CATS) (under review). Conceptual comparison of constructs as first step in data harmonization: Parental sensitivity, child temperament, and social support as illustrations.
- Waters, E., & Deane, K. E. (1985). Defining and assessing individual differences in attachment relationships: Q-methodology and the organization of behavior in infancy and early childhood. *Monographs of the Society for Research in Child Development*, 50(1–2), 41–65. <https://doi.org/10.2307/3333826> libproxy.newschool.edu/

How to cite this article: Dagan, O., & Sagi-Schwartz, A. (2021). Early attachment networks to multiple caregivers: History, assessment models, and future research recommendations. *New Directions for Child and Adolescent Development*, 2021, 9–19. <https://doi.org/10.1002/cad.20446>

Parenting costs time: Changes in pair bond maintenance across pregnancy and infant rearing in a monogamous primate (*Plecturocebus cupreus*)

Chloe L. Karaskiewicz^{1,2} | Lynea R. Witzak^{1,2} 

Allison R. Lau^{2,3}  | Madison E. Dufek² | Karen L. Bales^{1,2,3} 

¹ Department of Psychology, University of California, Davis, Davis, California, USA

² California National Primate Research Center, University of California, Davis, Davis, California, USA

³ Animal Behavior Graduate Group, University of California, Davis, Davis, California, USA

Correspondence

Karen L. Bales, Department of Psychology, University of California, Davis, One Shields Avenue, Davis, CA, 95616, USA.
Email: klbales@ucdavis.edu

Abstract

Relationships support social animals' health, but maintaining relationships is challenging. When transitioning to parenthood, new parents balance pair-bond maintenance with infant care. We studied pair-bond maintenance via affiliation in 22 adult titi monkey pairs (*Plecturocebus cupreus*) for 16 months centered around their first offspring's birth. Pair affiliation peaked during pregnancy, decreased across the postpartum period, and rose after reaching minimum affiliation 32.6 weeks postpartum. Pairs in which fathers carry infants more than average had lower affiliation at the infant's birth and return to an increase in affiliation sooner. Parents of infants who were slow to independence had higher rates of affiliation. Titi monkey infants actively prefer their fathers; mothers may avoid their infant-carrying mate, suggesting infants play an active role in parental affiliative decline. Our data supports previous findings that affiliation between partners declines following an infant's birth, but demonstrates new knowledge about the extent and duration of affiliative decline.

KEYWORDS

affiliation, attachment, infant development, nonhuman primate, pair bond, parental care, relationship maintenance

1 | INTRODUCTION

Relationships are vital to the survival of social species. While social bonds form between a variety of dyadic types, adult romantic relationships—sometimes referred to as adult attachments—are some of the most potent and important bonds individuals can form (Fraley, 2019). In humans, the existence and quality of adult romantic relationships reliably predict health, happiness, and longevity (Loving & Slatcher, 2013). Individuals in long-term romantic relationships live longer (Lawrence et al., 2019), recover faster from illness or surgery (Kiecolt-Glaser, 2018), and are overall more satisfied with life (Roberson et al., 2018) than individuals who are not in romantic relationships. However, in order for a relationship to survive and thrive, a pair must engage in active pair-bond maintenance as they navigate the changes that inevitably occur across an individual's lifetime.

Just as an individual is reshaped by a myriad of life events, relationships also change over time, responding to both discrete events and continuous change. One of the earliest and most easily identified transitions is the shift from relationship formation to relationship maintenance (Clark et al., 2019). This considerable milestone attracts much attention in the current relationship science literature as specific neurobiological and behavioral changes mark this transition (Walum & Young, 2018). Both in the human and nonhuman animal literature, individuals reinforce relationships through maintenance behaviors like proximity, affiliation, shared tasks, and pair communication (*humans*: Ogolsky & Bowers, 2013; Stafford, 2016; *nonhuman animals*: Dolotovskaya, Walker, et al., 2020; Singletary & Tecot, 2020). Though the exact behaviors involved in pair-bond maintenance vary depending upon species, the types of behaviors are consistent across taxa. Further, these maintenance behaviors are particularly important not just for regular maintenance of the bond, but also when pairs experience stress or changes to their relationship. Employment of pair-bond maintenance behaviors help ensure the resilience of the bond when energetic and behavioral priorities need to shift, as is the case when a pair becomes parents.

In the transition to parenthood, romantic partners experience large scale changes in their social landscape, which alter their behavior within the relationship. Adding offspring to the existing attachment relationship between partners shifts the dyad into an attachment network, wherein the offspring now require energetic resources previously devoted to the partner. Because infants of many species cannot adequately meet their own thermoregulatory, nutritional, or psychological needs, early caregivers often act as external homeostatic regulators (Hofer, 1994). Parental responsiveness supports secure infant attachment and infants can solicit parental care through vocal and behavioral solicitations (Bell & Ainsworth, 1972). In order to provide this care, new parents experience dramatic changes to their neurobiology and behavior which support infant responsivity and care (for review: Rogers & Bales, 2019). Lactation and infant carrying are the two most costly forms of infant care among mammals (Altmann & Samuels, 1992) and new parents must re-allocate energetic resources toward infant care and energetic maximization or conservation. Sometimes, this shift in energetic resource allocation results in reductions to the frequency of pair-focused social behaviors (Altmann, 1980), though there is an increasing amount of evidence to suggest that social behaviors are conserved as long as possible (*titi monkeys*: Dolotovskaya & Heymann, 2020; *black howler monkeys*: Dias et al., 2011; *gelada baboons*: Dunbar & Dunbar, 1988). As a consequence of allocating less time to social behaviors—including pair maintenance behaviors—romantic dyads may experience postpartum dips in relationship quality and satisfaction (*humans*: Belsky et al., 1985). Indeed, navigating the new balance required to meet the needs of the infant, the partner, and the self can cause considerable conflict between romantic partners (Adamsons, 2013; Cowan & Cowan, 1992). While these effects have been studied in the immediate postpartum period, most studies

do not evaluate their longevity or what milestones in infant development coincide with changes in the pair relationship.

The current study longitudinally examines the relationship between pair-bond maintenance and infant care as new parents balance the needs of their relationship with the needs of dependent offspring. This work demonstrates a unique perspective on attachment networks between parents and offspring as it focuses on how the presence of additional attachment network members (i.e., offspring) influence the relationship between existing members (i.e., the pair/parents). To investigate whether, and how, pair-focused behaviors change across the time when the dyad cares for their infant, we worked with coppery titi monkeys (*Plecturocebus cupreus*): small-bodied, socially monogamous neotropical primates that form socially monogamous pair bonds (Cubicciotti & Mason, 1976; Dolotovskaya, Roos, et al., 2020; Fuentes, 1998; Kleiman, 1977; Mason, 1966) and provide biparental care to their offspring (Fragaszy et al., 1982; Mason, 1966; Mendoza & Mason, 1986). Pair relationships are maintained with affiliative behaviors (Fernandez-Duque et al., 2000), territorial mate guarding (Mendoza & Mason, 1986), and vocal duets (Lau et al., 2020; Robinson, 1979). Pairs that have been together longer tend to engage in affiliative behavior more often (Hoffman, 1998; Rothwell et al., 2020). In addition to forming pair bonds, titi monkeys provide biparental care. Males serve as the infant's primary attachment figure and provide the bulk of non-nutritional parental care (Fragaszy et al., 1982). Females provide sustenance via lactation, carry the infant during nursing bouts, and have been observed to actively avoid and reject carrying the infant at other times (Mendoza & Mason, 1986; Reeder, 2001). Titi monkey infants actively solicit and transfer between parents, effectively shaping the frequency with which it is carried by each parent (Mendoza & Mason, 1986).

Thus far, no studies to date have examined the direct impacts of infant care on pair affiliation in a controlled manner. Here, we assess the impacts of the transition to parenthood on intra-pair affiliation. The current study tracks pair affiliation in the 8 months prior to the birth of a pair's first infant and across the 8 months following the birth to the first surviving offspring in an effort to uncover how and when affiliative social behaviors between pair mates change during this time. Overall, we expected pair affiliation to decline following the birth of the infant and recover as the infant becomes more and more independent. As titi monkey fathers are the primary caregivers of their infants, and mothers may avoid her partner when he is carrying the infant, we expected the proportion of time the father carries the infant to negatively predict the proportion of time the pair spends in affiliative contact. As affiliation may increase with pair tenure, we expected pair tenure to positively predict the rate of affiliation between pair mates. Finally, as infant care decreases with growing infant independence, we expected infant independence to positively predict pair affiliation.

2 | METHODS

2.1 | Selection of subjects and housing

We identified 22 pairs of adult coppery titi monkeys (*P. cupreus*; hereafter referred to as titi monkeys) for our study. We chose pairs for whom we had collected scan sample data when they gave birth to their first surviving infant. This criterion excluded any pairs with a first parturition prior to 2008 or after 2019. The infants of all 22 pairs survived past 8 months of age. Each focal family consisted of one adult male, one adult female, and their infant. Adult females in this study ranged from 2.17 to 12.81 years of age at the time of the infant's birth ($M = 4.97$, $SE = 0.60$). Adult males ranged from 2.41 to 10.96 years of age at the time of the infant's birth ($M = 5.25$, $SE = 0.45$). The duration of pair tenure, prior to the infant's birth ranged from 0.37 to 3.57 years ($M = 0.97$, $SE = 0.16$).

TABLE 1 Ethogram for social behaviors

Behavior	Definition
<i>Affiliative social interactions</i>	
Passive contact	Male's and female's bodies are in physical contact that does not include tail-twining.
Social proximity	Animal's body (excluding the tail) is within arm's length (approximately six inches) of another animal (excluding the tail).
Tail twine	Male and female tails are intertwined for at least one full turn.
None	Male and female are not in passive contact, social proximity, or tail twining.
<i>Infant carry interactions</i>	
Father carry	Infant is being carried by the father. Needs to have both back feet on the father to count as being carried (can have hands off father but as long as both feet are on father will count as a carry).
Mother carry	Infant is being carried by the mother. Needs to have both back feet on the mother to count as being carried (can have hands off mother but as long as both feet are on mother will count as a carry).
Off	Infant is not being carried by mother or father. If hands are touching a parent but feet are off of the parent this would be scored as "off."

All coppery titi monkeys in this study were born and housed at the California National Primate Research Center (CNPRC). Titi monkeys were housed in pairs in enclosures measuring either $1.2 \times 1.2 \times 2.1$ m, $1.2 \times 1.2 \times 1.8$ m, or $1.6 \times 1.2 \times 0.7$ m. The environment was maintained at 21°C on a 12-h light cycle with lights on from 06:00 to 18:00. Titi monkeys were fed monkey chow, carrots, bananas, apples, and rice cereal twice daily. Water was available ad libitum and additional edible foraging enrichment was provided twice daily. Subjects were housed in male-female pairs. Subject pairs were recruited 8 months prior to the birth of their first infant. After the birth of their infant, the family (male, female, and infant) remained together in the same enclosure for at least 8 months. This housing situation is the same as described in previous studies (Mendoza & Mason, 1986; Tardif et al., 2006). All procedures followed NIH guidelines for the ethical treatment of laboratory animals and were approved by the University of California, Davis Institutional Animal Care and Use Committee.

2.2 | Data collection

The data collected for this study included pair affiliation and parental care behavioral observations for each focal family unit. Each observation type was recorded 5 days a week in 2-h intervals during daytime hours (6:30 to 16:30) for a total of 16 months centered around the birth of each pair's first surviving infant. These data have been collected since 2008 in our laboratory.

Pair affiliation was recorded for the full 16-month observation period described above. Every 2 h, a trained observer recorded whether adult partners were within social proximity of each other, social contact, tail-twining, or none of the above (Table 1). These measures do not include interactions with offspring. For our analyses, social affiliation was measured as the proportion of time a pair spent in proximity, contact, or tail-twining—as opposed to none of these behaviors—out of all of the observations collected on that pair over a particular period of time.

Parental care was recorded for the 8-month period following the birth of the pair's first surviving offspring. Every 2 h, a trained observer recorded whether infants were being carried by their father, their mother, or neither ("off") (Table 1). This measure does not include interactions between pair mates. For our analyses, parental care was measured as the proportion of time each parent spent carrying the infant out of all of the observations collected on that infant over a 7-day period of time. Parental care was separated into the proportion of time the father carried the infant, the proportion of time the mother carried the infant, and the proportion of time either parent carried the infant.

We conducted analyses on two sets of data. The first set of analyses examined social affiliation data over a 16-month period, which began 8 months before the infant was born, and ended 8 months after the infant was born for each pair. Because pair tenure ranged from 0.37 to 3.57 years, not all pairs had the full 8 months of data preceding their infant's birth. This happened if the pairs became pregnant immediately after pairing. Of the 22 pairs in this study, 11 pairs had the full set of 8 months pre-birth data, five pairs had seven of the 8 months of pre-birth data, and six pairs had five of the 8 months pre-birth data. The aim of this first set of analyses was to examine broad changes in social affiliation centered around the birth of the infant. We chose to condense these data into four 4-month periods in order to examine pair behavior during several key stages: pre-pregnancy (8 to 5 months prior to infant birth), pregnancy (4 to 0 months prior to infant birth), infant dependence (0 to 4 months postpartum), and infant independence (4 to 8 months postpartum). We chose 4-month periods for two reasons: (1) pregnancy in titi monkeys is approximately 4 months (Valeggia et al., 1999); and (2) infants tend to transition to greater behavioral independence after 4 months of age (Fragaszy et al., 1982). Therefore, our four periods capture the 4 months directly preceding pregnancy, the entire 4 months of pregnancy, the first 4 months of an infant's life when it is highly dependent on parents, and the next 4 months of an infant's life when it is more independent. The proportion of time pairs spent in affiliative contact was calculated by adding the number of scan samples when a pair was in affiliative contact (tail-twining, contact, proximity) over each 4-month period, and dividing by the total number of scan samples recorded during that interval. This gave us four 4-month period social affiliation scores, with possible values ranging from 0 to 1.

The second set of analyses examined the first 8 months after the infant was born with the goal of investigating the effects of parental behavior on social affiliation between partners. We used the pair affiliation scan sample data described above to measure changes in pair affiliation over time in conjunction with the parental care scan sampling described above. While infants are typically observed being carried by one parent during nearly every observation throughout the first 4 months of their life, the timing of the transition to behavioral independence is variable and typically happens rapidly. We considered an infant "independent" when it was observed "off" for 10 consecutive observations. For our sample, mean infant independence occurred at 150.75 ($SE = 4.81$) days post-birth, ranging from 116 to 193 days. Because this change can occur in a matter of days, we chose to group our data by week. Therefore, we calculated the proportion of time spent in affiliative contact by adding up all of the times a pair was in affiliative contact (tail-twining, contact, proximity) over seven days, and divided by the total number of scan samples recorded during that interval. This gave us a weekly social affiliation score, with possible values ranging from 0 to 1. We then calculated three infant-carry scores: father carry, mother carry, and parent carry. Father carry was calculated by dividing the number of times the father was observed carrying the infant over seven days by the number of total observations recorded for that infant during that interval. Similarly, we calculated mother carry by dividing the number of times the mother was observed carrying the infant by the number of total observations recorded for that seven-day interval. Parent carry was calculated by adding the times either the mother and father were observed carrying the infant over a seven-day period divided

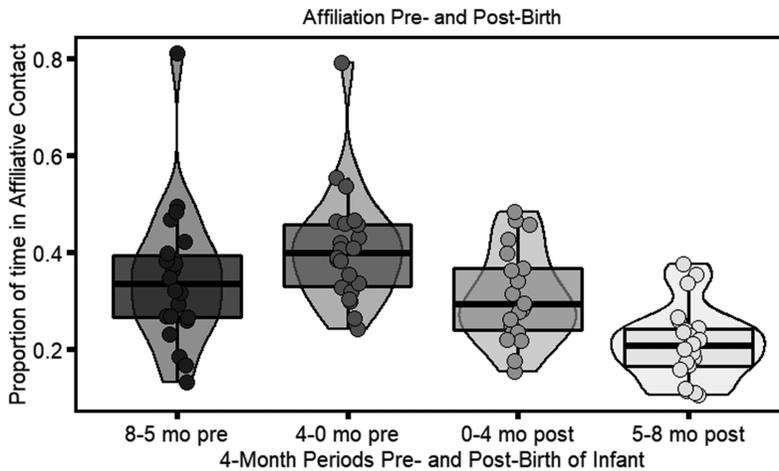


FIGURE 1 Proportion of time pairs spend in affiliative contact over four 4-month periods. Outliers included in the figure. Each point is an observed score for an individual pair at each time point. Boxplots represent median value of affiliative contact with lower and upper hinges corresponding to the first and third quartiles. A violin plot overlays the data for each time period, illustrating the distribution of the variables.

by the total number of observations for that sampling period. These calculations gave us weekly scores of the proportion of time the infant was carried by the father, the mother, or either parent, with possible values ranging from 0 to 1. Data for this study are available via Open Access (<https://doi.org/10.5281/zenodo.4480404>).

2.3 | Data analyses

We first wanted to examine change in parent social affiliation over a 16-month period. In R Statistical Software (version 4.0.3, R Core Development Team, 2020), we performed a Shapiro Wilk test of normality (Royston, 1983), removed two extreme outliers, and used Levene's test using the car package (Fox & Weisberg, 2019) to test for homogeneity of variance (Schultz, 1985). Using the lme4 package (Bates et al., 2015), we used a general linear mixed model (LMM) to determine whether period of time (fixed effect) predicted the proportion of time a pair spent in affiliative contact. We included pair ID as a random, repeated-measures effect. We performed a log likelihood ratio test to compare the fit of our model to that of a null model. To compare the mean values of affiliation between time points, we conducted a Tukey's Test post-hoc analysis, correcting for multiple comparisons, using the multcomp package (Hothorn et al., 2008). Tests were two-tailed and the significance threshold was set at 0.05.

We next wanted to determine how parenting behaviors impacted the proportion of time parents spend in social affiliation with each other during the first 8 months of an infant's life. Upon visual inspection of the data, it appeared affiliation followed a quadratic trend (Figure 1). To empirically test which trajectory best explained our data, different growth models that included no growth, linear growth, and quadratic growth were applied to the data using SAS 9.4 using PROC NL MIXED (SAS Institute, Cary, NC). These tests were run prior to including model covariates, but determined which growth model we would use to test for the effects of covariates. This model is subject-specific, allowing for a general growth model to characterize the population, but also allowing the coefficients of the

growth model to be unique to the individual dyad. Based on a comparison of AIC values, the quadratic growth model best fit our data.

We then compared measures of fit such as log likelihood and the information criterion of Akaike (AIC; Akaike, 1974) to determine whether adding random effects for the intercept, trough value of affiliation (value at which the inflection point occurs in the quadratic trajectory when affiliation begins to increase again), and time to trough value of affiliation. Deviance tests indicated that a quadratic growth model that included a random effect for each of the growth coefficients provided the best relative fit.

We then built on our baseline model by adding time-varying and fixed coefficients. Our time-varying covariates were the proportion of time the father spent carrying the infant each week, proportion of time the mother spent carrying the infant, and the proportion of time either parent was observed carrying the infant during each seven-day interval. We used pair-centering and grand-mean-centering to determine the effect of each time-varying covariate within a pair, controlling for all other covariates, and between pairs, including the effects of the other predictors. The fixed covariates were the length of time a pair had been together at the time the infant was born (pair tenure) and the age at which the infant became independent (defined as the point at which the infant has been observed "off" for 10 consecutive observations). Fixed covariates were centered about their respective means. We chose to examine the effects of pair tenure on affiliation because a previous study showed that well-established pairs were more likely to be observed tail-twining during scan samples than newly-formed pairs (Rothwell et al., 2020). We chose to examine infant-specific predictors because the presence of an infant predicts a decrease in proportion of time pairs spend in affiliative contact during the first year that a pair is together (Witczak, Blozis, & Bales, in prep).

Given that a quadratic growth model provided the best relative fit to the social response scores, a version of the model with interpretable parameters was applied to test the effects of covariates (Cudeck & du Toit, 2002). Letting y_{ij} denote the social response for titi monkey pair i at week j , the quadratic growth model was parameterized as

$$y_{ij} = \beta_{yi} - (\beta_{yi} - \beta_{0i}) \left(\frac{week_{ij} - 1}{\beta_{xi}} - 1 \right)^2 + \varepsilon_{ij} \quad (1)$$

where, for titi monkey pair i , β_{0i} represents the response at week 1, β_{yi} represents the trough response, and β_{xi} represents the week at which the trough response occurs. In the model, each of the coefficients is a sum of a fixed effect that relates to the population and a random effect that relates to titi monkey pair i . For example, $\beta_{0i} = \beta_0 + u_{0i}$, where β_0 denotes the expected response for the population at week 1 and u_{0i} is the random effect for titi monkey pair i . Positive values of u_{0i} for an animal pair would indicate that a titi monkey pair's response at week 1 is higher than the expected value of the population, and a negative value indicate that an animal pair's response at week 1 is lower than the expected value of the population. Finally, the residual of the model is denoted by ε_{ij} .

Under the quadratic growth model in Equation (1) the residual was assumed to be normally distributed with a mean of zero and variance $\sigma_{\varepsilon_i}^2$. The variance was assumed to be homogeneous across animal pairs. Specifically, the residual variance $\sigma_{\varepsilon_i}^2$ was assumed to follow a lognormal model (c.f.: Hedeker et al., 2008):

$$\sigma_{\varepsilon_i}^2 = \exp(\tau_0) \quad (2)$$

where τ_0 , when exponentiated, is the (geometric) residual variance for a titi monkey pair.

The three quadratic growth coefficients (β_{0i} , β_{yi} , and β_{xi}) were then predicted by the covariates, with each covariate centered about their respective sample mean. First, the effects of covariates were evaluated individually. In evaluating the effects of the length of time a pair had been together, for instance, each of the growth coefficients was regressed as follows:

$$\beta_{0i} = \beta_{00} + \beta_{01} \text{PairTenur } e_i + u_{0i}$$

$$\beta_{yi} = \beta_{y0} + \beta_{y1} \text{PairTenur } e_i + u_{yi}$$

$$\beta_{xi} = \beta_{x0} + \beta_{x1} \text{PairTenur } e_i + u_{xi}$$

where β_{00} , β_{y0} , and β_{x0} represent the expected response at week 1, the trough response, and the week at which the trough response occurs, respectively, for titi monkey pairs whose pair tenure score was at the sample mean. The coefficients β_{01} , β_{y1} , and β_{x1} represent the expected unit change in each of the coefficients for a one-unit increase in *PairTenure*_{*i*}. The residuals of the three equations, u_{0i} , u_{yi} , and u_{xi} , denote the random effects conditional on *PairTenure*_{*i*}. In each of the models fit to the data, each of the three random growth coefficients could covary.

Next, the full set of covariates were included in a larger model to provide tests of the covariates with the effects being statistically adjusted for other model covariates. Effects that were not statistically significant at the 0.05 level when tested independently were not included in the larger model and a final, relatively parsimonious version of the model was used for interpretation. It is important to note that the significance of fixed and random effects was only interpreted in this one final model; therefore, post-hoc corrections were not needed for this final model.

3 | RESULTS

We first examined general changes in social affiliation between titi monkey pair mates over the 8 months prior to infant birth and the 8 months following infant birth. We collected an average of 1030.36 ($SE = 71.66$) scan samples per pair over this period of time (range = 117–1,497). Analyses were based on a total of 22,668 observations. Initially, our data were not normally distributed ($W = 0.93$, $p < 0.001$); however, when we plotted our data, we identified two outliers (Figure 1). The same pair spent 80.9% and 79.0% of their observations in affiliative contact during the first period (8 to 5 months pre-birth of the infant) and second period (4 to 0 months pre-birth of the infant), respectively. When we removed those two outliers, our data were normally distributed across each period (Table 2; Figure 2). Levene's test also indicated equal variances ($F(3, 82) = 0.82$, $p = 0.49$). Because our data were normally distributed and did not violate assumptions of homogeneity of variance, we fit a general linear mixed-effects model to our data. The period of time had a significant effect on proportion of time in affiliative contact ($X^2(3) = 67.23$, $p < 0.0001$). Tukey's test revealed significant differences between nearly all 4-month periods of time (Table 3). Affiliation at pregnancy (4 to 0 months pre-birth of infant; $M = 0.39$, $SE = 0.02$) was higher than affiliation at pre-pregnancy (8 to 5 months pre-birth of infant; $M = 0.32$, $SE = 0.02$, $p < 0.001$), infant dependence (4 to 0 months pre-birth of infant; $M = 0.31$, $SE = 0.02$, $p < 0.001$) and infant independence (5 to 8 months post-birth of infant; $M = 0.21$, $SE = 0.02$, $p < 0.001$). Pair affiliation was also lower at infant independence than it was at pre-pregnancy ($p < 0.001$; Table 3) and T3 ($p < 0.001$).

TABLE 2 Proportion of time pairs spend in affiliative contact across the four 4-month periods

Variable	Mean	SE	W	p	Skewness	Kurtosis
T1 (8–5 months pre-infant birth)	0.32	0.02	0.98	0.84	−0.09	−0.96
T2 (4–0 months pre-infant birth)	0.39	0.02	0.98	0.92	0.12	−0.82
T3 (0–4 months post-infant birth)	0.31	0.02	0.96	0.43	0.35	−0.97
T4 (5–8 months post-infant birth)	0.21	0.02	0.94	0.21	0.54	−0.49

Note: Mean and standard error of the mean (SE) are reported with results from the Shapiro-Wilk test (*W* and *p*-value), as well as measures of skewness and kurtosis.

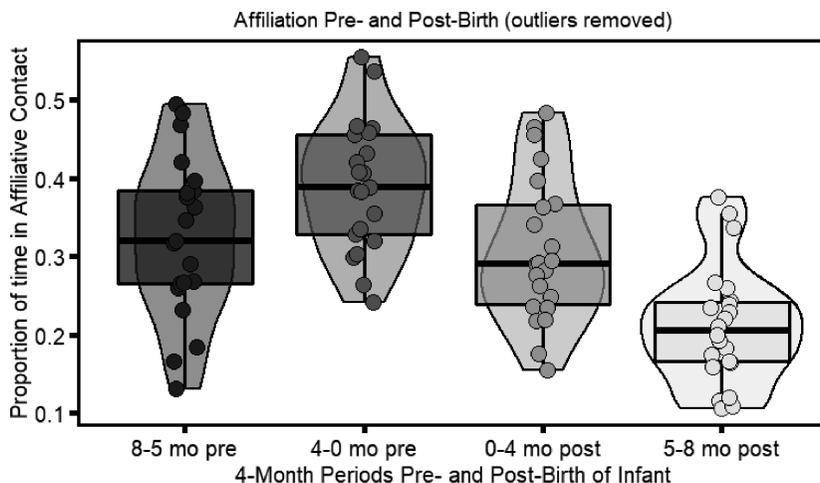


FIGURE 2 Proportion of time pairs spend in affiliative contact over four 4-month periods. Outliers were excluded in figure. Each point is an observed score for an individual pair at each time point. Boxplots represent median value of affiliative contact with lower and upper hinges corresponding to the first and third quartiles. A violin plot overlays the data for each time period, illustrating the distribution of the variables.

TABLE 3 Results from post hoc analyses using Tukey's post-hoc test

Comparison	Estimate	SE	p
T2-T1	0.07	0.02	<0.001
T3-T1	−0.02	0.02	0.68
T4-T1	−0.12	0.02	<0.001
T3-T2	−0.09	0.02	<0.001
T4-T2	−0.18	0.02	<0.001
T4-T3	−0.1	0.02	<0.001

Note: Period 1 = 8 to 5 months pre-birth of infant; Period 2 = 4 to 0 months pre-birth of infant; Period 3 = 0 to 4 months post-birth of infant; Period 4 = 5 to 8 months post-birth of infant

We next wanted to determine why the proportion of time pairs spend in affiliative contact decreased after the birth of the infant. Data from the first 8 months post-birth of the infant were used for analyses, and time was binned into seven-day periods to capture the effects of rapid changes in infant independence. We collected an average of 592.67 ($SE = 54.73$) observations per pair (range = 168–1,429), and analyses were based on a total of 12,374 observations. A Shapiro-Wilk test revealed that data were normally distributed for

TABLE 4 Proportion of time pairs spend in affiliative contact across the 35 7-day periods

Week	Mean	SE	W	p	Skewness	Kurtosis
1	0.43	0.03	0.93	0.23	0.28	-1.33
2	0.41	0.02	0.96	0.61	-0.35	0.92
3	0.34	0.04	0.89	0.03	0.49	-1.36
4	0.32	0.04	0.95	0.39	0.30	-1.06
5	0.37	0.04	0.95	0.35	0.42	-0.95
6	0.33	0.03	0.85	0.01	1.25	0.78
7	0.31	0.03	0.90	0.05	0.43	-1.36
8	0.31	0.03	0.96	0.58	0.00	0.99
9	0.28	0.03	0.92	0.07	0.29	-1.37
10	0.26	0.03	0.97	0.75	0.11	-1.08
11	0.25	0.02	0.98	0.92	-0.03	0.35
12	0.26	0.03	0.97	0.66	0.44	-0.51
13	0.26	0.03	0.98	0.84	-0.03	-0.95
14	0.23	0.02	0.96	0.48	0.38	1.02
15	0.25	0.03	0.95	0.34	0.44	-0.70
16	0.27	0.04	0.96	0.46	0.53	-0.48
17	0.23	0.03	0.91	0.06	-0.07	-1.58
18	0.24	0.03	0.95	0.36	0.33	-1.11
19	0.21	0.03	0.91	0.07	1.11	1.71
20	0.21	0.02	0.97	0.83	-0.21	-0.37
21	0.16	0.03	0.92	0.12	0.41	-0.86
22	0.22	0.03	0.86	0.01	1.17	0.39
23	0.23	0.05	0.65	0.00	2.56	6.72
24	0.16	0.03	0.95	0.34	0.38	-1.01
25	0.19	0.02	0.83	0.00	1.18	0.31
26	0.23	0.03	0.94	0.22	0.02	-1.15
27	0.19	0.03	0.94	0.33	0.51	-0.55
28	0.22	0.03	0.90	0.08	0.74	-0.74
29	0.21	0.04	0.89	0.04	0.78	-0.25
30	0.24	0.03	0.96	0.62	-0.03	-1.31
31	0.21	0.04	0.88	0.02	1.20	0.98
32	0.25	0.04	0.97	0.74	0.37	-0.70
33	0.26	0.03	0.86	0.01	1.43	2.17
34	0.22	0.03	0.98	0.92	0.39	-0.29
35	0.20	0.04	0.90	0.10	0.76	0.45

Note: Mean and standard error of the mean (SE) are reported with results from the Shapiro-Wilk test (W and p -value), as well as measures of skewness and kurtosis

26 of the 35 7-day periods (Table 4; Figure 3), so we decided not to remove any outliers or transform our variables. Levene's test also suggested our data did not violate assumptions of homogeneity of variance ($F(34, 641) = 0.83, p = 0.74$). Therefore, we were able to proceed with our nonlinear mixed-effects modeling.

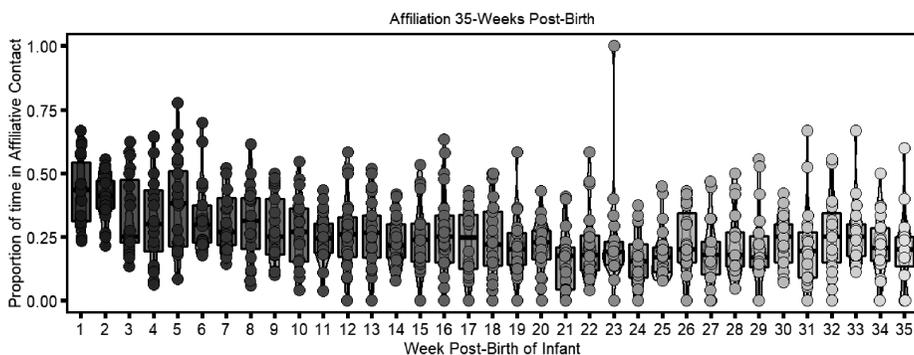


FIGURE 3 Proportion of time pairs spend in affiliative contact over 35 7-day periods. Each point is an observed score for an individual pair at each time point. Boxplots represent median value of affiliative contact with lower and upper hinges corresponding to the first and third quartiles. A violin plot overlays the data for each time period, illustrating the distribution of the variables.

TABLE 5 Indices of model fit, where q is the total number of model parameters

Model	q	$-2\ln L$	AIC	Models compared	$\chi^2(df)$	p
No growth	3	2371.2	2377.2			
Linear	6	2228.3	2240.3	No growth vs. linear	142.9(3)	<0.001
Quadratic	10	2182.2	2202.2	Linear vs. quadratic	46.1(4)	<0.001

Note: $-2\ln L$ is -2 times the log likelihood. AIC is the Akaike information criterion. Smaller values of the AIC indicate better fitting models. $\chi^2(df)$ is a deviance statistic for model fit comparisons.

TABLE 6 Indices of model fit, where q is the total number of model parameters

Model	q	$-2\ln L$	AIC	Models compared	$\chi^2(df)$	p
Intercept	11	2244.3	2254.3			
Intercept + trough	12	2196.7	2210.7	intercept vs. intercept + trough	47.6(1)	<0.001
Intercept + trough + time to trough	13	2174.3	2194.3	intercept + trough vs. intercept + trough + time to trough	22.4(1)	<0.001

Note: $-2\ln L$ is -2 times the log likelihood. AIC is the Akaike information criterion. Smaller values of the AIC indicate better fitting models. (df) is a deviance statistic for model fit comparisons

Given the pattern of affiliation over the 8-month period post-infant birth (Figure 3), we first determined whether a no growth, linear growth, or quadratic growth model best fit our data. Deviance tests indicated a quadratic growth model provided best relative fit (Table 5). Additionally, as we fit our no growth, linear growth, and quadratic growth models, residual variance decreased from 0.36, to 0.11, to 0.07, respectively. Therefore, the quadratic model explained the most variance in the data. These findings suggest affiliation declines after the birth of an infant, but then hits an inflection point and begins to rise again after a period of time. We added random effects one by one to determine whether dyads were quantitatively different in their starting levels of affiliation, their trough levels of affiliation, and the time when they reached their trough level of affiliation. Based on a comparison of model fit, the model with all three random effects best fit our data (Table 6) and resulted in the lowest residual variance ($\sigma_{\epsilon_i}^2 = 0.05$).

TABLE 7 Individual covariate effects on the response at week 1, trough response, and time of trough response

Covariate	β_{01}	β_{y1}	β_{x1}	$\sigma_{\epsilon_i}^2$
Pair tenure	0.120	-0.421*	-0.605*	0.048
Independence	7.582	4.685*	8.577*	0.043
Father carry (gmc)	-0.649	-0.663	-2.364*	0.024
Father carry (pc)	-0.922*	0.165	1.858*	0.024
Mother carry (gmc)	-1.859	1.894	3.688	0.043
Mother carry (pc)	0.648	-0.108	-1.049*	0.043
Parent carry (gmc)	0.192	-0.003	-4.095*	0.025
Parent carry (pc)	0.762	-0.388	2.445*	0.025

Abbreviations: gmc, grand-mean-centered; pc, pair-centered.

* $p < 0.05$.

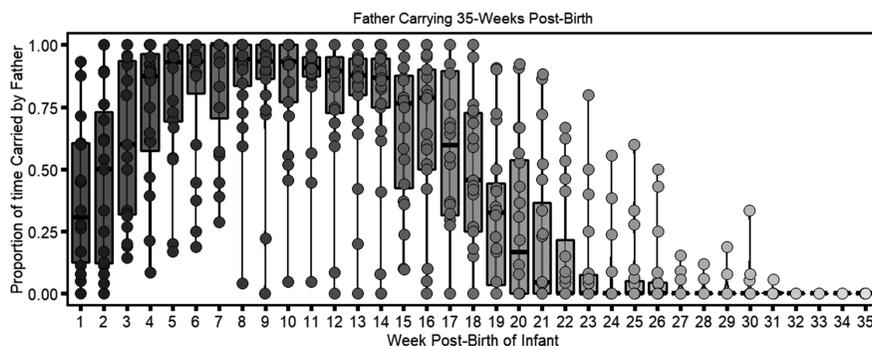


FIGURE 4 Proportion of time fathers spend carrying infants over 35 7-day periods. Each point is an observed score for an individual pair at each time point. Boxplots represent median value of affiliative contact with lower and upper hinges corresponding to the first and third quartiles. A violin plot overlays the data for each time period, illustrating the distribution of the variables.

We then evaluated the effects of each covariate independently. Our covariates were the length of time a pair had been together (pair tenure), the time at which an infant was considered independent (independent), the proportion of time the father spent carrying the infant (father carry), the proportion of time the mother spent carrying the infant (mother carry), and the proportion of time either parent spent carrying the infant (parent carry). Covariates were entered at all three levels (intercept, trough, and time to trough). Covariates that were statistically significant were added to the final, full model (Table 7). Because including all three measures of father carry, mother carry, and parent carry in our final full model would violate assumptions of independence, we chose to examine residual variance to determine which parameter to include in our final model. Compared to models with the other carrying-related covariates, the model that included father carry as a covariate resulted in the lowest residual variance ($\sigma_{\epsilon_i}^2 = 0.02$; Table 7). Upon examining the data, father carry also varied more at each time point (Figure 4) than mother carry (Figure 5) and parent carry (Figure 6). For these two reasons, we decided to include the father carry covariates (grand-mean centered and pair-centered) in our final model and did not include the mother carry or parent carry covariates.

Our final full model included the effects of father carry (grand-mean centered and pair-centered) on the intercept, the effects of infant age of independence and pair tenure on the

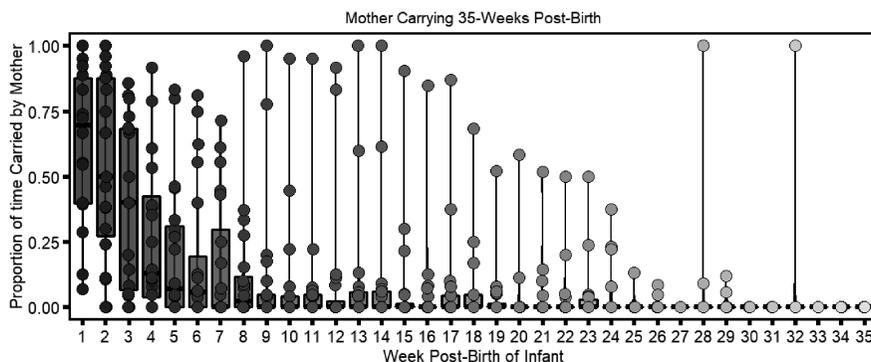


FIGURE 5 Proportion of time mothers spend carrying infants over 35 7-day periods. Each point is an observed score for an individual pair at each time point. Boxplots represent median value of affiliative contact with lower and upper hinges corresponding to the first and third quartiles. A violin plot overlays the data for each time period, illustrating the distribution of the variables.

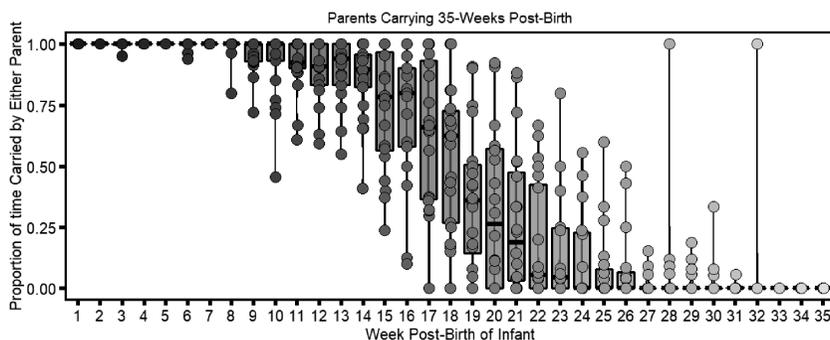


FIGURE 6 Proportion of time parents spend carrying infants over 35 7-day periods. Each point is an observed score for an individual pair at each time point. Boxplots represent median value of affiliative contact with lower and upper hinges corresponding to the first and third quartiles. A violin plot overlays the data for each time period, illustrating the distribution of the variables.

trough value, and the effects of infant age of independence, pair tenure, and father carry (grand-mean centered and pair-centered) on the time to trough response (Table 8). The population mean proportion of time spent in affiliative contact when infants are born is 0.40 ($SE = 0.21$), the population mean affiliation score at the trough (or inflection point) is 0.17 ($SE = 0.11$), and the population mean time to trough is approximately 32.60 weeks ($SE = 5.80$ weeks). Between pairs, including the effects of the other covariates in the model, fathers who spend more time carrying their infant than the mean time fathers carry infants have lower initial levels of time spent in affiliative contact ($\beta_{01a} = -2.21$, $SE = 0.86$, $p = 0.02$). This effect size is medium ($D = -0.55$, Hedges, 1982). If an infant becomes independent at an age that is later than the mean time infants become independent, then the proportion of time parents spend in affiliative contact at the trough (or inflection point) is higher ($\beta_{y1} = 3.94$, $SE = 1.59$, $p = 0.02$, $D = 0.53$). These findings suggest that these pairs would not drop as low in affiliation as pairs whose infants become independent earlier. Pairs who have been together for longer than the mean pair tenure have a lower trough value than the mean population ($\beta_{y2} = -0.38$, $SE = 0.12$, $p = 0.004$, $D = -0.69$). The results of this model suggest these pairs who have been together longer would be expected to drop lower than 17.1% time in affiliative contact at their trough. Between pairs, including the effects of the

TABLE 8 Parameter estimates from final full model for the effects of each covariate on the proportion of time pairs spent in affiliative contact at week 1 (intercept), trough affiliation score, and time of trough response

Parameter		Estimate	SE	DF	t-Value	Pr > t	95% Confidence Limits		D
Fixed effects									
Mean intercept	β_{00}	4.04	0.21	19	19.59	<0.0001	3.61	4.47	4.18
Mean trough	β_{y0}	1.71	0.11	19	15.78	<0.0001	1.48	1.94	3.36
Mean time to trough	β_{x0}	3.26	0.58	19	5.61	<.00001	2.04	4.48	1.20
Father carry (gmc; intercept)	β_{01a}	-2.21	0.85	19	-2.59	0.02	-4.00	-0.42	-0.55
Father carry (pc; intercept)	β_{01b}	-0.58	0.54	19	-1.08	0.29	-1.72	0.55	-0.23
Infant age of independence (trough)	β_{y1}	3.94	1.59	19	2.48	0.02	0.62	7.26	0.53
Pair tenure (trough)	β_{y2}	-0.38	0.12	19	-3.23	0.00	-0.63	-0.13	-0.69
Infant age of independence (time of trough)	β_{x1}	5.71	5.31	19	1.08	0.30	-5.40	16.81	0.23
Pair Tenure (time of trough)	β_{x2}	-0.24	0.13	19	-1.80	0.09	-0.52	0.04	-0.38
Father carry (gmc; time of trough)	β_{x3a}	-3.46	1.49	19	-2.33	0.03	-6.57	-0.35	-0.50
Father carry (pc; time of trough)	β_{x3b}	1.09	0.51	19	2.14	0.05	0.02	2.16	0.46
Random effects									
Residual variance	τ_0	0.15	0.06	19	2.64	0.02	0.03	0.27	0.56
Individual (intercept)	φ_0	1.27	0.27	19	4.61	<0.001	0.69	1.84	0.98
Individual (intercept, trough)	$\rho_{0,y}$	1.00	0.01	19	172.96	<0.0001	0.98	1.01	36.88
Individual (trough)	φ_y	0.11	0.16	19	0.70	0.49	-0.22	0.44	0.15
Individual (intercept, time of trough)	$\rho_{0,x}$	0.78	0.33	19	2.36	0.03	0.09	1.46	0.50
Individual (trough, time of trough)	$\rho_{x,y}$	0.81	0.33	19	2.49	0.02	0.13	1.49	0.53
Individual (time of trough)	φ_x	0.84	0.17	19	5.09	<0.0001	0.49	1.18	1.08

Abbreviations: gmc, grand-mean-centered; pc, pair-centered; D, Cohen's D (effect size).

other covariates in this model, fathers who spend more time carrying the infant than the mean time fathers carry infants hit their trough sooner ($\beta_{x3a} = -3.46$, $SE = 1.49$, $p = 0.03$, $D = -0.50$). While this effect is small, this suggests that pairs with fathers who spend a lot of time carrying infants will switch to an increase in affiliation sooner than pairs with fathers who generally do not carry infants as much when we account for the other covariates in the model. Interestingly, within a pair, when we control for the effects of the other covariates, pairs with fathers who spend more time carrying their infants reach that time to trough

later ($\beta_{x3b} = 1.09$, $SE = 0.51$, $p = 0.05$, $D = 0.46$). These findings suggest that, excluding the effects of the other covariates, pairs with fathers who spend more time carrying their infant than the population mean take a longer time to hit that inflection point where affiliation begins to rise again.

All of our random effects were significant with the exception of the trough value, suggesting pairs may not differ significantly in that trough value of social affiliation ($\varphi_y = 0.11$, $SE = 0.16$, $p = 0.49$, $D = 0.15$). Pairs did significantly vary in their initial levels of affiliation ($\varphi_0 = 1.27$, $SE = 0.26$, $p < 0.001$, $D = 0.98$) and their time to trough affiliation value ($\varphi_x = 0.84$, $SE = 0.17$, $p < 0.001$, $D = 1.09$). Individual levels of affiliation and trough values are positively correlated ($\rho_{0,y} = 1.00$, $SE = 0.01$, $p < 0.001$, $D = 36.88$), suggesting pairs who are more affiliative at the beginning of the sampling period have a higher trough value than those who are less affiliative initially. Initial levels of affiliation and the time to trough are also positively correlated ($\rho_{0,x} = 0.78$, $SE = 0.33$, $p = 0.03$, $D = 0.50$), meaning if a pair starts off higher in affiliation, then it will reach that inflection point later and therefore take a longer time to begin the increase in affiliation. The trough value and the time to trough were also positively correlated ($\rho_{x,y} = 0.81$, $SE = 0.33$, $p = 0.02$, $D = 0.53$), meaning those with a higher trough value also take longer to reach that trough point at which they would make the switch to increasing in affiliation.

Our final full model also had lower residual variance than the models without covariates and any of the models that only included one covariate ($\sigma_{\epsilon_i}^2 = 0.02$). Deviance tests also indicated that this model fit better than our quadratic model that included all three random effects but did not include any covariates ($X^2(8) = 39.2$, $p < 0.001$). AIC was also smaller for this full model (AIC = 2135.0) than it was for the quadratic model with three random effects and zero additional covariates (AIC = 2194.3). Therefore, compared to all other models tested, this final full model best explained our data.

4 | DISCUSSION

Our exploration of intra-pair affiliation across the 16 months centered on the birth of a pair's first infant revealed important changes in pair affiliation associated with this major life history event. First, our analyses revealed temporal differences in pair affiliation across time. Affiliation between pair mates was highest in the second time period, during pregnancy 4 to 0 months prior to the birth of the infant. There are important potential biological reasons for this. It is possible that there is something unique about pregnancy, such as decreased mobility for the female that supports increased affiliation within pairs during this period. Within titi monkey pairs, females control proximity between pair mates—both in terms of approaching and withdrawing (Dolotovskaya, Walker, et al., 2020). With restricted mobility and lower energy during pregnancy, females may withdraw less often simply by virtue of being more sedentary, leading to higher calculations of affiliation using our sampling method. It is also possible that lower levels of affiliation at other time points drives the pattern of pair affiliation. The pregnancy period coincides with longer relationship tenure relative to pre-pregnancy, and titi monkey pairs may simply increase in affiliation across pair tenure. There is limited data on intra-pair affiliation across time, but Rothwell et al. (2020) found that well-established pairs were more likely to be observed tail-twining during scan samples than newly-formed pairs, suggesting that at least this measure of affiliation may increase with pair tenure. Titi monkey rates of affiliative behaviors (e.g., grooming, proximity) are low at the time of pairing and increase dramatically during the first week, at which point they become stable across the next month (Hoffman, 1998). Other studies have not examined average levels of affiliation between pair mates across time in this way and indeed it would be difficult to examine such behavior without including the

influence of infant presence as titis with unrestricted reproduction tend to give birth within the first year of pairing (Valeggia et al., 1999).

We expected to see reductions in pair affiliation following birth (infant dependence and infant independence) as a consequence of energetic re-allocation toward infant rearing. Our findings align with previous research in titi monkeys which found reductions in social behavior and affiliation (Dolotovskaya & Heymann, 2020; Dolotovskaya, Walker, et al., 2020) and humans, which found reductions in relationship quality (Richter et al., 2019) and relationship functioning (Doss, 2009) following the birth of an infant. While we expected lower rates of affiliation postpartum relative to prepartum, we did not expect lower rates of affiliation in the infant independence period compared to the infant dependence period. Our model estimated an average time to trough of 32.6 weeks (approximately 228 days), which demonstrates a longer amount of time of decreasing affiliation than we expected. We predicted that affiliation between parents would begin to increase close to the time when infants transition to behavioral independence, which was approximately 150 days for our sample. Given these results, it is unclear when and whether intra-pair affiliation fully rebounds after partners become parents, especially given that titi monkeys reproduce annually (Valeggia et al., 1999). Future research should expand the postnatal window of interest to include the birth of a subsequent infant in order to better understand how affiliation changes across this interim.

In order to examine how pair affiliation changes in response to the demands of infant care, we used nonlinear mixed effects modeling, specifying a quadratic trajectory, and included the time-varying fixed effect of paternal carry as well as the time-invariant fixed effects of pair tenure and age of infant independence. Our model also included three random effects, allowing for estimates of initial levels of affiliation, trough values of affiliation (or the lowest value of affiliation before affiliation increases again), and time to trough values of affiliation to be independently estimated across pairs. The model identified several effects. As predicted, affiliation between pair mates decreased following the birth of an infant, but affiliation over the first week of pairing (intercept), length of the decline in affiliation (time to trough), and depth of the decline in affiliation (trough) were statistically significantly affected by our predictor variables (pair tenure, infant date of independence, and the time the father spent carrying the infant). During the first week following their infant's birth, new parents spent an average of 40.4% of their time in affiliative proximity or contact with their pair mate, but over the course of an average of 32.6 weeks, time spent in affiliative contact decreased to an average of 17.1%. There was significant variation between pairs in the time pairs spent in affiliative contact during the first week of pairing and this initial time spent in affiliative contact was related to both the time to, and value of, the trough. Pairs with a high rate of initial affiliation also had higher minimum rates of affiliation and arrived at their lowest rates later. In other words, pairs that spent more time in affiliative contact during the first week after their infant was born did not decrease their time spent in affiliative contact with their mate as much across the infant's development compared to pairs that started off spending less time in affiliative contact, but these pairs also took longer to eventually switch from a decline in affiliation to an eventual increase in affiliation. Pairs did not significantly differ in their minimum proportion of time spent in affiliative contact at the point of the trough, but there was significant variation in the time it took for pairs to reach their minimum rate of affiliation and transition from decreasing to increasing in affiliation. Interestingly, pairs with higher time spent in affiliation at the trough took longer to reach that value, meaning they had a longer, slower decline in affiliation over the study period.

Pairs in which the father carried the infant more often than the population mean spent less time in affiliative contact during the first postpartum week. Pairs in which the father provides a higher amount of care may shift their energetic resources away from pair-focused activities toward infant-focused activities early on. Dolotovskaya and Heymann

(2020) found that female wild coppery titi monkeys prioritized eating over rest and some social activities (likely to support the metabolic price of lactation), while males prioritized resting over eating. Perhaps in pairs in which the father provides more paternal care, the female is free to engage in foraging and feeding activities early on and it is her reprioritization of her time budget that leads to decreased time spent in affiliative contact with her mate. Furthermore, female titi monkeys act as the primary initiator of social proximity and contact (Dolotovskaya, Walker, et al., 2020) and will avoid being in proximity to their mate if he is carrying the infant (Reeder, 2001). Given this information in conjunction with our data, females may avoid affiliating with their partner if he is carrying the infant in an effort to prioritize feeding and/or avoid proximity with the infant—an effect which would be exacerbated by high levels of male infant carrying. In turn, titi monkey infants have a preferential attachment to their fathers and actively solicit moving from their mother to their father following the end of a nursing bout (Mendoza & Mason, 1986). This highlights to potential role of the infant's attachment to the father as a potential impetus for changes in affiliation and relationship maintenance between new parents.

A within-pairs comparison revealed that pairs in which the father carried the infant more often than the mean took a longer time to reach their lowest point in affiliation before shifting to an increase in affiliation. While this measure excludes the effects of our other covariates (i.e., pair tenure and infant age at independence), it does signal that paternal infant carrying takes a toll on the time a pair spends in affiliative contact. When examining between-pairs effects, we found the opposite effect: pairs in which the father carried the infant more often than the mean switch to an increase in affiliation sooner, signaling that these pairs may recover their rate of affiliation faster than pairs in which the father carries the infant less than the mean. As only the male and female are available to carry the infant, pairs in which the male carries the infant less often are also pairs in which the female carries the infant more often. Perhaps a high rate of maternal carrying in addition to supporting the infant through lactation results in the pair taking longer to increase their affiliation as the female further prioritizes eating to sustain this heavy energetic load.

Finally, infant independence and pair tenure affected the time spent in affiliative contact at the point of the trough value. Pairs whose infants became independent later than the population mean spent more time in affiliative contact at the nadir. While studies in several primate species support the theory put forth by Altmann (1980) that new mothers direct energy away from social activities in favor of eating, they also propose more nuance. Among black howler monkeys (Dias et al., 2011) and coppery titi monkeys (Dolotovskaya & Heymann, 2020), females maintain time allocated to social activities (e.g., grooming) for as long as possible, preferring to reduce resting time prior to reducing social time. Perhaps having an infant that is dependent on its parents for longer impacts the way in which the mother allocates her time budget such that more social activity is preserved. Another explanation may be that fathers promote infant independence in order to obtain greater social access to their partner. Thus, mothers who are more tolerant of being in proximity to their partner while he carries the infant may have infants who are carried longer because the father has less cause to hasten their independence. In reference to pair tenure, pairs that had been together longer than the mean had lower levels of affiliation at the trough. Perhaps pairs that have been together longer do not need to employ these behaviors, or are employing different behaviors, in order to maintain their pair bond.

Broadly, this work supports previous findings in both titi monkeys and humans and continues the narrative that the birth of offspring initiates a decline in relationship maintenance behaviors such as intra-pair affiliation. But the implication that relationship partners allocate their energy away from relationship maintenance to prioritize infant care may over-simplify this phenomenon. The impact of paternal care, length of relationship,

and infant independence all play various roles in shaping the timing and degree of the decline in affiliation and though our research illustrates the pattern of change across time, the underlying mechanism behind such change remains theoretical.

4.1 | Limitations

There were some limitations of the current work. First, our measure of pair mate behavior was conditional, meaning that both animals needed to participate in order for the behavior to be scored. Since the measure is not individual-specific, we cannot know which animal initiated or refused affiliative contact and steered these interactions. Second, some pairs in our sample did not have a complete dataset for the pre-pregnancy period because they became pregnant less than 4 months after being paired. Due to our small sample size, it is possible that the exclusion of these pairs from the pre-pregnancy period meant that the pairs that were included may have biased the estimated population time spent in affiliative contact at that time point.

4.2 | Future directions

Overall, these analyses tell us that caring for an infant is costly—and one of the things it costs new parents is time spent together, specifically time spent maintaining their pair bond. This decline may be due to active avoidance by one parent when the partner is carrying the infant or simply a casualty of prioritizing other activities (e.g., eating). Given the length of time in which affiliation continues to decline, further study is needed to identify what factors co-occur with the nadir in affiliation and spur increases in affiliation rates. One mechanism that may contribute to the length of time in which affiliation declines is parental sleep. In humans (Bayer et al., 2007; Lee et al., 2000; Yamazaki et al., 2005) and nonhuman primates (Fite et al., 2003), parental sleep declines following the birth of an infant. Decreased sleep is associated with impaired affective processing, namely difficulty in perspective-taking (Shapiro et al., 2000), perceiving events to have a negative bias (Tempesta et al., 2010), and an increased tendency to assign blame (Kahn-Greene et al., 2006). It is little wonder then, that new parents experience more negative communication and higher problem intensity as well as decreased conflict management (Doss, 2009). Postpartum decrease in sleep is typically more severe for mothers compared to fathers and can persist even after the infant attains nutritional independence (Fite et al., 2003; Richter et al., 2019). Parental sleep has not yet been investigated in titi monkeys, but exploration of the timing of postpartum sleep recovery could provide insight into the recovery of affiliative behavior between pair mates.

Future research should also investigate how other behaviors implicated in pair-bond maintenance are affected by the birth of an infant, going beyond affiliation to include other species-typical behaviors. For instance, vocal duetting is a hallmark behavior of titi monkeys (Robinson, 1979) and has been shown to convey information about individual identity (Lau et al., 2020), pair tenure (Clink et al., 2019), age (Clink et al., 2019), and kinship (Clink et al., *in review*). Given the complexity of these territorial duet vocalizations (Robinson, 1981) and their importance in daily titi life (Mason, 1966), tities may alter aspects of their duets with changes in parental status.

Given the duration during which pair affiliation decreased following the infant's birth, dyads may become pregnant prior to regaining pre-partum rates of affiliation. Using archival data on subsequent births, it is possible that half of the females in our study became pregnant in the final month of our postpartum study window. While it was

not possible to isolate the effects of subsequent pregnancies on pair affiliation, further research in this area could investigate the extent to which the rebound in affiliation at the end of our research period is attributable to infant development and independence versus the next pregnancy. Future research should also seek to understand whether recovery of pair affiliation occurs, what effect the birth of a second infant has on intra-pair affiliation, and whether there is a cumulative effect of subsequent births on adult affiliation.

Finally, the next chapter to this work should focus directly on the impact of caregiving experience (i.e., paternal care, maternal care) and the quality of the parental pair relationship on the pairing and parenting success of these infants in adulthood. Tracing multiple generations of parenting behavior and pair affiliation would allow us to form a more complete picture of how titi monkeys become the social animals they are and form the attachment network that is the hallmark of their species. Compelling research in humans demonstrates that early social interactions between infant and caregiver shape cross-generational transmission of social affiliation (Feldman et al., 2010). While the implications of this cross-generational transmission of social affiliation has been studied in connection with infants' social behavior, it would be interesting to assess these infants' performance in future pair bonds, specifically in regards to pair bond maintenance behaviors.

ACKNOWLEDGMENTS

This study was supported by the National Institutes of Childhood Health and Development (HD092055) and The Good Nature Institute to Karen L. Bales, and by the Office of Research Infrastructure programs (OD011107) to the California National Primate Research Center. The authors would like to thank the countless undergraduate research assistants, laboratory staff, graduate students, and post-doctoral fellows who assisted in the collection of this data for the last 12 years. Their hard work made the collection of this robust set of observations possible. They would also like to thank the Animal Care and Veterinary Staff at the California Primate Research Center for their excellent care of the animals.

CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare.

ORCID

Lynea R. Witczak  <https://orcid.org/0000-0002-7265-6856>

Allison R. Lau  <https://orcid.org/0000-0003-2149-919X>

Karen L. Bales  <https://orcid.org/0000-0001-5826-2095>

REFERENCES

- Akaike, H. (1974). A new look at the statistical model identification. *IEEE Transactions on Automatic Control*, 19(6), 716–723. <https://doi.org/10.1109/TAC.1974.1100705>
- Altmann, J. (1980). *Baboon mothers and infants*. University of Chicago Press.
- Adamsons, K. (2013). Predictors of relationship quality during the transition to parenthood. *Journal of Reproductive and Infant Psychology*, 31(2), 160–171. <https://doi.org/10.1080/02646838.2013.791919>
- Altmann, J., & Samuels, A. (1992). Costs of maternal care: Infant-carrying in baboons. *Behavioral Ecology and Sociobiology*, 29, 391–398. <https://doi.org/10.1007/BF00170168>
- Bates, D., Mächler, M., Bolker, B. M., & Walker, S. C. (2015). Fitting linear mixed-effects models using lme4. *Journal of Statistical Software*, 67(1), 1–48. <https://doi.org/10.18637/jss.v067.i01>
- Bayer, J. K., Hiscock, H., Hampton, A., & Wake, M. (2007). Sleep problems in young infants and maternal mental and physical health. *Journal of Paediatrics and Child Health*, 43(1–2), 66–73. <https://doi.org/10.1111/j.1440-1754.2007.01005.x>
- Bell, S. M., & Ainsworth, M. D. S. (1972). Infant crying and maternal responsiveness. *Child Development*, 43(4), 1171–1190. <https://doi.org/10.2307/1127506>
- Belsky, J., Lang, M. E., & Rovine, M. (1985). Stability and change in marriage across the transition to parenthood: A second study. *Journal of Marriage and Family*, 47(4), 855–865.

- Clark, M. S., Beck, L. A., & Aragón, O. R. (2019). Relationship initiation: Bridging the gap between initial attraction and well-functioning communal relationships. In *APA handbook of contemporary family psychology: Foundations, methods, and contemporary issues across the lifespan*, Vol. 1 (pp. 409–425). American Psychological Association.
- Clink, D. J., Lau, A. R., & Bales, K. L. (2019). Age-related changes and vocal convergence in titi monkey duet pulses. *Behaviour*, 156(15), 1471–1494. <https://doi.org/10.1163/1568539X-00003575>
- Cowan, C. P., & Cowan, P. A. (1992). *When partners become parents: The big life change for couples*. Basic Books.
- Cubicciotti, D., & Mason, W. A. (1976). Comparative studies of social behavior in *Callicebus* and *Saimiri*: Male-female emotional attachments. *Behavioral Biology*, 16(2), 185–197. [https://doi.org/10.1016/S0091-6773\(76\)91296-7](https://doi.org/10.1016/S0091-6773(76)91296-7)
- Cudeck, R., & Du Toit, S. H. C. (2002). A version of quadratic regression with interpretable parameters. *Multivariate Behavioral Research*, 37(4), 501–519. https://doi.org/10.1207/S15327906MBR3704_04
- Dias, P. A. D., Rangel-Negrín, A., & Canales-Espinosa, D. (2011). Effects of lactation on the time-budgets and foraging patterns of female black howlers (*Alouatta pigra*). *American Journal of Physical Anthropology*, 145(1), 137–146. <https://doi.org/10.1002/ajpa.21481>
- Dolotovskaya, S., & Heymann, E. W. (2020). Do less or eat more: Strategies to cope with costs of parental care in a pair-living monkey. *Animal Behaviour*, 163, 163–173. <https://doi.org/10.1016/j.anbehav.2020.03.012>
- Dolotovskaya, S., Roos, C., & Heymann, E. W. (2020). Genetic monogamy and mate choice in a pair-living primate. *Scientific Reports*, 10(1), 1–13. <https://doi.org/10.1038/s41598-020-77132-9>
- Dolotovskaya, S., Walker, S., & Heymann, E. W. (2020). What makes a pair bond in a Neotropical primate: Female and Male contributions. *Royal Society Open Science*, 191489, 7(1). <https://doi.org/10.1098/rsos.191489>
- Doss, B. D. (2009). The effect of the transition to parenthood on relationship quality: An eight-year prospective study. *Journal of Personality*, 96(3), 601–619. <https://doi.org/10.1037/a0013969>
- Dunbar, R. I. M., & Dunbar, P. (1988). Maternal time budgets of gelada baboons. *Animal Behaviour*, 36(4), 970–980. [https://doi.org/10.1016/S0003-3472\(88\)80055-1](https://doi.org/10.1016/S0003-3472(88)80055-1)
- Feldman, R., Gordon, I., & Zagoory-Sharon, O. (2010). The cross-generation transmission of oxytocin in humans. *Hormones and Behavior*, 58(4), 669–676. <https://doi.org/10.1016/j.yhbeh.2010.06.005>
- Fernandez-Duque, E., Valeggia, C. R., & Mason, W. A. (2000). Effects of pair-bond and social context on male-female interactions in captive titi monkeys (*Callicebus moloch*, Primates: Cebidae). *Ethology*, 106(12), 1067–1082. <https://doi.org/10.1046/j.1439-0310.2000.00629.x>
- Fite, J. E., French, J. A., Patera, K. J., Hopkins, E. C., Rukstalis, M., Jensen, H. A., & Ross, C. N. (2003). Night-time wakefulness associated with infant rearing in *Callithrix kuhlii*. *International Journal of Primatology*, 24(6), 1267–1280. <https://doi.org/10.1023/B:IJOP.0000005992.72026.e6>
- Fox, J., & Weisberg, S. (2019). *An R companion to applied regression*, 3rd edn. Sage. <https://socialsciences.mcmaster.ca/jfox/Books/Companion/>
- Fragaszy, D. M., Schwarz, S., & Shimosaka, D. (1982). Longitudinal observations of care and development of infant titi monkeys (*Callicebus moloch*). *American Journal of Primatology*, 2, 191–200. <https://doi.org/10.1002/ajp.1350020207>
- Fraley, R. C. (2019). Attachment in adulthood: Recent developments, emerging debates, and future directions. *Annual Review of Psychology*, 70, 401–422. <https://doi.org/10.1146/annurev-psych-010418-102813>
- Fuentes, A. (1998). Re-evaluating primate monogamy. *American Anthropologist*, 100(4), 890–907. <https://doi.org/10.1525/aa.1998.100.4.890>
- Hedeker, D., Mermelstein, R. J., & Demirtas, H. (2008). An application of a mixed-effects location scale model for analysis of ecological momentary assessment (EMA) data. *Biometrics*, 64(2), 627–634. <https://doi.org/10.1111/j.1541-0420.2007.00924.x>
- Hedges, L. V. (1982). Estimation of effect size from a series of independent experiments. *Psychological Bulletin*, 92(2), 490. <https://doi.org/10.1037/0033-2909.92.2.490>
- Hofer, M. A. (1994). Early relationships as regulators of infant physiology and behavior. *Acta Paediatrica Supplement*, 83, 9–18. <https://doi.org/10.1111/j.1651-2227.1994.tb13260.x>
- Hoffman, K. A. (1998). *Transition from juvenile to adult stages of development in titi monkeys (Callicebus moloch)*. University of California.
- Hothorn, T., Bretz, E., & Westfall, P. (2008). Simultaneous inference in general parametric models. *Biometrical Journal*, 50(3), 346–363. <https://doi.org/10.1002/bimj.200810425>
- Kahn-Greene, E. T., Lipizzi, E. L., Conrad, A. K., Kamimori, G. H., & Killgore, W. D. S. (2006). Sleep deprivation adversely affects interpersonal responses to frustration. *Personality and Individual Differences*, 41(8), 1433–1443. <https://doi.org/10.1016/j.paid.2006.06.002>
- Kiecolt-Glaser, J. K. (2018). Marriage, divorce, and the immune system. *American Psychologist*, 73(9), 1098. <https://doi.org/10.1037/amp0000388>
- Kleiman, D. G. (1977). Monogamy in mammals. *The Quarterly Review of Biology*, 52(1), 39–69. <https://doi.org/10.1086/409721>

- Lau, A. R., Clink, D. J., & Bales, K. L. (2020). Individuality in the vocalizations of infant and adult coppery titi monkeys (*Plecturocebus cupreus*). *American Journal of Primatology*, 82(6), 1–12. <https://doi.org/10.1002/ajp.23134>
- Lawrence, E. M., Rogers, R. G., Zajacova, A., & Wadsworth, T. (2019). Marital happiness, marital status, health, and longevity. *Journal of Happiness Studies*, 20(5), 1539–1561. <https://doi.org/10.1007/s10902-018-0009-9>
- Lee, K. A., Zaffke, M. E., & McEnany, G. (2000). Parity and sleep patterns during and after pregnancy. *Obstetrics and Gynecology*, 95(1), 14–18. [https://doi.org/10.1016/S0029-7844\(99\)00486-X](https://doi.org/10.1016/S0029-7844(99)00486-X)
- Loving, T. J., & Slatcher, R. B. (2013). Romantic relationships and health. In *Oxford Handbook of Close Relationships* (pp. 617–637). <https://doi.org/10.1093/oxfordhb/9780195398694.013.0028>
- Mason, W. A. (1966). Social organization of the south american monkey, *Callicebus moloch*: A preliminary report. *Tulane Studies in Zoology*, 13, 23–28.
- Mendoza, S. P., & Mason, W. A. (1986). Parental division of labour and differentiation of attachments in a monogamous primate (*CaUicebus moloch*). *Animal Behaviour*, 34(5), 1336–1347. [https://doi.org/10.1016/S0003-3472\(86\)80205-6](https://doi.org/10.1016/S0003-3472(86)80205-6)
- Ogolsky, B. G., & Bowers, J. R. (2013). A meta-analytic review of relationship maintenance and its correlates. *Journal of Social and Personal Relationships*, 30(3), 343–367. <https://doi.org/10.1177/0265407512463338>
- R Core Team (2020). R: A language and environment for statistical computing. *R Foundation for Statistical Computing*, <https://www.R-project.org/>
- Reeder, D. (2001). *The biology of parenting in the monogamous titi monkey (Callicebus moloch)*. University of California.
- Richter, D., Krämer, M. D., Tang, N. K. Y., Montgomery-Downs, H. E., & Lemola, S. (2019). Long-term effects of pregnancy and childbirth on sleep satisfaction and duration of first-time and experienced mothers and fathers. *Sleep*, 42(4), zsz015. <https://doi.org/10.1093/sleep/zsz015>
- Roberson, P. N., Norona, J. C., Lenger, K. A., & Olmstead, S. B. (2018). How do relationship stability and quality affect wellbeing?: Romantic relationship trajectories, depressive symptoms, and life satisfaction across 30 years. *Journal of Child and Family Studies*, 27(7), 2171–2184. <https://doi.org/10.1007/s10826-018-1052-1>
- Robinson, J. G. (1979). An analysis of the organization of vocal communication in the titi monkey *Callicebus moloch*. *Zeitschrift Für Tierpsychologie*, 49(4), 381–405. <https://doi.org/10.1111/j.1439-0310.1979.tb00300.x>
- Robinson, J. G. (1981). Vocal regulation of inter- and intragroup spacing during boundary encounters in the titi monkey, *Callicebus moloch*. *Primates; Journal of Primatology*, 22(2), 161–172. <https://doi.org/10.1007/BF02382607>
- Rogers, F. D., & Bales, K. L. (2019). Mothers, fathers, and others: Neural substrates of parental care. *Trends in Neurosciences*, 42(8), 552–562. <https://doi.org/10.1016/j.tins.2019.05.008>
- Rothwell, E. S., Carp, S. B., Savidge, L. E., Mendoza, S. P., & Bales, K. L. (2020). Relationship tenure differentially influences pair-bond behavior in male and female socially monogamous titi monkeys (*Callicebus cupreus*). *American Journal of Primatology*, 82(10), 1–12. <https://doi.org/10.1002/ajp.23181>
- Royston, J. P. (1983). Some techniques for assessing multivariate normality based on the Shapiro-Wilk W. *Applied Statistics*, 32(2), 121–133. <https://doi.org/10.2307/2347291>
- Schultz, B. B. (1985). Levene's test for relative variation. *Systematic Zoology*, 34(4), 449. <https://doi.org/10.2307/2413207>
- Shapiro, A. F., Gottman, J. M., & Carrère, S. (2000). The baby and the marriage: Identifying factors that buffer against decline in marital satisfaction after the first baby arrives. *Journal of Family Psychology*, 14(1), 59–70. <https://doi.org/10.1037/0893-3200.14.1.59>
- Singletary, B., & Tecot, S. (2020). Multimodal pair-bond maintenance: A review of signaling across modalities in pair-bonded nonhuman primates. *American Journal of Primatology*, 82(3), 1–13. <https://doi.org/10.1002/ajp.23105>
- Stafford, L. (2016). Marital sanctity, relationship maintenance, and marital quality. *Journal of Family Issues*, 37(1), 119–131. <https://doi.org/10.1177/0192513X13515884>
- Tardif, S., Bales, K., Williams, L., Moeller, E. L., Abbott, D., Schultz-Darken, N., Mendoza, S., Mason, W., Bourgeois, S., & Ruiz, J. (2006). Preparing new world monkeys for laboratory research. *ILAR Journal*, 47(4), 307–315. <https://doi.org/10.1093/ilar.47.4.307>
- Tempesta, D., Couyoumdjian, A., Curcio, G., Moroni, F., Marzano, C., De Gennaro, L., & Ferrara, M. (2010). Lack of sleep affects the evaluation of emotional stimuli. *Brain Research Bulletin*, 82(1–2), 104–108. <https://doi.org/10.1016/j.brainresbull.2010.01.014>
- Valeggia, C. R., Mendoza, S. P., Fernandez-Duque, E., Mason, W. A., & Lasley, B. (1999). Reproductive biology of female titi monkeys (*Callicebus moloch*) in captivity. *American Journal of Primatology*, 47, 183–195. [https://doi.org/10.1002/\(SICI\)1098-2345\(1999\)47:3%3c183::AID-AJP1%3e3.0.CO;2-J](https://doi.org/10.1002/(SICI)1098-2345(1999)47:3%3c183::AID-AJP1%3e3.0.CO;2-J)
- Walum, H., & Young, L. J. (2018). The neural mechanisms and circuitry of the pair bond. *Nature Reviews Neuroscience*, 19(11), 643–654. <https://doi.org/10.1038/s41583-018-0072-6>
- Witzcak, L. R., Blozis, S. A., & Bales, K. L. (in prep). Assessing variability in affiliative maintenance behaviors in captive coppery titi monkeys using longitudinal data.

Yamazaki, A., Lee, K. A., Kennedy, H. P., & Weiss, S. J. (2005). Sleep-wake cycles, social rhythms, and sleeping arrangement during Japanese childbearing family transition. *JOGNN - Journal of Obstetric, Gynecologic, and Neonatal Nursing*, 34(3), 342–348. <https://doi.org/10.1177/0884217505276156>

How to cite this article: Karaskiewicz, C. L., Witzak, L. R., Lau, A. R., Dufek, M. E., & Bales, K. L. (2021). Parenting costs time: Changes in pair bond maintenance across pregnancy and infant rearing in a monogamous primate (*Plecturocebus cupreus*). *New Directions for Child and Adolescent Development*, 2021, 21–42. <https://doi.org/10.1002/cad.20438>

REVIEW

Child-father attachment in early childhood and behavior problems: A meta-analysis

Audrey-Ann Deneault¹ | Marian J. Bakermans-Kranenburg² |
Ashley M. Groh³ | Pasco R. M. Fearon⁴ | Sheri Madigan⁵

¹ Department of Psychology, University of Calgary, Calgary, Alberta, Canada

² Department of Clinical Child and Family Studies and Amsterdam Public Health Research Institute, Vrije Universiteit Amsterdam, Amsterdam, The Netherlands

³ Department of Psychological Sciences, University of Missouri, Columbia, Missouri, USA

⁴ Research Department of Clinical, Educational and Health Psychology, University College London, London, UK

⁵ Department of Psychology, University of Calgary and Alberta Children's Hospital Research Institute, Calgary, Alberta, Canada

Correspondence

Sheri Madigan, Associate Professor, Department of Psychology, University of Calgary, Calgary, Alberta, T2N 1N4, Canada.
Email: sheri.madigan@ucalgary.ca

Abstract

This meta-analytic study examined the associations between child-father attachment in early childhood and children's externalizing and internalizing behavior problems. Based on 15 samples ($N = 1,304$ dyads), the association between child-father attachment insecurity and externalizing behaviors was significant and moderate in magnitude ($r = 0.18$, 95% CI: 0.10, 0.27 or $d = 0.37$, 95% CI: 0.20, 0.55). No moderators of this association were identified. Based on 12 samples ($N = 1,073$), the association between child-father attachment insecurity and internalizing behaviors was also significant, albeit smaller in magnitude ($r = 0.09$, 95% CI: 0.02, 0.15; or $d = 0.17$, 95% CI: 0.03, 0.31). Between-study heterogeneity was insufficient to consider moderators. When compared to the effect sizes of prior meta-analyses on child-mother attachment and behavior problems, the quality of the attachment relationship with fathers yields a similar magnitude of associations to children's externalizing and internalizing behaviors. Results support the need to consider the role of the attachment network, which notably includes attachment relationships to both fathers and mothers, to understand how attachment relationships contribute to child development.

KEYWORDS

child-father attachment, externalizing behaviors, internalizing behaviors, meta-analysis

1 | INTRODUCTION

Attachment theory proposes a framework to understand how relationships with caregivers in early childhood shape lifelong development (Bowlby, 1969/1982). A mature body of research shows that children's secure attachment relationships with the parent (hereafter referred to as child-parent attachment) promotes adaptation across diverse developmental outcomes, and that insecure attachment relationships are risk factors in the development of maladaptation (e.g., Badovinac et al., 2021; Cassidy & Shaver, 2016; Groh et al., 2017; O'Connor et al., 2011; Sroufe et al., 2010; van IJzendoorn et al., 1999). Much of this work has centered on child-mother attachment, as exemplified by a series of quantitative reviews. The meta-analyses have shown that child-mother attachment insecurity assessed in the early life course is associated with children's externalizing (Fearon et al., 2010) and internalizing (Groh et al., 2012; Madigan et al., 2013) behavior problems. Less is known, however, on how other attachment relationships within children's attachment networks may contribute to the development of behavior problems. For example, due to the scarcity of child-father studies, the meta-analyses published to date did not comprehensively examine the role of child-father attachment on children's behavior problems. Fortunately, research on child-father attachment insecurity and children's behavior problems has rapidly expanded over the last decade (e.g., Brown & Aytuglu, 2020; Schoppe-Sullivan & Fagan, 2020), thereby allowing for a meta-analytic synthesis of this body of research, which is the goal of the current study. Specifically, we (a) examine whether child-father attachment is associated with children's externalizing and internalizing behaviors at a meta-analytical level and (b) compare the magnitude of the derived meta-analytic associations with previous meta-analyses of child-mother attachment and behavior problems (Fearon et al., 2010; Groh et al., 2012; Madigan et al., 2013).

1.1 | Theoretical considerations on the link between caregiver-child attachment and behavior problems

Attachment theory posits that experiences with caregivers in early childhood can shape the nature of children's attachment relationships (Ainsworth et al., 1978). For example, children who experience sensitive caregiving—defined as prompt, contingent, and appropriate responses to the child's needs and signals—are expected to form a secure attachment relationship to their caregiver. In contrast, children who experience insensitive caregiving, which may include delayed, inconsistent, inadequate, or absent responses to the child's needs, are at a higher risk of developing an insecure attachment relationship to their caregiver than children who experience sensitive caregiving (De Wolff & van IJzendoorn, 1997). These early attachment relationships are theorized to result in different developmental trajectories with respect to social and emotional development, including risk for psychopathology (e.g., DeKlyen & Greenberg, 2016; Groh et al., 2017).

Attachment research typically distinguishes between four patterns of child attachment, one being secure, and three being insecure, referred to as avoidant, resistant, and disorganized. Attachment behavioral patterns are distinguished during experimental paradigms such as the Strange Situation Procedure (SSP) (Ainsworth et al., 1978), during which the child is successively separated and reunited with their caregiver. Children classified as having a secure attachment are comforted by the caregiver, signal their distress directly and openly, and readily explore their environments within the proximity of the caregiver.

Children whose attachment with their caregiver is classified as insecure-avoidant show little distress related to separation from the caregiver, tend to ignore the caregiver in times of challenge, and explore their environment without reference to the caregiver. Children classified as having insecure-resistant attachment with their caregiver are often distressed upon separation from the caregiver and show difficulty settling down upon their return and/or resuming exploration (Ainsworth et al., 1978). Lastly, when under stress in the SSP, children with insecure-disorganized attachment with their caregiver exhibit a breakdown in an organized attachment strategy, indicated by highly conflicted, disoriented, or fearful behavior (Main & Hesse, 1990). Insecure attachment patterns (i.e., avoidant, resistant, and disorganized) are commonly grouped and compared against children with secure parent-child attachment.

Secure and insecure attachment relationships are expected to have lasting significance for children's developmental adjustment, including in regard to psychopathology (Bowlby, 1969/1982). Within the context of a secure attachment relationship, children can purportedly learn a wealth of social and emotional skills that foster positive adaptation. For example, it is hypothesized that children with secure attachments are more likely to learn how to freely express and discuss their emotions with the support and acceptance of their caregiver, which forms the basis of their adaptive emotion regulation skills (Fearon & Belsky, 2004; Thompson, 2016). Children with secure attachments are thus better equipped to cope with stressful situations in their environment and are less likely to develop maladaptive or dysregulating behaviors.

In contrast to secure attachment, children with an insecure attachment may not have been able to learn adaptive emotion regulation skills in the context of their attachment relationship, which increases their risk of developing maladaptive behaviors. For example, if their caregiver is rejecting or unresponsive, a child may develop expectations of others as unresponsive and rejecting and thereby treat others in an antagonistic matter (Cassidy & Kobak, 1988; Sroufe, 1983). Children with an insecure attachment may also be preoccupied with the caregiver at the expense of exploration, which may create a sense of dependency, social isolation, and regressed or immature behaviors (Moss et al., 1996). Without appropriate scaffolding from the parents, children with insecure attachments may not learn key emotion regulation skills that support their social relationships beyond the dyad.

1.2 | Empirical research on child-caregiver attachment and behavior problems

Children's behavior problems are often classified along two broadband dimensions: externalizing or internalizing behaviors (Achenbach & Rescorla, 2000). Externalizing behaviors are problematic behaviors that are directed outward, such as aggression, delinquency, and hyperactivity. Internalizing behaviors include problematic behaviors that are directed inward, such as depression, anxiety, somatic complaints, social isolation, and withdrawal (Liu, 2004). Considerable research effort in developmental and clinical science has been dedicated to uncovering the most potent factors that increase the risk of, and/or protect against, externalizing and internalizing behavior problems in children. Children's attachment relationships to their caregivers are believed to be one such factor.

A series of meta-analyses have confirmed an association between child-mother attachment insecurity and children's behavior problems (Fearon et al., 2010; Groh et al., 2012; Madigan et al., 2013). The first meta-analysis addressed the association between child-mother attachment and externalizing behaviors across 69 studies representing a

cumulative sample of 5,947 children (Fearon et al., 2010). The meta-analysis revealed that insecure attachment was associated with higher levels of externalizing behaviors ($r = 0.15$ or $d = 0.31$). The latter two meta-analyses found small but statistically significant associations between insecure attachment and internalizing behaviors (Groh et al., 2012; Madigan et al., 2013). The effect sizes were noticeably smaller than those identified for externalizing behaviors and varied from $r = 0.08$ ($d = 0.15$; $k = 42$, $N = 4,614$; Groh et al., 2012) to $r = 0.18$ ($d = 0.37$; $k = 60$, $N = 5,236$; the effect size adjusted for publication bias was $r = 0.10$; $d = 0.19$; Madigan et al., 2013).¹ Taken together, previous meta-analyses on child-mother attachment provide evidence in support of attachment theory's central claim regarding the long-term repercussions of relationships in early childhood, as the magnitude of the associations did not decrease with age (Fearon et al., 2010; Groh et al., 2012).

1.3 | Child-father attachment relationships in the attachment network

An important limitation of the meta-analyses reviewed above, as noted explicitly by the authors, was the focus on child-mother attachment relationships due to the limited research on child-father dyads at the time. For decades, scholars have called for more studies considering the attachment network (e.g., Cowan, 1997; Cowan & Cowan, 2019; Dagan & Sagi-Schwartz, 2018). The composition of such a network may be quite diverse (with respect to the attachment figures involved and the number of relationships), but one of the ways that research has progressed is by considering the role of child-father attachment. That is, the field of developmental psychology can gain significant insights into child development by examining the child's relationship to both their mother and father (as well as to other significant caregivers). Although research on child-parent attachment continues to primarily focus on children's attachments to mothers, there is increasing research considering the developmental significance of children's attachments to fathers. The move to the study of attachment networks is driven by the notion that a child may develop unique attachment relationships with the mother and the father, and accordingly, each relationship may have its own impact on child development. To advance understanding of the attachment network, concerted attention should be paid to the role of the child-father relationship within this network.

Initial empirical research and quantitative reviews of attachment, and developmental science more broadly, have largely ignored the contributions of fathers and the quality of child-father attachment relationships to children's developmental trajectories (Brown & Aytuglu, 2020; Cabrera et al., 2000, 2014, 2018; Cowan, 1997; Cowan & Cowan, 2019). Indeed, Cassano et al. (2006) observed that in child psychopathology research, 1% of studies exclusively included fathers in research protocols, compared to 54% that exclusively included mothers (Cassano et al., 2006). The early focus on mothers in research may be explained by a reliance on a 20th century, mother-centric research model. Throughout much of the 20th century, mothers were the primary—and sometimes sole—caregivers involved in child-rearing. Fathers were considered husbands and breadwinners, rather than actively involved caregivers (Lamb, 2014). This societal belief informed research hypotheses; fathers' parenting behaviors and the quality of child-father relationships were not expected to have a direct impact on child development—they were consequently ignored, until recently.

The increase in research on fathers over the last several decades coincides with important societal trends. For example, women's increased participation in the workforce has transformed family roles and favored father involvement in child-rearing in many Western

countries (Bakermans-Kranenburg et al., 2019; Cabrera et al., 2000). This trend highlights how the mother-centric model no longer reflects the realities of most 21st century Western families, wherein both mothers and fathers may play an active role in child-rearing (Bakermans-Kranenburg et al., 2019; Cabrera et al., 2018). In many families, fathers act as co-parents (Cabrera et al., 2000; Pleck & Pleck, 1997) who participate in childcare and decision-making, and most importantly for the formation of child-father attachment, spend considerable time with their child (e.g., a 3- to 6-fold increase in father involvement has been observed in a recent generation of fathers; Bakermans-Kranenburg et al., 2019). A number of ensuing theoretical models on fathering and child-father relationships (e.g., Cabrera et al., 2007, 2014; Pleck, 2010; Volling & Cabrera, 2019), along with pleas for the inclusion of fathers in attachment research (e.g., Cowan, 1997; Cowan & Cowan, 2019; Fagan, 2020), have likely also contributed to burgeoning research on child-father attachment.

1.4 | The contribution of child-mother and father attachment to children's behavior problems

There is an ongoing debate regarding the relative contributions of child-mother and child-father relationships (as well as maternal and paternal parenting behaviors) to children's behavior problems, and to child development more broadly. There are three main views in this debate: (a) child-mother relationships are more important for all types of behavior problems, (b) child-father relationships are more important for specific types of behavior problems (i.e., externalizing behaviors), and (c) both relationships hold similar contributions for different types of behavior problems. On the one hand, it has been noted that developmental research has largely assumed that maternal behaviors and children's relationships with their mothers are more important contributors to child development than paternal behaviors and children's relationships with their fathers. This view partly stems from the long-held belief that fathers are secondary caregivers who spend little time with their children (see Cabrera et al., 2018). Accordingly, mothers, who act as the primary caregivers and spend more time interacting with their children, would hold a greater influence on their children's development. In support of this reasoning, much of the early work on attachment relationships and child outcomes failed to find an association between child-father attachment and children's behavior problems. For example, child-father attachment insecurity was not associated with maternal or paternal ratings of child externalizing and internalizing behaviors in a sample of 62 American children (Rothbaum et al., 1995); however, significant associations were observed for child-mother attachment and behavior problems. Lafrenière et al. (1992) documented a similar pattern of findings for internalizing problems in a sample of 83 Canadian children.

On the other hand, some scholars have proposed and demonstrated that father involvement, child-father relationships, and fathering behaviors are more potent predictors of certain developmental outcomes (such as externalizing problems) than child-mother relationships and maternal behaviors. For example, Paquette's (2004) activation theory proposes that fathers are more likely than mothers to excite and destabilize children, compete with children, and encourage children to take developmental risks (e.g., through physical and rough-and-tumble play). It is argued that in the context of insensitive interactions, fathers' activating and destabilizing behaviors could undermine the development of emotion regulation and social competence in children. Given that externalizing problems take place in social situations through outward-directive negative behaviors, fathers' behaviors and child-father relationships would be particularly relevant in the case of

externalizing behaviors. Empirical research has supported the unique role of paternal behaviors and child-father relationships in predicting externalizing problems and provided mixed findings when it comes to internalizing problems (Hennigar et al., 2020; Rodrigues et al., 2021). In the case of attachment research specifically, more contemporary research has provided evidence that insecure child-father attachment, in particular, may confer risk to children's externalizing behaviors. For example, studies by Kochanska and Kim (2013) and Bureau et al. (2020), on 86 American and 83 Canadian children, respectively, found that child-father attachment, but not child-mother attachment, was associated with children's externalizing behaviors.

Finally, a more integrative view suggests that with fathers' increasing levels of involvement, responsibility, and interaction with children, children's attachment relationships with their fathers and mothers contribute similarly to children's development (Fagan et al., 2014). This hypothesis has also been supported in research. For example, in a sample of 90 American children by Goffin et al. (2018), both child-mother and father attachment were associated with children's antisocial behaviors.

The inconsistent views and divergent findings regarding the relative contributions of child-father and mother relationships highlight the need for a meta-analysis that systematically examines whether the quality of children's attachment relationship with their father in early childhood is associated with behavior problems in children, and to compare the magnitude of the derived associations with effect sizes identified in meta-analyses on child-mother attachment (Fearon et al., 2010; Groh et al., 2012; Madigan et al., 2013). In addition, the small sample sizes in individual studies highlight the need to combine studies through a meta-analysis to increase power and precision in testing these abovementioned hypotheses on the relative contribution of mothers and fathers to children's behavioral problems.

1.5 | Potential moderators of the association between child-father attachment and behavior problems

Meta-analyses on child-mother attachment and behavior problems have shown that methodological and sociodemographic characteristics may increase or attenuate the magnitude of the observed associations. In line with this work, the current study examines several potential moderators of the association between child-father attachment in early childhood and behavior problems. First, there are various measures to assess child-father attachment, including the SSP (Ainsworth et al., 1978), the Attachment Q-Sort (Waters, 1987), and the modified SSP (e.g., separation-reunion procedure; Cassidy and Marvin, 1992). As these measures are typically collected at different ages (from infancy to middle childhood), and in different contexts (i.e., home vs. laboratory), it is possible that association between attachment and behavior problems may vary as a function of the attachment measure used.

Second, children's age at the measurement of attachment and behavior problems may influence the strength of the association between child-father attachment and behavior problems. It has been shown that fathers become more involved in childcare during the preschool years (Black et al., 1999; Lamb, 2004), and this developmental period coincides with an increase in behavior problems among children (Tremblay, 2010). Third, child gender has been shown to play a role in the association between attachment and behavior problems. For example, child-mother attachment insecurity is more predictive of externalizing and internalizing behaviors in boys than in girls (Fearon et al., 2010; Madigan et al., 2013). Finally, the publication year may serve as a proxy that can account for a

sociological change in father involvement in childcare over time. As father involvement rises (Bakermans-Kranenburg et al., 2019; Bianchi et al., 2006), it is possible that child-father attachment may hold a stronger association with behavior problems in more recent years.

1.6 | The current study

Responding to the noted need for meta-analyses on child-father attachment and child outcomes (Fearon et al., 2010; Groh et al., 2012; Madigan et al., 2013) and the renewed research interest in the attachment network (Dagan & Sagi-Schwartz, 2018), the first aim of the current study is to synthesize the association between child-father insecure attachment in early childhood and children's externalizing and internalizing behavior problems and test for potential moderators of this association. We focus on comparisons between children with secure versus insecure attachment (i.e., grouped as avoidant, resistant, disorganized), specifically, given that research examining associations by each attachment pattern (e.g., secure vs. avoidant) in child-father research is very limited. Indeed, roughly half of the studies included in this study used the traditional or modified SSP that would allow insecure attachment patterns to be distinguished; however, among these, very few reported on separate insecure classifications ($n = 2$).

Consistent with Groh et al. (2017), a second aim of the current study was to compare the pooled effect sizes for the meta-analyses on child-father attachment and externalizing behaviors, and child-father attachment and internalizing behaviors, to examine if child-father attachment predicts both dimensions of behavior problems similarly or differentially. Finally, our third aim was to compare the magnitude of the pooled effect sizes for child-father attachment and behavior problems derived herein, to those of child-mother attachment derived in previous meta-analyses (Fearon et al., 2010; Groh et al., 2012; Madigan et al., 2013) to compare if attachment relationships to fathers and mothers hold similar or differential predictive power on children's behavior problems. The results can inform the current debate as to the relative contribution of different relationships in children's attachment networks on their behavioral development.

2 | METHOD

2.1 | Search strategy

This meta-analysis was conducted following the recommendations and standards set by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA; Moher et al., 2009). Searches were conducted by a science librarian in PsycINFO, MEDLINE, EMBASE, Web of Science, and Dissertation Abstracts International for published and unpublished studies from 1946 to August 5, 2020. Database-specific headings and text word fields were searched for concepts of "strange situation," "q-sort," and "attachment" in children up to age 12, with truncation symbols used to capture variant endings and spellings (e.g., infant*). Synonymous terms were combined with the Boolean "OR," and the concepts were combined with the Boolean "AND." No language restrictions were applied.

A total of 24,980 non-duplicate abstracts/titles were reviewed for inclusion into the *Child Attachment Studies Catalogue and Data Exchange* (CASCADE; Madigan, 2020), a data repository consisting of extracted, compiled, and coded data from all studies that have observationally measured child-parent attachment. A total of 2,405 full-text articles were

reviewed for inclusion into CASCADE, which required the study to be (a) empirical; and (b) using one of the following observational coding measures of child-parent attachment: the SSP (Ainsworth et al., 1978), the modified SSP (Cassidy & Marvin, 1992; Main & Cassidy, 1988; Moss et al., 2015), the Attachment Q-Sort (Waters, 1987), and the Preschool Attachment Assessment (Crittenden, 1992). Data in CASCADE are cataloged on a variety of sample demographics, measurement, and outcome factors, creating ease in conducting conventional meta-analyses. From the CASCADE catalog, we selected all studies that met the two following criteria:

1. The study measured children's attachment with their fathers in early childhood using an observational measure of attachment. To retain consistency with our comparators, that is, meta-analyses on child-mother attachment and behavior problems (Fearon et al., 2010; Groh et al., 2012; Madigan et al., 2013), we did not include representational measures (e.g., Attachment Story Completion Task; Bretherton et al., 1990), or questionnaire measures of attachment (e.g., the Security Scale; Kerns et al., 2001).
2. The study included an assessment of externalizing or internalizing behaviors. There was no restriction on this assessment: we included parent-, teacher-, or self-report, as well as direct observation conducted at any point in childhood. Consistent with the series of meta-analyses on child-mother attachment and behavior problems (Fearon et al., 2010; Groh et al., 2012; Madigan et al., 2013), externalizing behaviors included aggression, oppositional problems, conduct problems, and hostility. Internalizing behaviors included anxiety, depression, withdrawal, and somatic complaints. One study that only provided the association for child-father attachment and total behavior problems was excluded. Measures of externalizing and internalizing behaviors can be found in Table 1.

A total of 22 full-text articles met initial inclusion criteria from CASCADE (see PRISMA diagram in Figure 1). Reference lists of relevant meta-analyses and articles identified in CASCADE were also screened for additional studies, and 13 potential studies were identified and full-text articles were reviewed. Five studies required further information to determine inclusion criteria. We contacted the authors of these studies, and three (60%) responded with the requested information. Further, publications with overlapping data were identified for two samples across seven publications (sample 1: Bureau et al., 2017, 2020; Deneault et al., 2020; sample 2: Boldt et al., 2017; Goffin et al., 2018; Kim et al., 2014; Kochanska & Kim, 2012, 2013). To ensure each sample was only represented once, we selected the publication with the largest sample size and most complete effect size information (externalizing behaviors: Boldt et al., 2017 and Deneault et al., 2020; internalizing behaviors: Bureau et al., 2017 and Kochanska & Kim, 2013).

After applying all the above-mentioned criteria, a total of 18 full-text articles met the full-text inclusion criteria and were included in the meta-analysis. The meta-analysis on child-father attachment insecurity and externalizing behaviors included 15 studies, while the meta-analysis on child-father attachment insecurity and internalizing behaviors included 12 studies.

2.2 | Data extraction

Several moderator variables were extracted from individual studies: (a) attachment measure; (b) child age (in months) at both the attachment and outcome assessments; (c) percentage of male children in the sample; and (d) publication year. The first author was the

TABLE 1 Sample characteristics for studies included in the meta-analyses

Study	N	Country	% Male	% White	Attachment measure	Age at attachment assessment ^a	Informant of ext./int.	Ext. measure	Age at ext. assessment ^a	Int. measure	Age at int. assessment ^a
Aviezer et al. (2002)	66	Israel	50	–	SSP	14	Teacher	Unspecified questionnaire	133	–	–
Boldt et al. (2017)	82	USA	50	84	SSP	15	Father	Child Symptom Inventory-4, Adolescent Symptom Inventory-4	120, 144	–	–
Bureau et al. (2017)	107	Canada	–	–	SSP-M	47	Mother & Father	–	–	SDQ	47
Colonnesi et al. (2013)	20	the Netherlands	35	–	AQS	46	Father	SDQ	46	SDQ	46
DeKlyen et al. (1998)	105	USA	100	86	SSP-M	57	Mother, Father, & Teacher	CBCL	57	–	–
Deneault et al. (2020)	144	Canada	42	85	SSP-M	47	Mother & Father	SDQ	47	–	–
Dumont and Paquette (2013)	53	Canada	38	81	SSP	15	Father	SCBES	35	SCBES	35
Feugé et al. (2020)	68	Canada	67	93	AQS	47	Father	CBCL	47	CBCL	47
George (2010)	235	USA	45	77	SSP-M	72	Teacher	CBCL	72, 96	CBCL	72, 96

(Continues)

TABLE 1 (Continued)

Study	N	Country	% Male	% White	Attachment measure	Age at attachment assessment ^a	Informant of ext./int.	Ext. measure	Age at ext. assessment ^a	Int. measure	Age at int. assessment ^a
Kochanska and Kim (2013)	86	USA	53	84	SSP	15	Mother, Father, & Teacher	–	–	Child Symptom Inventory-4	78, 96
Lafrenière et al. (1992)	83	Canada	49	–	AQS	45	Teacher	–	–	Preschool Behavior Questionnaire	45
Lindsey et al. (2009)	80	USA	48	76	SSP	18	Observer	Observation	36	–	–
McElwain and Volling (2004)	30	USA	50	–	SSP	12	Observer	Observation	51	–	–
Monteiro et al. (2008)	56	Portugal	48	–	AQS	32	Mother & Father	SCBES	32	SCBES	32
Rothbaum et al. (1995)	32	USA	50	100	SSP	22	Mother, Father, & Teacher	CBCL	84	CBCL	84
Suess et al. (1992)	39	Germany	46	–	SSP	18	Observer	Minnesota Preschool Affect Checklist	60	Minnesota Preschool Affect Checklist	60
Tirkkonen et al. (2016)	69	Finland	48	98	PAA	18	Father	CBCL	48	CBCL	48
Volling et al. (2014)	225	USA	46	86	AQS	31	Mother & Father	CBCL	31	CBCL	31

Abbreviations: AQS, attachment Q-Sort; CBCL, Child Behavior Checklist; Ext., externalizing problems; Int., internalizing problems; PAA, Preschool Attachment Assessment; SCBES, Social Competence and Behavior Evaluation Scale; SDQ, Strengths and Difficulties Questionnaire; SSP, Strange Situation Procedure; SSP-M, Strange Situation Procedure Modified.

^aAge in months.

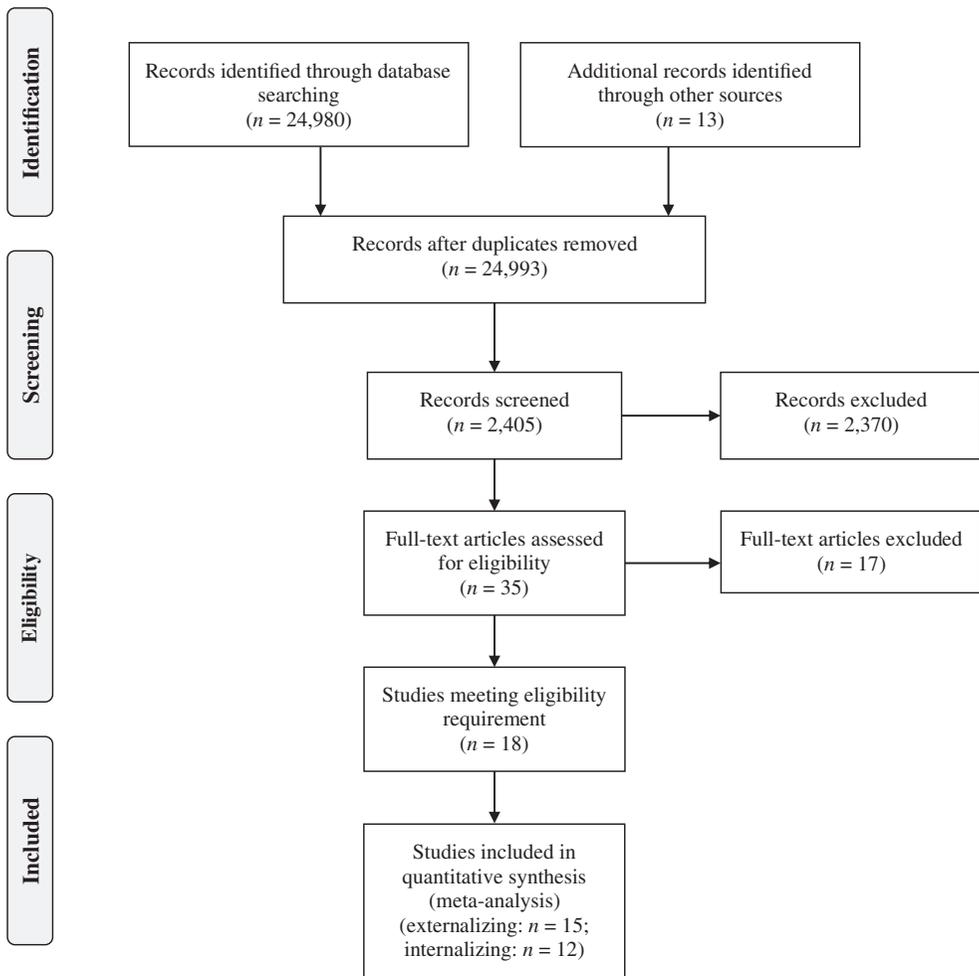


FIGURE 1 Prisma flow diagram of study selection

primary coder for these studies. Reliability with a second coder on 28% of included studies ranged from 0.80 to 1.00 for continuous variables and was 100% for the categorical moderator.

2.3 | Data analysis

The first author extracted effect sizes from studies, including correlation coefficients, regression coefficients, F -values, and means/standard deviations. Two studies reported non-significant findings without specifying the effect size. For these studies, following recommendations by Rosenthal (1995), we computed an effect size based on a two-sided p -value of 0.50. We conducted all transformations across effect sizes using the R package *compute.es* (Del Re, 2013). Some studies provided more than one effect size. For example, instead of reporting the association between attachment and a total externalizing score, they reported the link between attachment and conduct problems as well as attachment and hyperactivity/inattention. In such cases, we used the R package *metafor* (Viechtbauer,

2010) to pool the effect sizes such that the meta-analysis only included one effect size per study.

We used the R package *metafor* (Vietchtbauer, 2010) to conduct the meta-analyses. Pooled effect sizes are presented as Pearson's correlations (r), with 95% confidence intervals (CI's) given that the majority of included studies provided this effect size format in their studies. Pearson's correlations are considered small, medium, and large, based on values of 0.10, 0.20, and 0.30, respectively, according to newly calibrated effect size guidelines for psychological research provided by Funder and Ozer (2019). Prior to the analyses, correlations were converted to a Fischer's z because of the large variability of the variance depending on the magnitude of the correlation (Borenstein & Hedges, 2019). We also presented the meta-analytic effects as standard Pearson's correlations and Cohen's d for ease of interpretation and comparison with the child-mother attachment meta-analyses. We examined the presence of publication bias with the Egger test and examination of the funnel plots. We assessed heterogeneity using the Q and I^2 statistics. Consistent with recommendations by Borenstein (2009), we examined moderators if the Q statistic was significant or if the I^2 was greater than 50%.

To compare the effect sizes of child-father attachment with externalizing and internalizing behaviors, we used the *robumeta* package (Tanner-Smith & Tipton, 2014), which allowed for a multilevel approach to compare dependent effect sizes. We compared results of the child-father attachment meta-analyses to the effect sizes of the child-mother attachment meta-analyses through the comparison of 85% confidence intervals (CI; Goldstein & Healy, 1995). This approach is a conservative significance test for the comparison of overlapping studies across meta-analyses (e.g., if one study was included in the child-father and mother meta-analyses). A difference between effect sizes is identified if the 85% confidence intervals do not overlap. To remain consistent with the meta-analyses on child-mother attachment and behavior problems, which reported effect sizes in Cohen's d , comparisons for these analyses are presented using Cohen's d .

3 | RESULTS

3.1 | Child-father attachment and externalizing behaviors

3.1.1 | Summary of study variables

Fifteen studies reported on the association between child-father attachment security/insecurity in early childhood and externalizing behaviors. The median sample size was 68, with a range of 20–235 participants. The socioeconomic background of all samples was either mixed, middle class, or middle-upper class. Three samples contained an indicator of risk (20%): two included foster/adoptive children (Colonnesi et al., 2013; Feugé et al., 2020), and one included children with a diagnosis of oppositional defiant disorder (50% of the sample; DeKlyen et al., 1998). One sample included fathers in a homosexual relationship (7%; Feugé et al., 2020), while the remaining studies consisted of fathers in a heterosexual relationship.

With respect to the attachment measure used, seven used the SSP (47%), four studies used the Attachment Q-Sort (27%), three used a modified SSP (20%), and one used the Preschool Attachment Assessment (7%). Children were 31 months old on average when attachment was assessed, with a range of 12–72 months (median: 21.5 months). As for the externalizing assessment, six studies used the Child Behavior Checklist (40%), three used a direct observation method (20%), two used the Strengths and Difficulties Questionnaire (13%), two used the Social Competence and Behavior Evaluation Scale (13%), one used a

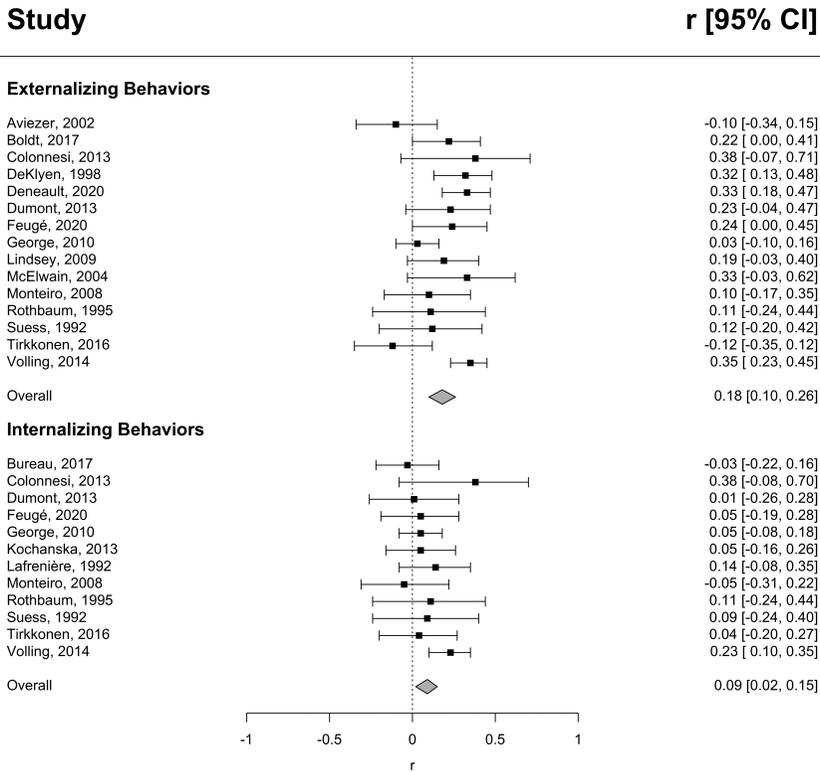


FIGURE 2 Forest plot of effect sizes for child-father attachment and child behavior problems

composite of the Child Symptom Inventory-4 and Adolescent Symptom Inventory-4 (7%), and one used an unspecified questionnaire (7%). The informants of externalizing problems were the father (33%), an observer (20%), or a teacher (13%), or composites of multiple informants (mother and father: 20%; father, mother, teacher: 13%). Children were 60 months on average at the time of the externalizing behavior assessment, with a range of 31–133 months (median: 48 months). Eight studies used a longitudinal design (53%), six studies used a cross-sectional design (40%), and one used a mixed design that included cross-sectional and longitudinal analyses (7%).

Almost all studies were published peer-reviewed articles (93%), while one was a doctoral dissertation. Publication year ranged from 1992–2020. In terms of geographical location, seven studies were conducted in the United States (47%), three in Canada (20%), and one in each of the following countries: Finland (7%), Germany (7%), Israel (7%), the Netherlands (7%), and Portugal (7%).

3.1.2 | Meta-analytic result for externalizing behaviors

A total of 15 studies (1,304 participants) were included in the random-effects meta-analysis model. As shown in Figure 2, this model showed a significant positive combined effect size of child-father attachment insecurity and children's externalizing behaviors: Fisher's $z = 0.19$ (95% CI: 0.10, 0.27), $p < 0.001$. This is equivalent to an effect size of $r = 0.18$ (95% CI: 0.10, 0.27), or $d = 0.37$, 95% CI: 0.20, 0.55, a moderate effect size. Child-father attachment insecurity is thus associated with more externalizing behaviors. The funnel plot did

TABLE 2 Results of the moderator analysis for the association between child-father attachment insecurity and externalizing behaviors

Externalizing behaviors					
Categorical moderators	<i>k</i>	<i>r</i>	95% CI	<i>Q_M</i>	<i>p</i>
Attachment measure ^a				5.08	0.17
Attachment Q-Sort	4	0.28	0.16, 0.42		
Strange Situation Procedure	7	0.15	0.04, 0.26		
Modified Strange Situation Procedure	3	0.22	0.02, 0.43		
Continuous moderators	<i>k</i>	<i>B</i>	95% CI	<i>Z</i>	<i>P</i>
Child age at attachment assessment	15	0.001	-0.004, 0.01	0.53	0.60
Child age at outcome assessment	15	-0.002	-0.01, 0.0004	-1.70	0.09
Child gender	15	0.002	-0.004, 0.01	0.67	0.50
Publication year	15	0.004	-0.01, 0.02	0.68	0.50

Abbreviations: b, estimate; CI, confidence interval; *k*, number of studies; *Q_M*, test of moderator; *r*, correlation coefficient.

^aThe Preschool Attachment Assessment was excluded from the analysis as there fewer than three studies the categories.

not reveal asymmetry, and the Egger test was not significant ($z = 0.10$, $p = 0.93$), suggesting that studies with small sample sizes did not present more extreme values. The *Q*-statistic ($Q = 31.5$, $p = 0.005$) and the I^2 value ($I^2 = 54.09$) indicated the presence of heterogeneity between studies, thereby warranting exploration of moderators. As shown in Table 2, none of the moderators tested (i.e., attachment measure used, child age at the assessment of the attachment and outcome measure, child gender, and publication year) emerged as significant.

3.2 | Child-father attachment and internalizing behaviors

3.2.1 | Summary of study variables

Twelve studies reported on the association between child-father attachment security/insecurity in early childhood and internalizing behaviors. The median sample size was 68, with a range of 20–235 participants. The socioeconomic background of all samples was mixed, middle class, or middle-upper class. Two of the samples contained an indicator of risk because they studied foster/adoptive children (17%; Colonnese et al., 2013; Feugé et al., 2020). One sample included fathers in a homosexual relationship (8%; Feugé et al., 2020); the rest were in a heterosexual relationship.

With respect to the attachment measure used, five studies used the Attachment Q-Sort (42%), four used the SSP (33%), two used a modified SSP (17%), and one used the Preschool Attachment Assessment (8%). Children were 31 months old on average when attachment was assessed, with a range of 12–72 months (median: 21.5 months). As for the internalizing assessment, five studies used the Child Behavior Checklist (42%), two used the Strengths and Difficulties Questionnaire (17%), two used the Social Competence and Behavior Evaluation Scale (17%), one used the Child Symptom Inventory-4 (8%), one used the Preschool Behavior Questionnaire (8%), and one used a direct observation method (8%). The informants of internalizing problems were the father (33%), a teacher (17%), or an observer (8%), or composites of multiple informants (mother and father: 25%; father, mother, teacher: 17%). Children were 60 months on average at the internalizing behavior assessment, with a range of 31–133 months (median: 48 months). Eight studies relied on

a longitudinal design (53%), six studies on a cross-sectional design (40%), and one on a mixed design (7%).

Almost all studies were published peer-reviewed articles (92%); the other one was a doctoral dissertation. Publication year ranged from 1992–2020. Seven of the studies were conducted in the United States (58%), three in Canada (25%), and one in each of the following countries: Finland (8%), Germany (8%), Israel (8%), the Netherlands (8%), and Portugal (8%).

3.2.2 | Meta-analytic results for internalizing behaviors

A total of 12 studies (1,073 participants) were included in the random-effects meta-analysis model. As shown in Figure 2, this model showed a significant positive combined effect size of child-father attachment insecurity and children's internalizing behaviors: Fischer's $z = 0.09$ (95% CI: 0.02, 0.15), $p = 0.01$. This is equivalent to an effect size of $r = 0.09$ (95% CI: 0.02, 0.15), or $d = 0.17$, 95% CI: 0.03, 0.31, a small effect size. Child-father attachment insecurity is thus associated with more internalizing behaviors. The funnel plot did not reveal asymmetry, and the Egger test was not significant ($z = 0.14$, $p = 0.89$), suggesting that studies with small sample sizes did not present more extreme values. The Q statistic ($Q = 9.63$, $p = 0.564$) and the I^2 value ($I^2 = 13.55$) did not indicate the presence of heterogeneity between studies. Thus, we did not examine the role of moderators for this meta-analysis.

3.3 | Comparing results of child-father attachment on externalizing versus internalizing behaviors

We examined whether child-father attachment was more strongly associated with externalizing behaviors or internalizing behaviors through a multilevel meta-analysis. The test of the difference in effect sizes between externalizing and internalizing behaviors included 27 effect sizes from 16 studies. The test revealed a marginal effect, with child-father attachment being more strongly associated with externalizing behaviors than internalizing behaviors: Fischer's $z = 0.10$, $SE = 0.05$, $p = 0.07$, 95% CI: -0.01, 0.21).

3.4 | Comparison with child-mother attachment meta-analytic results

We compared the results of this meta-analysis on child-father attachment and externalizing behaviors to the results of Fearon et al.'s (2010) meta-analysis on child-mother attachment and externalizing behaviors. The 85% confidence intervals overlapped (child-mother attachment: $d = 0.31$, 85% CI: 0.25, 0.37; child-father attachment: $d = 0.37$, 85% CI: 0.24, 0.52), suggesting that child-mother and child-father attachment insecurity are similarly associated with children's externalizing behaviors.

We also compared our meta-analytic results on child-father attachment and internalizing behaviors to the results of Groh et al. (2012) and Madigan et al. (2013) meta-analyses on child-mother attachment and internalizing behaviors (see Figure 3). The 85% confidence intervals overlapped (child-mother attachment [Groh]: $d = 0.15$, 85% CI: 0.08, 0.22; child-mother attachment [Madigan]: $d = 0.19$, 85% CI: 0.11, 0.26); child-father attachment: $d = 0.17$, 85% CI: 0.08, 0.26), suggesting that child-mother and child-father attachment insecurity are similarly associated with children's internalizing behaviors.

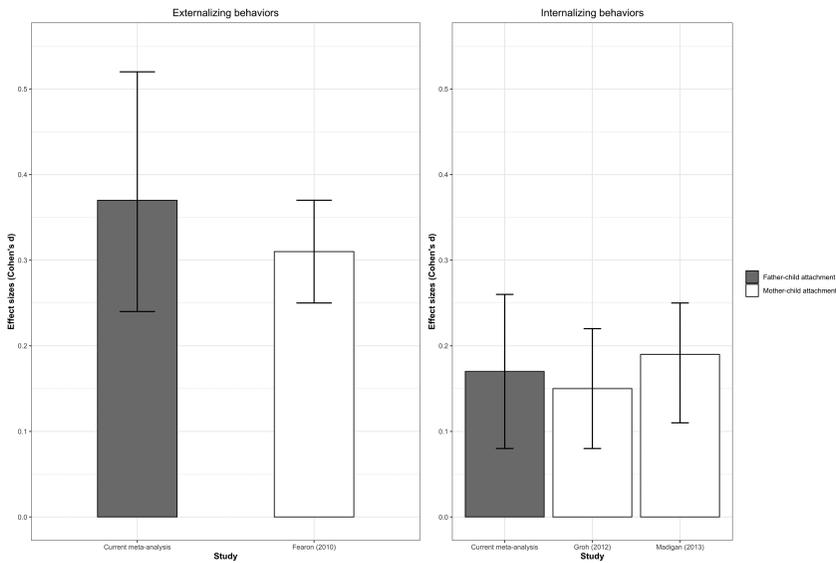


FIGURE 3 Visual representation of the effect sizes for child-mother and child-father attachment

4 | DISCUSSION

Attachment theory posits that children's relationships with caregivers can shape their development, notably in the domain of psychopathology (Bowlby, 1969/1982). A wealth of research has provided empirical support for this premise, especially in regard to child-mother attachment relationships, which has been synthesized meta-analytically (Fearon et al., 2010; Groh et al., 2012; Madigan et al., 2013). Less attention has been dedicated to other members of children's attachment networks and their role in the development of behavior problems. In particular, it has been noted that parenting research has fixated on the role of child-mother attachment relationships, often to the exclusion of the child-father relationships (Cabrera et al., 2018; Cowan & Cowan, 2019). The rise in father involvement in childcare in recent decades due to various sociological trends, in combination with pleas by attachment theorists to include fathers in research endeavors (e.g., Cowan, 1997), has spurred a growing literature base on child-father attachment relationships, and the role of this relationship in promoting adaptive and/or maladaptive behavior (e.g., Brown & Aytugly, 2020; Cabrera et al., 2000, 2014, 2018; Cowan, 1997; Fagan et al., 2014). It was therefore timely to quantitatively summarize this body of research and to compare it to syntheses on child-mother attachment and behavior problems to understand how children's relationships to various members of their attachment network contribute to the development of behavior problems in children.

In the current study, we found a significant, positive association between child-father attachment insecurity in early childhood and externalizing behaviors ($r = 0.18$, $d = 0.37$, $k = 15$, $N = 1,304$). This effect size was moderate in magnitude (Funder & Ozer, 2019). We also found a small but significant positive association between child-father attachment insecurity in early childhood and internalizing behaviors ($r = 0.09$, $d = 0.17$, $k = 12$, $N = 1,073$). Together, these findings highlight the critical role that child-father attachment relationships play in their developmental trajectories.

These findings also call attention to the continued need to consider children's attachment networks when examining their developmental outcomes. While studies examining the independent contributions of each attachment relationship (such as the ones reported

here) are valuable, from an integrative perspective, even more insight can be gained from examining how various attachment relationships in children's attachment network impact child development (Dagan & Sagi-Schwartz, 2018). Consideration of the unique, cumulative, or multiplicative role of the attachment network on children's development would be especially informative. In the case of behavior problems, it may be that children with an insecure attachment relationship to both their fathers and mothers may be most at risk of developing behavior problems (additive hypothesis), or that a secure relationship to one of the parents buffers against the impact of an insecure relationship with the other parent (buffering hypothesis; Dagan & Sagi-Schwartz, 2018). This highly relevant question is addressed in a contribution to the current special issue (see Dagan et al., 2021; this issue), which revealed that children with one or more insecure relationships are more at risk of developing behavior problems (partial support for the additive hypothesis).

While the current study provides evidence that child-father attachment insecurity is associated with children's social maladaptation, research on the underlying mechanisms of this association is needed to advance further knowledge in this area and to effectively inform intervention efforts. One potential mechanism by which a secure child-father attachment may reduce the risk of behavior problems is through the type of play that fathers engage in with their children. It has been proposed that child-father play of a rough-and-tumble nature (e.g., wrestling, pretending to fight; StGeorge & Freeman, 2017), challenging paternal behaviors (e.g., behaviors that push the child out of their comfort zone) (Majdandžić et al., 2016), and/or activating behaviors (e.g., behaviors that excite, surprise, and destabilize the child; Volling et al., 2019), may help children to learn how to decode emotional cues during interactions. Further, these parenting behaviors may translate into higher relationship quality, as fathers would help the child express their emotions in appropriate ways when they feel frustration, fear, and/or excitement. Thus, these behaviors may provide a growth-enhancing opportunity to learn emotional regulation and emotional understanding, which children can then generalize to other social contexts. It is also possible that child characteristics (e.g., temperament, genetics) or other aspects of the family environment (e.g., the marital relationship) play a role in the association between child-father attachment and behavior problems (Brown & Aytuglu, 2020; Cabrera et al., 2014; Volling & Cabrera, 2019). Mechanisms by which child-father attachment promotes, or potentially derails, adaptation certainly warrant concerted attention in future research.

While the meta-analysis on externalizing behaviors indicated between-study heterogeneity, none of the moderators examined could explain the variability in effect sizes. Further, the meta-analysis on internalizing behaviors did not present sufficient heterogeneity to warrant examining moderators. This may be due, in large part, to the small sample sizes in both meta-analyses. That is, it is possible that a greater number of studies, with more diverse demographic characteristics, may yield more between-study heterogeneity. For example, there was little variability across studies in child gender (i.e., % male in samples), with the exception of the DeKlyen et al. (1998) study with 100% boys. Comparatively, the meta-analysis on child-mother attachment and externalizing behaviors included 14 effect sizes for boys, and 12 effect sizes for girls specifically (Fearon et al., 2010). Yet, it is worth noting that the lack of moderation by age converges with the meta-analysis on child-mother attachment, thereby suggesting that child-father attachment likely also has enduring effects on children's behavior problems. It is imperative for attachment research, and parenting research more broadly, to study child-parent attachment in more diverse samples to advance our understanding of the ways that child-father attachment promotes adaptation across populations. Similarly, the level and areas of involvement of fathers may be an important moderator of the relation between child-father attachment and social adaptation—levels of father involvement should thus be included in future research to examine this hypothesis.

Results showed that the pooled associations for child-father attachment on internalizing and externalizing behaviors were marginally different, with the association tending to be larger for externalizing behaviors. This result is consistent with the idea that fathers' physical play, within the context of a sensitive relationship, may be useful to learn how to regulate behaviors such as aggressiveness (Bureau et al., 2020). Consistent with Paquette's (2004) activation theory, child-father relationships may be more influential for socially relevant behaviors like externalizing problems, compared to more inward behaviors such as internalizing problems. As mentioned above, more research on the specific mechanisms by which child-father relationships influence child development is needed. In light of these results, a promising way forward would be to look at the interplay of paternal activating or challenging behaviors and sensitivity to try and identify the specific paternal behaviors that may confer an advantage or a risk to children's externalizing problems.

4.1 | Comparing the contribution of child-father and mother attachment for the development of child behavior problems

The pooled effect sizes for child-father attachment and behavior problems derived herein were statistically comparable to those of past meta-analyses on child-mother attachment and behavior problems (Fearon et al., 2010; Groh et al., 2012; Madigan et al., 2013). This finding suggests that attachment to both mothers and fathers holds a similar influence on children's development of behavior problems. This finding is consistent with larger trends in fathering research, which emphasize that there are more similarities than differences between fathers and mothers (Cabrera et al., 2014; Fagan et al., 2014). For example, even at a neurophysiological level, men, like women, undergo important considerable hormonal and behavioral changes when becoming parents (Bakermans-Kranenburg et al., 2019). Our finding of comparable effect sizes between child-mother and child-father attachment and behavior problems stands in contrast with activation theory (Paquette, 2004), which suggests that while child-mother attachment is central to child-mother interactions, child-father attachment may not be a key part of child-father relationships. That said, *how* and *why* child-parent attachment confers risks for the development of behavior problems may be different for mothers and fathers, and as noted above, an examination of mechanisms of transmission warrants concerted attention in future research given its implications for intervention efforts.

Interestingly, our findings are consistent with Dagan and colleagues' individual participant data synthesis (2021; this issue), which also finds similar contributions of child-mother and child-father attachment to children's behavior problems. This is consistent with the views of scholars suggesting that mothers and fathers are more similar than different in terms of their impact on children's development (e.g., Fagan et al., 2014). Taken together, the current study and that of Dagan and colleagues help to build an understanding of the ways that children's attachment relationships are similar to one another, and how different relationships in the attachment network independently and jointly contribute to the development of children's behavior problems.

4.2 | Limitations and future directions

Several limitations of the current series of meta-analyses are worthy of note. First, meta-analyses are correlational in nature, making it inappropriate to derive conclusions regarding causation. Due to the limited sample size, we were also unable to examine if the study design (cross-sectional or longitudinal) moderated associations. Second, this

study is limited to assessments of attachment conducted in early childhood through observational coding. Thus, we did not include other methods of assessing attachment, such as representational methods and questionnaires (see e.g., Madigan et al., 2016). It is worth noting that it would be difficult to include such methods for child-father attachment specifically, as they often assess attachment representations generally versus specifically for mothers and/or fathers. Third, due to sample size restrictions, we were unable to examine whether the association between child-father attachment and behavior problems varied based on subclassifications of insecure attachment (i.e., avoidant, resistant, disorganized). Distinguishing between insecure classifications requires large sample sizes, something that is hard to achieve, especially with child-father samples, but important to strive toward in future research. The meta-analyses on child-mother attachment found important differences based on attachment subclassifications. For example, avoidant and disorganized attachment versus secure attachment created a particular risk for the development of externalizing behaviors (Fearon et al., 2010). Future studies on child-father attachment with larger sample sizes will be necessary to examine the subclassifications of insecure attachment and how they confer risk for children's behavior problems. An alternative lies in the use of continuous attachment measures, such as the ones that include a scale for each attachment pattern (e.g., avoidant, resistant, disorganized; Deneault et al., 2020; Fraley & Spieker, 2003; Groh et al., 2019; Shakiba and Raby, 2021). The use of such scales in future research could provide more statistical power to examine each insecure attachment type individually, even with smaller samples.

Finally, samples included in the current meta-analyses lacked socio-demographic diversity. For example, the lowest proportion of White fathers was 76%, all samples came from largely middle-upper class socio-demographic strata, and all but one sample included fathers in heterosexual relationships. This lack of diversity is part of a greater limitation in parenting research, whereby most research on child-father dyads is conducted with very homogeneous samples of White, middle-upper class, heterosexual, biparental fathers, largely from Westernized countries. Yet, fathers' role in the family may notably differ across socioeconomic status and cultures (Volling, & Cabrera 2019). It will be important for future research to collect data from more diverse samples to gain a fuller understanding of the ways that fathers from different backgrounds promote children's positive development.

5 | CONCLUSIONS

Our two meta-analyses provide important evidence on how the quality of children's attachment relationships with their fathers can contribute to children's (mal)adaptation. Child-father attachment in early childhood, much like child-mother attachment, matters for children's developmental trajectories. However, there is a need for additional research on child-father attachment and fathering, in conjunction with research on child-mother attachment and mothering, to move the field forward toward a greater understanding of the unique, cumulative, and multiplicative contribution of caregivers on child development. Moreover, research that advances knowledge on the potential mechanisms and mediating variables of child-parent attachment and child development is recommended. Such work is imperative to drive practice and policy initiatives that strive to optimize the developmental health of children globally.

ACKNOWLEDGMENT

This research was funded by fellowships from the Social Sciences and Humanities Research Council of Canada and the Fonds de Recherche du Québec-Société et Culture awarded to the first author. The authors would like to thank Cheri Nickel, MLIS (University of Calgary)

who conducted the literature search, and Anh Ly (University of Calgary) for her help in extracting the data.

NOTE

¹ Some methodological choices across the two studies (e.g., Groh et al. had a narrower definition of internalizing behaviors than Madigan et al.; if multiple articles used the same sample, Groh selected the first published, whereas Madigan selected the largest *N*) could explain the difference in magnitude of effect sizes across the meta-analyses. That said, the effect sizes converge when Madigan et al., adjusted for publication bias.

REFERENCES

- Achenbach, T. M., & Rescorla, L. A. (2000). *Manual for the ASEBA preschool forms & profiles*. Youth, & Families: University of Vermont, Research Center for Children.
- Ainsworth, M. D. S., Blehar, M. C., Waters, E., & Wall, S. (1978). *Patterns of attachment: A psychological study of the strange situation*. Lawrence Erlbaum Associates.
- Aviezer, O., Resnick, G., Sagi, A., & Gini, M. (2002). School competence in young adolescence: Links to early attachment relationships beyond concurrent self-perceived competence and representations of relationships. *International Journal of Behavioral Development*, 26(5), 397–409. <https://doi.org/10.1080/01650250143000328>
- Badovinac, S., Pillai Riddell, R., Deneault, A.-A., Martin, J., Bureau, J.-F., & O'Neill, M. C. (2021). Associations between early childhood parent-child attachment and internalizing/externalizing symptoms: A systematic review and narrative synthesis. *Marriage & Family Review*, <https://doi.org/10.1080/01494929.2021.1879984>
- Bakermans-Kranenburg, M. J., Lotz, A., Dijk, K. A., & van IJzendoorn, M. (2019). Birth of a father: Fathering in the first 1,000 days. *Child Development Perspectives*, 13(4), 247–253. <https://doi.org/10.1111/cdep.12347>
- Bianchi, S. M., Robinson, J. P., & Milkie, M. A. (2006). *Changing rhythms of American family life*. Russell Sage Foundation.
- Black, M. M., Dubowitz, H., & Starr, R. H. (1999). African American Fathers in Low Income, Urban Families: Development, Behavior, and Home Environment of Their Three-Year-Old Children. *Child Development*, 70(4), 967–978. <https://doi.org/10.1111/1467-8624.00070>
- Boldt, L. J., Kochanska, G., & Jonas, K. (2017). Infant attachment moderates paths from early negativity to preadolescent outcomes for children and parents. *Child Development*, 88(2), 584–596. <https://doi.org/10.1111/cdev.12607>
- Borenstein, M. (2009). Effect sizes for continuous data. In H. Cooper, L. V. Hedges, & J. C. Valentine (Eds.), *The handbook of research synthesis and meta-analysis* (2nd ed., pp. 221–235). Russell Sage Foundation.
- Borenstein, M., & Hedges, L. V. (2019). Effect sizes for meta-analysis. In H. Cooper, L. V. Hedges, & J. C. Valentine (Eds.), *The handbook of research synthesis and meta-analysis* (3rd ed., pp. 207–241). Russell Sage Foundation.
- Bowlby, J. (1969/1982). *Attachment and loss*. Vol. 1: *Attachment*. Basic Books.
- Bretherton, I., Ridgeway, D., & Cassidy, J. (1990). Assessing internal working models of the attachment relationship. In M. T. Greenberg, D. Cicchetti, & E. M. Cummings (Eds.), *Attachment in the preschool years: Theory, research, and intervention* (pp. 273–308). University of Chicago Press.
- Brown, G. L., & Aytuglu, H. A. (2020). Father-child attachment relationships. In H. E. Fitzgerald, K. von Klitzing, N. J. Cabrera, J. Scarano de Mendonça, & T. Skjøthaug (Eds.), *Handbook of fathers and child development: Prenatal to preschool* (pp. 273–290). Springer International Publishing. https://doi.org/10.1007/978-3-030-51027-5_18
- Bureau, J.-F., Deneault, A.-A., & Yurkowski, K. (2020). Preschool father-child attachment and its relation to self-reported child socioemotional adaptation in middle childhood. *Attachment & Human Development*, 22(1), 90–104. <https://doi.org/10.1080/14616734.2019.1589065>
- Bureau, J.-F., Martin, J., Yurkowski, K., Schmiedel, S., Quan, J., Moss, E., Deneault, A.-A., & Pallanca, D. (2017). Correlates of child-father and child-mother attachment in the preschool years. *Attachment & Human Development*, 19(2), 130–150. <https://doi.org/10.1080/14616734.2016.1263350>
- Cabrera, N., Fitzgerald, H. E., Bradley, R. H., & Roggman, L. (2007). Modeling the Dynamics of Paternal Influences on Children Over the Life Course. *Applied Developmental Science*, 11(4), 185–189. <https://doi.org/10.1080/10888690701762027>
- Cabrera, N. J., Fitzgerald, H. E., Bradley, R. H., & Roggman, L. (2014). The ecology of father-child relationships: An expanded model. *Journal of Family Theory & Review*, 6(4), 336–354. <https://doi.org/10.1111/jftr.12054>
- Cabrera, N. J., Tamis-LeMonda, C. S., Bradley, R. H., Hofferth, S., & Lamb, M. E. (2000). Fatherhood in the twenty-first century. *Child Development*, 71(1), 127–136. <https://doi.org/10.1111/1467-8624.00126>
- Cabrera, N. J., Volling, B. L., & Barr, R. (2018). Fathers are parents, too! Widening the lens on parenting for children's development. *Child Development Perspectives*, 12(3), 152–157. <https://doi.org/10.1111/cdep.12275>
- Cassano, M., Adrian, M., Veits, G., & Zeman, J. (2006). The inclusion of fathers in the empirical investigation of child psychopathology: An update. *Journal of Clinical Child & Adolescent Psychology*, 35(4), 583–589. https://doi.org/10.1207/s15374424jccp3504_10

- Cassidy, J., & Kobak, R. (1988). Avoidance and its relation to other defensive processes. In J. Belsky & T. Nezworski (Eds.), *Clinical implications of attachment* (pp. 300–323). Lawrence Erlbaum Associates.
- Cassidy, J., & Marvin, R. S., & the MacArthur Working Group on Attachment. (1992). *Attachment organization in 2 1/2 to 4 1/2 year olds: Coding manual*. Unpublished coding manual, University of Virginia.
- Cassidy, J., & Shaver, P. R. (Eds.). (2016). *Handbook of attachment: Theory, research, and clinical applications* (3rd ed.). Guilford Press.
- Colonnese, C., Wissink, I. B., Noom, M. J., Asscher, J. J., Hoeve, M., Stams, G. J. J. M., Polderman, N., & Kellaert-Knol, M. G. (2013). Basic trust: An attachment-oriented intervention based on mind-mindedness in adoptive families. *Research on Social Work Practice, 23*(2), 179–188. <https://doi.org/10.1177/1049731512469301>
- Cowan, P. A. (1997). Beyond meta-analysis: A plea for a family systems view of attachment. *Child Development, 68*(4), 601–603. <https://doi.org/10.1111/j.1467-8624.1997.tb04222.x>
- Cowan, P. A., & Cowan, C. P. (2019). Introduction: Bringing dads back into the family. *Attachment & Human Development, 21*(419–425), 1–7. <https://doi.org/10.1080/14616734.2019.1582594>
- Crittenden, P. M. (1992). *The preschool assessment of attachment: Coding manual*. Unpublished manuscript.
- Dagan, O., & Sagi-Schwartz, A. (2018). Early attachment network with mother and father: An unsettled issue. *Child Development Perspectives, 12*(2), 115–121. <https://doi.org/10.1111/cdep.12272>
- De Wolff, M., & van IJzendoorn, M. H. (1997). Sensitivity and attachment: A meta-analysis on parental antecedents of infant attachment. *Child Development, 68*(4), 571–591. <https://doi.org/10.1111/j.1467-8624.1997.tb04218.x>
- DeKlyen, M., & Greenberg, M. T. (2016). Attachment and psychopathology in childhood. In J. Cassidy & P. R. Shaver (Eds.), *Handbook of attachment: Theory, research, and clinical applications* (3rd ed., pp. 639–666). Guilford Press.
- DeKlyen, M., Speltz, M. L., & Greenberg, M. T. (1998). Fathering and early onset conduct problems: Positive and negative parenting, father-son attachment, and the marital context. *Clinical Child and Family Psychology Review, 1*(1), 3–21. <https://doi.org/10.1023/A:1021844214633>
- Del Re, A. C. (2013). compute.es: Compute Effect Sizes. R package version 0.2-2. Retrieved from <https://cran.r-project.org/package=compute.es>
- Deneault, A.-A., Bureau, J.-F., Yurkowski, K., & Moss, E. (2020). Validation of the Preschool Attachment Rating Scales with child-mother and child-father dyads. *Attachment & Human Development, 22*(5), 491–513. <https://doi.org/10.1080/14616734.2019.1589546>
- Dumont, C., & Paquette, D. (2013). What about the child's tie to the father? A new insight into fathering, father-child attachment, children's socio-emotional development and the activation relationship theory. *Early Child Development and Care, 183*(3–4), 430–446. <https://doi.org/10.1080/03004430.2012.711592>
- Fagan, J. (2020). Broadening the scope of father-child attachment research to include the family context. *Attachment & Human Development, 22*(1), 139–142. <https://doi.org/10.1080/14616734.2019.1589071>
- Fagan, J., Day, R., Lamb, M. E., & Cabrera, N. J. (2014). Should researchers conceptualize differently the dimensions of parenting for fathers and mothers? *Journal of Family Theory & Review, 6*(4), 390–405. <https://doi.org/10.1111/jftr.12044>
- Fearon, P. R. M., & Belsky, J. (2004). Attachment and Attention: Protection in Relation to Gender and Cumulative Social-Contextual Adversity. *Child Development, 75*(6), 1677–1693. <https://doi.org/10.1111/j.1467-8624.2004.00809.x>
- Fearon, R. M. P., Bakermans-Kranenburg, M. J., van IJzendoorn, M. H., Lapsley, A.-M., & Roisman, G. I. (2010). The significance of insecure attachment and disorganization in the development of children's externalizing behavior: A meta-analytic study. *Child Development, 81*(2), 435–456. <https://doi.org/10.1111/j.1467-8624.2009.01405.x>
- Feu g ,  . A., Cyr, C., Cossette, L., & Julien, D. (2020). Adoptive gay fathers' sensitivity and child attachment and behavior problems. *Attachment & Human Development, 22*(3), 247–268. <https://doi.org/10.1080/14616734.2018.1557224>
- Fraleigh, R. C., & Spieker, S. J. (2003). Are infant attachment patterns continuously or categorically distributed? A taxometric analysis of strange situation behavior. *Developmental Psychology, 39*(3), 387–404. <https://doi.org/10.1037/0012-1649.39.3.387>
- Funder, D. C., & Ozer, D. J. (2019). Evaluating effect size in psychological research: Sense and nonsense. *Advances in Methods and Practices in Psychological Science, 2*(2), 156–168. <https://doi.org/10.1177/2515245919847202>
- George, M. R. W. (2010). Parent-child attachment security and children's socio-emotional adjustment during the early school years [Unpublished doctoral dissertation]. University of Notre Dame.
- Goffin, K. C., Boldt, L. J., & Kochanska, G. (2018). A secure base from which to cooperate: Security, child and parent willing stance, and adaptive and maladaptive outcomes in two longitudinal studies. *Journal of Abnormal Child Psychology, 46*(5), 1061–1075. <https://doi.org/10.1007/s10802-017-0352-z>
- Goldstein, H., & Healy, M. J. R. (1995). The graphical presentation of a collection of means. *Journal of the Royal Statistical Society: Series A (Statistics in Society), 158*(1), 175–177. <https://doi.org/10.2307/2983411>

- Groh, A. M., Fearon, R. M. P., van IJzendoorn, M. H., Bakermans-Kranenburg, M. J., & Roisman, G. I. (2017). Attachment in the early life course: Meta-analytic evidence for its role in socioemotional development. *Child Development Perspectives, 11*(1), 70–76. <https://doi.org/10.1111/cdep.12213>
- Groh, A. M., Propper, C., Mills-Koonce, R., Moore, G. A., Calkins, S., & Cox, M. (2019). Mothers' physiological and affective responding to infant distress: Unique antecedents of avoidant and resistant attachments. *Child Development, 90*(2), 489–505. <https://doi.org/10.1111/cdev.12912>
- Groh, A. M., Roisman, G. I., van IJzendoorn, M. H., Bakermans-Kranenburg, M. J., & Fearon, R. M. P. (2012). The significance of insecure and disorganized attachment for children's internalizing symptoms: A meta-analytic study. *Child Development, 83*(2), 591–610. <https://doi.org/10.1111/j.1467-8624.2011.01711.x>
- Hennigar, A., Cabrera, N. J., & Chen, Y. (2020). The role of fathers and their young children's social development. In H. E. Fitzgerald, K. von Klitzing, N. J. Cabrera, J. Scarano de Mendonça, & T. Skjøthaug (Eds.), *Handbook of fathers and child development: Prenatal to preschool* (pp. 339–355). Springer International Publishing. https://doi.org/10.1007/978-3-030-51027-5_21
- Kerns, K. A., Aspelmeier, J. E., Gentzler, A. L., & Grabill, C. M. (2001). Parent-child attachment and monitoring in middle childhood. *Journal of Family Psychology, 15*(1), 69–81. <https://doi.org/10.1037/0893-3200.15.1.69>
- Kim, S., Kochanska, G., Boldt, L. J., Nordling, J. K., & O'Bleness, J. J. (2014). Developmental trajectory from early responses to transgressions to future antisocial behavior: Evidence for the role of the parent-child relationship from two longitudinal studies. *Development and Psychopathology, 26*(1), 93–109. <https://doi.org/10.1017/S0954579413000850>
- Kochanska, G., & Kim, S. (2012). Toward a new understanding of legacy of early attachments for future antisocial trajectories: Evidence from two longitudinal studies. *Development and Psychopathology, 24*(3), 783–806. <https://doi.org/10.1017/S0954579412000375>
- Kochanska, G., & Kim, S. (2013). Early attachment organization with both parents and future behavior problems: From infancy to middle childhood. *Child Development, 84*(1), 283–296. <https://doi.org/10.1111/j.1467-8624.2012.01852.x>
- Lafrenière, P. J., Provost, M. A., & Dubeau, D. (1992). From an insecure base: Parent-child relations and internalizing behaviour in the pre-school. *Early Development and Parenting, 1*(3), 137–148. <https://doi.org/10.1002/edp.2430010303>
- Lamb, M. E. (Ed.). (2004). *The role of the father in child development* (4th ed.). John Wiley & Sons, Inc.
- Lamb, M. (2014). The changing faces of fatherhood and father-child relationships: From fatherhood as status to father as dad. M. A. Fine, & F. D. Fincham (Eds.), *Handbook of family theories: A content-based approach*. Routledge/Taylor & Francis Group, pp. 87–102. <https://doi.org/10.4324/9780203075180.ch6>
- Liu, J. (2004). Childhood externalizing behavior: Theory and implications. *Journal of Child and Adolescent Psychiatric Nursing, 17*(3), 93–103. <https://doi.org/10.1111/j.1744-6171.2004.tb00003.x>
- Lindsey, E. W., Caldera, Y. M., & Tankersley, L. (2009). Marital conflict and the quality of young children's peer play behavior: The mediating and moderating role of parent-child emotional reciprocity and attachment security. *Journal of Family Psychology, 23*(2), 130–145. <https://doi.org/10.1037/a0014972>
- Madigan, S. (2020). *Child attachment studies catalogue and data exchange (CASCADE)*. University of Calgary.
- Madigan, S., Atkinson, L., Laurin, K., & Benoit, D. (2013). Attachment and internalizing behavior in early childhood: A meta-analysis. *Developmental Psychology, 49*(4), 672–689. <https://doi.org/10.1037/a0028793>
- Madigan, S., Brumariu, L. E., Villani, V., Atkinson, L., & Lyons-Ruth, K. (2016). Representational and questionnaire measures of attachment: A meta-analysis of relations to child internalizing and externalizing problems. *Psychological Bulletin, 142*(4), 367–399. <https://doi.org/10.1037/bul0000029>
- Majdandžić, M., de Vente, W., & Bögels, S. M. (2016). Challenging parenting behavior from infancy to toddlerhood: Etiology, measurement, and differences between fathers and mothers. *Infancy, 21*(4), 423–452. <https://doi.org/10.1111/inf.12125>
- Main, M., & Cassidy, J. (1988). Categories of response to reunion with the parent at age 6: Predictable from infant attachment classifications and stable over a 1-month period. *Developmental Psychology, 24*(3), 415–426. <https://doi.org/10.1037/0012-1649.24.3.415>
- Main, M., & Hesse, E. (1990). Parents' unresolved traumatic experiences are related to infant disorganized attachment status: Is frightened and/or frightening parental behavior the linking mechanism? In M. T. Greenberg, D. Cicchetti, & E. M. Cummings (Eds.), *Attachment in the preschool years: Theory, research, and intervention* (pp. 161–182). University of Chicago Press.
- McElwain, N. L., & Volling, B. L. (2004). Attachment security and parental sensitivity during infancy: Associations with friendship quality and false-belief understanding at age 4. *Journal of Social and Personal Relationships, 21*(5), 639–667. <https://doi.org/10.1177/0265407504045892>
- Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., & Group, T. P. (2009). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *PLoS Medicine, 6*(7), e1000097. <https://doi.org/10.1371/journal.pmed.1000097>

- Monteiro, L., Verissimo, M., Vaughn, B. E., Santos, A. J., & Bost, K. K. (2008). Secure base representations for both fathers and mothers predict children's secure base behavior in a sample of Portuguese families. *Attachment & Human Development, 10*(2), 189–206. <https://doi.org/10.1080/14616730802113711>
- Moss, E., Lecompte, V., & Bureau, J.-F. (2015). *Preschool and early school-age attachment rating scales (PARS)*. Unpublished coding manual, University of Quebec at Montreal.
- Moss, E., Parent, S., Gosselin, C., Rousseau, D., & St-Laurent, D. (1996). Attachment and teacher-reported behavior problems during the preschool and early school-age period. *Development and Psychopathology, 8*(03), 511. <https://doi.org/10.1017/S0954579400007240>
- O'Connor, E., Bureau, J.-F., McCartney, K., & Lyons-Ruth, K. (2011). Risks and outcomes associated with disorganized/controlling patterns of attachment at age three years in the National Institute of Child Health & Human Development Study of Early Child Care and Youth Development. *Infant Mental Health Journal, 32*(4), 450–472. <https://doi.org/10.1002/imhj.20305>
- Paquette, D. (2004). Theorizing the father-child relationship: Mechanisms and developmental outcomes. *Human Development, 47*(4), 193–219. <https://doi.org/10.1159/000078723>
- Pleck, E. H., & Pleck, J. H. (1997). Fatherhood ideals in the United States: Historical dimensions. In M. E. Lamb (Ed.), *The role of the father in child development* (3rd ed., pp. 33–48). John Wiley & Sons Inc.
- Pleck, J. H. (2010). Paternal involvement. In M. E. Lamb (Ed.), *The role of the father in child development* (5th ed., pp. 58–93). John Wiley & Sons, Inc.
- Rodrigues, M., Sokolovic, N., Madigan, S., Luo, Y., Silva, V., Misra, S., & Jenkins, J. (2021). Paternal sensitivity and children's cognitive and socioemotional outcomes: A meta-analytic review. *Child Development, 92*(2), 554–577. <https://doi.org/10.1111/cdev.13545>
- Rosenthal, R. (1995). Writing meta-analytic reviews. *Psychological Bulletin, 118*(2), 183–192.
- Rothbaum, E., Schneider Rosen, K., Pott, M., & Beatty, M. (1995). Early parent-child relationships and later problem behavior: A longitudinal study. *Merrill-Palmer Quarterly, 41*(2), 133–151.
- Schoppe-Sullivan, S. J., & Fagan, J. (2020). The evolution of fathering research in the 21st century: Persistent challenges, new directions. *Journal of Marriage and Family, 82*(1), 175–197. <https://doi.org/10.1111/jomf.12645>
- Shakiba, N., & Raby, K. L. (2021). Attachment dimensions and cortisol responses during the strange situation among young children adopted internationally. *Attachment & Human Development, 1*–15. <https://doi.org/10.1080/14616734.2021.1896445>
- Sroufe, L. A. (1983). *Infant-caregiver attachment and patterns of adaptation in preschool: The roots of maladaptation and competence* (Vol. 16). Erlbaum.
- Sroufe, L. A., Coffino, B., & Carlson, E. A. (2010). Conceptualizing the role of early experience: Lessons from the Minnesota Longitudinal Study. *Developmental Review, 30*(1), 36–51. <https://doi.org/10.1016/j.dr.2009.12.002>
- StGeorge, J., & Freeman, E. (2017). Measurement of father-child rough-and-tumble play and its relations to child behavior. *Infant Mental Health Journal, 38*(6), 709–725. <https://doi.org/10.1002/imhj.21676>
- Suess, G. J., Grossmann, K. E., & Sroufe, L. A. (1992). Effects of infant attachment to mother and father on quality of adaptation in preschool: From dyadic to individual organisation of self. *International Journal of Behavioral Development, 15*(1), 43–65. <https://doi.org/10.1177/016502549201500103>
- Tanner-Smith, E. E., & Tipton, E. (2014). Robust variance estimation with dependent effect sizes: Practical considerations including a software tutorial in Stata and SPSS. *Research Synthesis Methods, 5*, 13–30. <https://doi.org/10.1002/jrsm.1091>
- Thompson, R. A. (2016). Early attachment and later development: Reframing the questions. In J. Cassidy & P. R. Shaver (Eds.), *Handbook of attachment: Theory, research, and clinical applications* (3rd ed., pp. 330–348). Guilford Press.
- Tirkkonen, T., Joskitt, L., Kunelius, A., Huhtaniska, M., Ebeling, H., & Moilanen, I. (2016). Twinship as a protective factor against behavioural and emotional problems at preschool age. *Early Child Development and Care, 186*(6), 863–878. <https://doi.org/10.1080/03004430.2015.1066783>
- Tremblay, R. E. (2010). Developmental origins of disruptive behaviour problems: The 'original sin' hypothesis, epigenetics and their consequences for prevention. *Journal of Child Psychology and Psychiatry, 51*(4), 341–367. <https://doi.org/10.1111/j.1469-7610.2010.02211.x>
- van IJzendoorn, M. H., Schuengel, C., & Bakermans-Kranenburg, M. J. (1999). Disorganized attachment in early childhood: Meta-analysis of precursors, concomitants, and sequelae. *Development and Psychopathology, 11*(2), 225–250. <https://doi.org/10.1017/S0954579499002035>
- Volling, B. L., Yu, T., Gonzalez, R., Kennedy, D. E., Rosenberg, L., & Oh, W. (2014). Children's responses to mother-infant and father-infant interaction with a baby sibling: Jealousy or joy? *Journal of Family Psychology, 28*(5), 634–644. <https://doi.org/10.1037/a0037811>
- Viechtbauer, W. (2010). Conducting meta-analyses in R with the metafor package. *Journal of Statistical Software, 36*(3), 1–48. <https://doi.org/10.18637/jss.v036.i03>
- Volling, B. L., & Cabrera, N. J. (2019). Advancing research and measurement on fathering and children's development. *Monographs of the Society for Research in Child Development, 84*(1), 7–160. <https://doi.org/10.1111/mono.12404>

- Volling, B. L., Stevenson, M. M., Safyer, P., Gonzalez, R., & Lee, J. Y. (2019). Chapter IV: In search of the father-infant activation relationship: A person-centered approach. *Monographs of the Society for Research in Child Development, 84*(1), 7-160. <https://doi.org/10.1111/mono.12404>
- Waters, E. (1987). *Attachment behavior Q-set (Revision 2.0)*. State University of New York at Stony Brook.

How to cite this article: Deneault, A.-A., Bakermans-Kranenburg, M. J., Groh, A. M., Pasco Fearon, R. M., & Madigan, S. (2021). Child-father attachment in early childhood and behavior problems: A meta-analysis. *New Directions for Child and Adolescent Development, 2021*, 43–66. <https://doi.org/10.1002/cad.20434>

Configurations of mother-child and father-child attachment as predictors of internalizing and externalizing behavioral problems: An individual participant data (IPD) meta-analysis

Or Dagan¹  | Carlo Schuengel² | Marije L. Verhage² |
Marinus H. van IJzendoorn^{3,4}  | Abraham Sagi-Schwartz⁵ |
Sheri Madigan⁶ | Robbie Duschinsky⁴ | Glenn I. Roisman⁷ |
Kristin Bernard¹ | Marian Bakermans-Kranenburg² |
Jean-François Bureau⁸ | Brenda L. Volling⁹ | Maria S. Wong¹⁰ |
Cristina Colonesi¹¹  | Geoffrey L. Brown¹² | Rina D. Eiden¹³ |
R.M. Pasco Fearon¹⁴ | Mirjam Oosterman² | Ora Aviezer⁵ |
E Mark Cummings¹⁵ | The Collaboration on Attachment to Multiple
Parents and Outcomes Synthesis

¹ Department of Psychology, Stony Brook University, Stony Brook, NY, USA

² Section of Clinical Child and Family Studies, Department of Educational and Family Studies, Vrije Universiteit Amsterdam, Amsterdam, The Netherlands

³ Research Department of Clinical, Education and Health Psychology, Faculty of Brain Sciences, University College London, London, UK

⁴ Department of Public Health and Primary Care, University of Cambridge, UK

⁵ Center for the Study of Child Development and School of Psychological Sciences, University of Haifa, Haifa, Israel

⁶ Department of Psychology, University of Calgary, Calgary, Canada

⁷ Institute of Child Development, University of Minnesota Twin Cities, Minnesota, USA

Abstract

An unsettled question in attachment theory and research is the extent to which children's attachment patterns with mothers and fathers *jointly* predict developmental outcomes. In this study, we used individual participant data (IPD) meta-analysis to assess whether early attachment networks with mothers and fathers are associated with children's internalizing and externalizing behavioral problems. Following a pre-registered protocol, data from 9 studies and 1,097 children (mean age: 28.67 months) with attachment classifications to both mothers and fathers were included in analyses. We used a linear mixed effects analysis to assess differences in children's internalizing and externalizing behavioral problems as assessed via the average of both maternal and paternal reports based on

⁸ School of Psychology, Faculty of Social Sciences, University of Ottawa, Ottawa, Canada

⁹ Department of Psychology, University of Michigan, Michigan, USA

¹⁰ School of Social Sciences, Communication & Humanities, Endicott College, Maryland, USA

¹¹ Research Institute of Child Development and Education, Faculty of Social and Behavioral Sciences, University of Amsterdam, Amsterdam, The Netherlands

¹² Department of Human Development and Family Science, University of Georgia, Georgia, USA

¹³ Department of Psychology, Penn State University, Pennsylvania, USA

¹⁴ Clinical, Educational, and Health Psychology, Division of Psychology and Language Sciences, University College London, London, UK

¹⁵ Department of Psychology, University of Notre Dame, Indiana, USA

Correspondence

Or Dagan, Department of Psychology, Stony Brook University, NY, USA.
Email: or.dagan@stonybrook.edu

Members are listed in the appendix.

whether children had two, one, or no insecure (or disorganized) attachments. Results indicated that children with an insecure attachment relationship with one or both parents were at higher risk for elevated internalizing behavioral problems compared with children who were securely attached to both parents. Children whose attachment relationships with both parents were classified as disorganized had more externalizing behavioral problems compared to children with either one or no disorganized attachment relationship with their parents. Across attachment classification networks and behavioral problems, findings suggest (a) an increased vulnerability to behavioral problems when children have insecure or disorganized attachment to both parents, and (b) that mother-child and father-child attachment relationships may not differ in the roles they play in children's development of internalizing and externalizing behavioral problems.

KEYWORDS

attachment, externalizing, father, internalizing, mother, network

1 | INTRODUCTION

Research has shown that infants and children simultaneously and independently form attachment relationships with at least two caregivers (An et al., 2021; Easterbrooks & Goldberg, 1984; Goossens & Van IJzendoorn, 1990; Grossmann et al., 2002, 1981; Lamb, 1978; Main & Weston, 1981; Sagi-Schwartz & Aviezer, 2005). Based on these findings, Van IJzendoorn et al. (1992) stated that it is necessary to take into account how early attachment to fathers (and other potential caregivers) interact with mother-child attachment patterns when assessing the predictive power that attachment may have on children's developmental outcomes. To assess the interaction between attachments to multiple caregivers, Van IJzendoorn et al. (1992) proposed the *Integrative Hypothesis*, according to which two early parental attachment relationships—hereafter referred to as an “attachment network”—carry forward to *jointly* affect developmental outcomes.

In line with the integrative hypothesis, a move from the traditional view of mother-child attachment to a more ecologically valid, multiple-caregiver framework was recommended decades ago to more accurately represent the social context of development (e.g., Belsky, 1981; Kozłowska & Hanney, 2002). Recently, efforts have also been made to extend attachment network research to children who are adopted by same-sex couples (Carone et al., 2020; McConnachie et al., 2020). However, attachment research has yet to offer a robust reply to such calls. Among studies that have assessed children's attachment to multiple caregivers (mostly mothers and fathers), sample sizes have been limited ($N = 20$ –186 parent-child dyads); such underpowered study samples might have contributed to mixed

findings regarding the multiple-caregiver configuration that best predicts developmental outcomes. It is possible that these mixed findings have contributed to inconsistent associations between the configuration of children's attachment patterns and developmental outcomes (Dagan & Sagi-Schwartz, 2018, 2020). In this individual participant data (IPD) meta-analysis, we aimed to focus on the joint effect of children's attachment networks on a specific set of developmental outcomes: internalizing and externalizing behavioral problems.

1.1 | Early attachment patterns and internalizing and externalizing behavioral problems

According to attachment theory, infants form selective attachment relationships through repeated interactions with their parents or other primary caregivers (Bowlby, 1969). Children may develop secure attachment relationships when parents are available and responsive in times of need. As a result, these children are likely to derive a sense of safety from physical or perceived proximity to caregivers when facing distress. As such, securely attached children tend to exhibit behavior that reflects flexibility in switching from exploration of the physical environment to proximity seeking to caregivers in times of need. However, when parents respond insensitively to children's distress, children are more likely to develop insecure attachment patterns (i.e., insecure-avoidant or insecure-resistant attachment). A second dimension of attachment is disorganization, in which children are likely to show conflicted, apprehensive, or disoriented behavior toward their caregiver when alarmed by the Strange Situation (Main & Solomon, 1986). Disorganized attachment has been linked to a child's experience of frightening, frightened, or disruptive behaviors by caregivers (Cyr et al., 2010; Madigan et al., 2006; Main & Hesse, 1990; Schuengel et al., 1999). Over time, attachment patterns (assessed in most prior work with mothers)—in tandem with individual and ecological factors—predict an array of long-term developmental outcomes, including internalizing and externalizing behavioral problems (though effect sizes are modest; Colonna et al., 2011; Fearon et al., 2010; Groh et al., 2012; Madigan et al., 2013; Spruit et al., 2020).

Bowlby (1973, 1980) hypothesized that children's vulnerability to depression and anxiety, the hallmarks of internalizing disorders, stems from early insecure attachment patterns. He proposed that anxiety may be both predisposed and sustained by the expectation of others as unavailable in times of need, and that depression may be predisposed and sustained by the expectation that efforts to seek help or closeness with others are futile. Bowlby also proposed that aggressive behavior might be predisposed and sustained by a child's expectation that others require coercion or pestering in order to be available, and inhibition of feelings of trust and closeness; accordingly, he anticipated that insecure attachment would be an important developmental process underpinning such expectations.

Empirical evidence has supported attachment theory's claims about the link between early life insecure attachment and later internalizing and externalizing behavioral problems. Meta-analyses have yielded significant associations between (mostly mother-child) insecure attachment, as assessed by observational measures, and both internalizing (Colonna et al., 2011, $d = 0.41$ [for anxiety symptoms]; Groh et al., 2012, $d = 0.15$; Madigan et al., 2013, $d = 0.19$; Spruit et al., 2020, $d = 0.32$ [for depression symptoms]) and externalizing (Fearon et al., 2010, $d = 0.31$) behavioral problems. After decomposing insecure attachment to its different subtypes, both organized (i.e., insecure-avoidance, but not insecure-resistant) and disorganized insecurity were significantly (yet modestly) associated with externalizing behavioral problems ($d = 0.12$ and 0.34 , respectively; Fearon

et al., 2010). Only insecure-avoidance (but not disorganized) attachment was linked to internalizing behavioral problems ($d = 0.17$, when compared to all other attachment classifications[Groh et al., 2012]; and $d = 0.29$ when compared with securely attached children[Madigan et al., 2013]). It thus remains an open question whether the predictive power of a single (organized and disorganized) insecure parent-child attachment to predict internalizing and externalizing behavioral problems may be extended to attachment networks with two parents.

To date, only two studies have directly assessed the predictive power of the secure/insecure (but not organized/disorganized) attachment network to mothers and fathers, as assessed via observational dyadic measures, for internalizing and externalizing behavioral problems. Kochanska and Kim (2013) assessed 86 children for their attachment patterns to both mothers and fathers via the Strange Situation Procedure (SSP; Ainsworth et al., 1978) at age 15 months, and their self-reported internalizing and externalizing behavioral problems at age 8 years. They found that children who were insecurely attached to both parents reported significantly more internalizing and externalizing behavioral problems than children who were insecurely attached to only one parent (irrespective of which parent). In addition, children who were insecurely attached to only one parent, either mother or father, reported having comparable internalizing and externalizing symptom levels to children with no insecure attachments. Recently, Bureau et al. (2020) reported on 83 children between the ages of 3 and 5 who were assessed for attachment security with both mothers and fathers using a modified separation-reunion procedure (Cassidy et al., 1992). When children were 9 years of age, those children insecurely attached to both parents reported more externalizing symptoms compared to children who were securely attached to at least one parent.

1.2 | IPD meta-analysis

A large number of mother-child and father-child attachment assessments are needed to permit comparisons between the four different attachment network configurations. That is, four configurations of secure/insecure attachment networks [(a) insecure with both parents (I-I); (b) secure with mother, insecure with father (S_M - I_F); (c) insecure with mother, secure with father (I_M - S_F); (d) secure with both parents (S-S)], and four configurations of organized/disorganized attachment networks [(a) disorganized with both parents (D-D); (b) organized with mother, disorganized with father (non D_M - D_F); (c) disorganized with mother, organized with father (D_M -non D_F); (d) organized with both parents (non D -non D)]. Aggregation of data from existing studies offers a means to permit such comparisons (see hypotheses regarding such comparisons below).

IPD meta-analysis entails the accumulation and aggregation of raw participant data from relevant studies (Riley et al., 2010; Verhage et al., 2020). Bringing together IPD from multiple studies that assessed child attachment patterns to both parents and developmental outcomes enables reconfiguration of previously collected data according to a-priori models (e.g., create groups such as S-S/nonD-nonD and I-I/D-D) that may or may not have been considered in the original studies. This approach also significantly increases the statistical power to detect the potential associations between attachment networks and developmental outcomes. Furthermore, gathering raw data enables the standardization and harmonization of outcome data from multiple outcome measures used in the original studies (some of which may have not been reported) to arrive at a more comprehensive set of outcome constructs of interest. Lastly, IPD meta-analysis also allows for examination of moderator effects to test the boundaries of the investigated models (Ioannidis, 2017).

1.3 | The present study

The original Integrative Hypothesis set forward by Van IJzendoorn et al. (1992) was further developed by Dagan and Sagi-Schwartz (2018, 2020) in order to capture the relations between all possible mother-child/father-child attachment configurations. They identified two sets of competing hypotheses (see Research Questions 1 and 2 below). These hypotheses are ultimately combined into four mutually exclusive integrative models (see Research Question 3 below) that are most likely to fit data representing the predictive power of attachment networks on developmental outcomes. The present study aims to assess these attachment network integrative models based on three pre-registered research questions (<https://osf.io/a3qs9>) that are summarized below. Consistent with the pre-registration, this study is set to assess only the main effects of attachment networks on the internalizing and externalizing behavioral problems, and future analyses will assess the contextual factors (e.g., growing up in poverty) which may influence such effects.

1.3.1 | Research Question 1: Is the number of insecure or disorganized attachments important in predicting internalizing and externalizing behavioral problems?

According to the *Additive Hypothesis*, there is a linear “dose-response” association between the number of secure or organized attachment patterns and developmental outcomes. In contrast, the *Buffering Hypothesis* predicts that secure or organized attachment to one parent is sufficient to offset the risk effects of an insecure or disorganized attachment to the other, respectively. Moreover, this hypothesis predicts that there is no advantage to having a secure or organized attachment to both parents. Evidence in support of the Additive Hypothesis (e.g., Main & Weston, 1981) and the Buffering Hypothesis (Bureau et al., 2020; Kochanska & Kim, 2013), has been reported, rendering both hypotheses worthy of consideration. However, in line with attachment theory, which predicts that attachment security, contributes to a lower risk for behavioral problems, as well as with the single parent-child meta-analytic results described above, indicating that secure attachment confers less child internalizing and externalizing behavioral problems, our hypothesis in the current study is consistent with the Additive Model. That is, children with secure or organized attachment to both parents were expected to have fewer internalizing and externalizing behavioral problems than children with secure or organized attachment to only one parent, respectively. We also hypothesized that children with secure or organized attachment to only one parent would have fewer behavioral problems than children with insecure or disorganized attachments to both parents, respectively.

1.3.2 | Research Question 2: Does the quality of attachment to one caregiver predict internalizing and externalizing behavioral problems better than to the other?

As previously proposed (Bowlby, 1969; Bretherton, 1985; Van IJzendoorn et al., 1992), the *Hierarchical Hypothesis* suggests that one parent influences the developmental outcomes of the child more than the other parent. In contrast, the *Horizontal Hypothesis* (Dagan & Sagi-Schwartz, 2018, 2020) predicts that children with a secure or organized attachment to only the mother should exhibit similar developmental outcomes to those who form a secure or organized attachment only to the father. Evidence for the Hierarchical and the Horizontal Hypotheses was demonstrated in the past (e.g., Suess et al., 1992 and

TABLE 1 Model-based outcome predictions for secure/insecure attachment networks (based on Dagan & Sagi-Schwartz, 2018)

Integrative model	Prediction	Brief description
Additive-Hierarchical ^a	$S-S > S_M-I_F > I_M-S_F > I-I$	Secure attachment to mother (but not father) leads to better outcomes than insecure attachment to both parents, but poorer outcomes than secure attachment to both parents.
Additive-Horizontal	$S-S > S_M-I_F = I_M-S_F > I-I$	A single secure attachment to either parent leads to better outcomes than insecure attachment to both parents, but poorer outcomes than secure attachment to both parents.
Buffering-Hierarchical ^a	$S-S = S_M-I_F > I_M-S_F > I-I$	Secure attachment to mother (but not father) leads to as good outcomes as secure attachment to both parents.
Buffering-Horizontal	$S-S = S_M-I_F = I_M-S_F > I-I$	A single secure attachment to either parent leads to as good outcomes as secure attachment to both parents, all better than insecure attachment to both parents.

Note. Given the limitation of space, this table only depicts the different secure/insecure attachment networks. These models apply to organized/disorganized attachment networks. S-S = Secure-Secure; S_M-I_F = Secure/Mother-Insecure/Father; I_M-S_F = Insecure/Mother-Secure/Father; I-I = Insecure-Insecure.

^aIt is possible in principle that the parental hierarchy is such that secure attachment only to father leads to better outcomes than secure attachment only to mother.

Kochanska & Kim, 2013, respectively). Despite the increasing involvement of fathers in caregiving (Pleck, 2010)—rendering the Horizontal Hypothesis plausible—mothers in Western countries in which attachment research has been conducted are more involved, on average, than fathers across a number of childrearing domains (e.g., Europe and the USA; Bakermans-Kranenburg et al., 2019; Parker & Wang, 2013), and that more time spent in child care may amplify the impact of the quality of the parent-child relationship. Thus, in this study we hypothesized that children's internalizing and externalizing behavioral problems will be predicted in accordance with the Hierarchical Model. That is, children with a secure or organized attachment only to mother will show fewer internalizing and externalizing behavioral problems than children with a secure or organized attachment only to father, respectively.

1.3.3 | Research Question 3: Which attachment network model accounts best for children's internalizing and externalizing behavioral problems?

Overall, the hypotheses presented in Research Questions 1 and 2 can be formulated as four mutually exclusive explanatory integrative models: (a) Additive-Hierarchical, (b) Additive-Horizontal, (c) Buffering-Hierarchical, and (d) Buffering-Horizontal (see Table 1 for the model-based predictions, including the relations between the different attachment configurations within each integrative model). Empirical evidence supporting each of the four hypotheses—as mentioned in Research Questions 1 and 2—suggests that all of the four models are plausible. However, integrating our hypotheses described in Research Questions 1 (i.e., the Additive Model) and 2 (i.e., the Hierarchical Model), we hypothesized that internalizing and externalizing behavioral problems outcomes will be best accounted for by the Additive-Hierarchical Model. That is, children who have secure attachments to both mothers and fathers will show the fewest internalizing and externalizing behavioral problems compared to all other secure/insecure attachment network groups, followed by children

who have a secure attachment only to the mother, then those who have a secure attachment only to the father, and finally, those children with insecure attachments to both parents, who will exhibit the most internalizing and externalizing behavioral problems. In the same manner, we hypothesized that children who have organized attachments (i.e., secure, insecure-avoidant, or insecure-resistant) to both parents will show the fewest internalizing and externalizing behavioral problems compared to all other organized/disorganized attachment network groups, followed by children who have an organized attachment only to the mother, then those who have an organized attachment only to the father, and children with disorganized attachments to both parents exhibiting the most internalizing and externalizing behavioral problems.

2 | METHOD

2.1 | Protocol, registration, and reporting

This study is part of a larger research project that aims to assess the predictive power of the attachment networks to mother and father on multiple developmental outcomes. Authors of all eligible studies were invited to share their datasets and participate in the project of the Collaboration on Attachment to Multiple Parents and Outcomes Synthesis (CAMPOS; see pre-registered protocol at <https://osf.io/a3qs9>). We have adhered to the Preferred Reporting Items for Systematic Reviews and Meta-analysis of Individual Participant Data (PRISMA-IPD) statement (Stewart et al., 2015).

2.2 | Eligibility criteria

We sought all available studies that assessed (1) infant/child attachment to both mothers and fathers, (2) via an attachment behavioral coding measure for caregiver-child (i.e., excluding parent-report, parent-observation, self-report, self-observation, and projective measures), and (3) either concurrent or later internalizing and/or externalizing behavioral problems.

2.3 | Study identification and selection

Studies for the current project were identified through a number of means. First, the Child Attachment Studies Catalogue and Data Exchange (CASCADE) at the Determinants of Child Development Lab in the Department of Psychology, University of Calgary, with the permission and supervision of the lab director, Dr. Sheri Madigan. CASCADE is a catalogue of all research studies published up until 2017 that have assessed observational measures of infant and child attachment. These studies were obtained through searches in the following databases: Medline, EMBASE, PsychINFO, Web of Science, and Dissertation Abstracts International. After removing duplicate datasets, the search yielded 35 studies meeting inclusion criteria. See Figure 1 for the study selection flow chart.

2.4 | Data items

Authors of eligible studies were asked to provide data on the observational (but not self-reported; e.g., the Security Scale, Kerns et al., 1996) attachment assessments (i.e., attach-

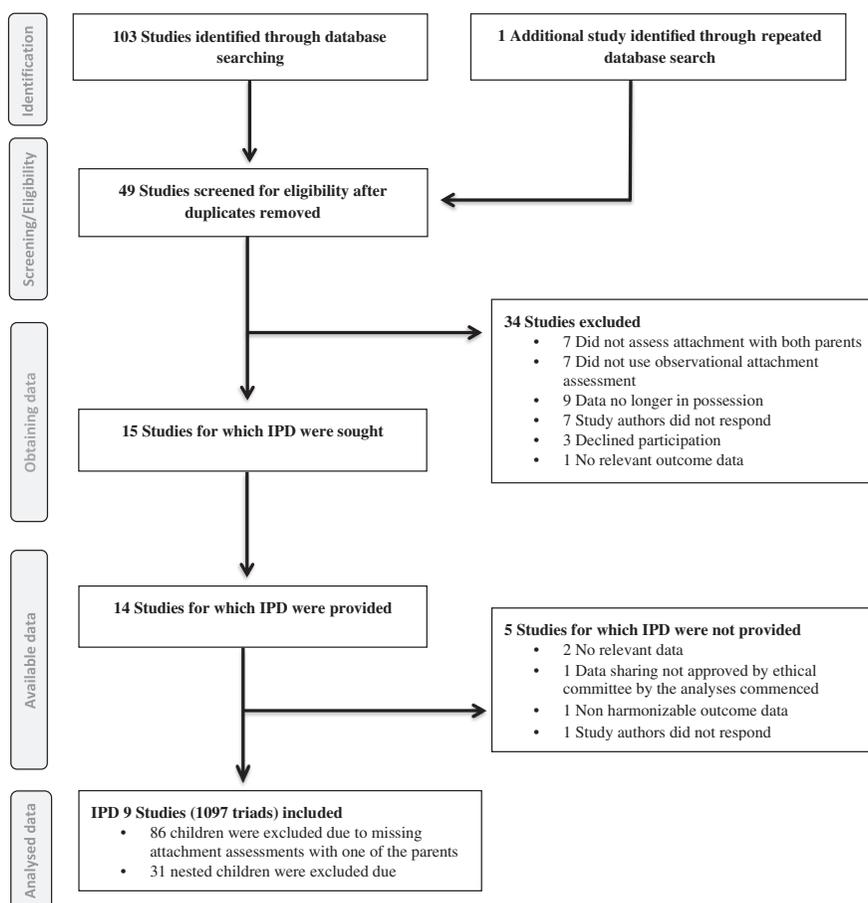


FIGURE 1 PRISMA-IPD flowchart of study selection and data selection process

ment classifications and, if available, continuous scores for the various attachment coding scales). Accordingly, observational attachment measures in this study included the following: Attachment Q-Sort (AQS; Waters & Deane, 1985), the SSP, two modified SSP coding systems for preschool children (the MacArthur Preschool Attachment Coding System [PACS], Cassidy et al., 1992; Preschool Assessment of Attachment [PAA], Crittenden, 1992), and the Main & Cassidy Age 6 Scoring System (Main & Cassidy, 1988). Authors were also asked for all accessible outcome data that matched any of the outcome domains that were pre-registered, including the focal outcome data presented in this study (i.e., internalizing and externalizing behavioral problems; see pre-registered minimum detectable effect size sensitivity power analyses that justified collecting data on these outcomes: <https://osf.io/tcj45>). We also requested demographic data on both children (i.e., gender, age at the time of both attachment and internalizing/externalizing behavioral problems assessment, and psychosocial risk status) and parents (i.e., age at the time of attachment assessments, education, ethnicity, relationship status, whether the parent was adoptive or non-adoptive, and psychosocial risk status), all of which were measured at the time of one or both of the child-parent attachment assessments. If individual-level demographic data was not provided, it was extracted from the study-level information indicated in the published papers or communicated by the authors.

The pooled analytic sample size was $N = 1,097$, of which half (49.6%) were female. At the time of the first attachment assessment, the mean age of children was 28.67 months ($SD = 22.74$), the mean age of mothers was 32.14 years ($SD = 5.70$), and that of fathers was 33.78 years ($SD = 6.45$). Mothers and fathers were mostly White (88.1% and 86.5%, respectively), highly educated (77.7% of mothers and 68.1% of fathers had post high school education), and employed (69.5% of mothers and 66.9% of fathers). The vast majority of mothers (98.1%) and fathers (95.2%) were biological parents, and virtually all of the parents (99.3%) resided in the same household at the time of the attachment assessments with their children. The average time gap between attachment assessments with mother and father was approximately one month (0.92 months, $SD = 0.78$, range: 0–5.09 months), and the average interval between initial attachment assessments with both parents and subsequent assessment of internalizing and externalizing behavioral problems was 1.34 years ($SD = 2.56$, range: 0–10.79 years). For a description of the studies see Table S1.

2.5 | Data verification

All data were checked for numerical anomalies (e.g., parent age of 99). When available, the descriptive statistics of the requested variables were compared with the data reported in the publications. Inconsistency was noted in one study; the principal investigator was contacted and the discrepancy was resolved.

2.6 | IPD synthesis methods

In the case that a study reported on multiple attachment measures, preference was given to data derived from the SSP¹ since this measure has been most widely used in the attachment literature. When Attachment Q-Sort (AQS; Waters & Deane, 1985) scores were reported, we followed previous studies and recoded them into binary secure/insecure variables such that scores above 0.40 were considered secure (Lehman et al., 1992; Verhage et al., 2018). No organized/disorganized attachment categories were extracted from studies that used AQS to assess attachment patterns. Children were then grouped into binary Secure/Insecure and Organized/Disorganized attachment categories with both parents, with insecure-avoidant and -resistant attachment categories regarded as Insecure regardless of their disorganization classification.

The vast majority of the studies reported internalizing and externalizing behavioral problems via the Child Behavior Checklist (CBCL; Achenbach, 1991; Achenbach et al., 1987a; Achenbach et al., 1987b). To harmonize outcome data reported in two studies via the Strengths and Difficulties Questionnaire (SDQ; Goodman et al., 1998), we selected the subscales that have shown strong associations with the CBCL internalizing and externalizing scale scores (i.e., the Emotional Symptoms and Conduct Problems scores, respectively), and converted them into T scores (for details on the outcome harmonization procedure, see <https://osf.io/s75th>). Of note, we excluded one study (Kennedy et al., 2014) that assessed internalizing and externalizing behavioral problems via the teacher reported Child Behavior Scale (CBS; Ladd & Profilet, 1996) given that there is currently no robust available data on the concordance of CBS with either SDQ and CBCL, and that no item level data was available by the study authors to allow for item level data harmonization. To reduce bias, our analyses involved the average of mother and father behavioral problems reports, which in the pooled sample were largely correlated ($r = 0.47$, $p < 0.001$ for both internalizing and externalizing behavioral problems).

2.7 | Handling missing data

We first used multiple imputations for missing demographic and outcome variables within each study separately, retaining the first imputed set of values. For variables with missing outcome or covariate values for the entire study, we conducted multiple imputation based on similar studies which had outcome data for similar age ranges to allow for comparable T score imputation. We then merged all imputed study files into a single dataset and conducted multiple imputation for all demographic variables with missing values for the entire study based on the entire pooled dataset (for details on missing data imputation per study see Table S2). We performed all subsequent analyses with both imputed and complete-cases merged datasets.

2.8 | Analytic approach

We first harmonized the outcome data across studies and handled missing data by performing multiple imputations for each independent variable in SPSS, version 25. We then conducted a one-step IPD meta-analysis on the pooled dataset. To account for the clustering of mother-child/father-child triads within studies, we performed separate linear mixed effects analyses for the association between attachment network and both internalizing and externalizing behavioral problems using the “lme4” package (Bates et al., 2015) in R (R Core Team, 2021). We fit the data with a random effects model. Models included random intercepts for the study identity (i.e., the study from which the IPD was pooled from), and fixed effects for (a) attachment networks and (b) covariates that were significantly associated with both attachment networks and the outcome variable.

In this study we tested both for a presence of an effect (i.e., significant difference in outcomes between attachment network groups) and for an absence of a meaningful effect (i.e., non-significant difference in outcomes between attachment network groups). Where attachment network proved to be a significant predictor, we followed up with planned comparisons via the “emmeans” package (Russell, 2020) in R. For non-significant comparisons we performed equivalence testing, using the “TOSTER” package (Lakens, 2017) in R, with equivalence bounds set for small effect size ($-0.20 < d < 0.20$) and alpha of 0.05. Given that traditional null hypothesis testing can only reject an absence of an effect but not statistically support it, equivalence testing allows for more confidence in determining whether an absence of a significant difference between the attachment network groups is indeed zero. Finally, we performed the following sensitivity analyses: (a) we compared internalizing and externalizing behavioral problems outcomes from different informants (i.e., mother, father, and average of their reports), and (b) we compared the effects of the complete-case versus the imputed pooled dataset.

3 | RESULTS

Below we report the results based on the imputed pooled dataset models with significant main effects of attachment networks on internalizing and externalizing T scores obtained from an average of mother and father behavioral problems reporting. For mean and standard deviation internalizing and externalizing scores reported by each parent individually and by both parents on average, we refer to Table 2. For a complete set of results from both the complete-case and imputed datasets, we refer to Tables 3–5.

TABLE 2 Pooled dataset internalizing and externalizing behavioral problems T scores per attachment network group

n	S-S		S _M -I _F		I _M -S _F		I-I		nonD-nonD		nonD _M -D _F		D _M -nonD _F		D-D	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Internalizing behavioral problems																
Mother	47.94	10.92	49.55	9.63	49.98	10.79	50.07	10.58	48.73	10.34	46.43	9.56	48.91	10.58	48.23	11.09
Father	48.30	9.95	49.76	10.63	49.74	11.12	49.13	49.10	48.39	9.83	49.31	10.71	49.92	11.13	47.58	8.05
Mother/Father	48.12	8.97	49.65	8.54	49.86	9.46	49.6	8.84	48.58	8.65	47.87	8.26	49.41	9.12	47.91	8.18
Externalizing behavioral problems																
Mother	50.02	9.55	51.08	8.76	49.74	9.37	52.6	11.23	50.44	9.02	50.42	8.84	50.68	10.23	54.49	13.95
Father	49.18	8.84	49.99	9.05	49.35	9.38	50.59	10.79	49.22	8.77	51.36	9.74	50.38	9.19	52.85	11.83
Mother/Father	49.60	7.85	50.54	7.47	49.54	7.80	51.59	9.87	49.83	7.54	50.89	7.54	50.53	8.04	53.67	11.24

Abbreviations: D_M-nonD_F, Disorganized/Mother-Organized/Father; D-D, Disorganized/Mother-Disorganized/Father; I_M-S_F, Insecure/Mother-Secure/Father; I-I, Insecure-Insecure; nonD-nonD, Organized/Mother-Organized/Father; nonD_M-D_F, Organized/Mother-Disorganized/Father; S-S, Secure-Secure; S_M-I_F, Secure/Mother-Insecure/Father.

TABLE 3 Planned comparisons for Research Question 1: Is the number of insecure or disorganized attachments important in predicting internalizing and externalizing behavioral problems?

Outcome /Informant	Complete-case dataset						Imputed dataset					
	I-I vs. S-I/S-S			S-I vs. I-I			I-I vs. S-I/S-S			S-I vs. I-I		
	df	t	p	df	t	p	df	t	p	df	t	p
Internalizing behavioral problems												
Mother	773	0.48	0.63	774	-2.23	0.03	1092	0.51	0.61	1093	-2.53	0.01
Father	762	-0.19	0.85	763	-1.94	0.05	1092	-0.92	0.36	1095	2.12	0.04
Mother/Father	754	0.35	0.72	754	-2.38	0.02	1092	-0.25	0.81	1093	-2.77	0.006
Externalizing behavioral problems												
Mother	783	2.34	0.02	784	-1.28	0.20	1095	2.07	0.04	1104	-0.68	0.49
Father	755	1.44	0.15	756	-0.99	0.32	1093	0.66	0.51	1100	-0.99	0.32
Mother/Father	755	2.34	0.02	756	-1.12	0.27	1090	1.63	0.10	1099	-0.98	0.33
D-D vs. nonD-D vs./nonD-nonD												
nonD-D/nD-nonD												
D-D vs. nonD-D vs. nonD-D/nonD-nonD												
Internalizing behavioral problems												
Mother	790	-1.04	0.30	791	0.94	0.35	945	-0.74	0.46	949	1.39	0.16
Father	731	-1.56	0.12	732	-2.21	0.03	950	-1.64	0.10	955	-1.52	0.13
Mother/Father	724	-1.58	0.12	725	-0.93	0.35	949	-1.43	0.15	953	-0.03	0.97
Externalizing behavioral problems												
Mother	797	2.18	0.03	787	-1.12	0.26	959	2.08	0.04	950	-0.34	0.74
Father	738	1.88	0.06	731	-2.05	0.01	955	1.49	0.14	960	-2.38	0.02
Mother/Father	730	2.39	0.02	729	-2.19	0.03	956	2.18	0.03	959	-1.59	0.11

Abbreviations: D-D, Disorganized-Disorganized; I-I, Insecure-Insecure; nonD-nonD, Organized/Organized; nonD-D, Organized/Disorganized; S-S, Secure-Secure; S-I, Secure-Insecure.

TABLE 4 Planned comparisons for Research Question 2: Does the quality of attachment to one caregiver predict internalizing and externalizing behavioral problems better than to the other?

Outcome /Informant	COMPLETE-CASE DATASET			IMPUTED DATASET		
	S_M-I_F vs. I_M-S_F			S_M-I_F vs. I_M-S_F		
	<i>df</i>	<i>t</i>	<i>p</i>	<i>df</i>	<i>t</i>	<i>p</i>
Internalizing behavioral problems						
Mother	296	-0.26	0.79	380	-0.29	0.77
Father	291	0.05	0.96	377	-0.11	0.91
Mother/Father	287	0.03	0.97	377	-0.24	0.81
Externalizing behavioral problems						
Mother	300	1.36	0.18	384	1.63	0.10
Father	324	0.33	0.74	380	1.00	0.32
Mother/Father	290	1.49	0.14	383	1.59	0.11
	D_M -non D_F D_M -non D_F			non D_M D_F vs. non D_M D_F vs.		
Internalizing behavioral problems						
Mother	149	0.33	0.75	177	0.88	0.38
Father	136	0.16	0.87	178	0.10	0.92
Mother/Father	134	0.57	0.57	176	0.44	0.66
Externalizing Behavioral Problems						
Mother	148	0.08	0.93	174	0.01	0.94
Father	138	-0.28	0.78	179	-0.67	0.49
Mother/Father	137	-0.06	0.95	179	-0.46	0.64

Abbreviations: D_M -non D_F , Disorganized/Mother-Organized/Father; I_M - S_F , Insecure/Mother-Secure/Father; non D_M - D_F , Organized/Mother-Disorganized/Father; S_M - I_F , Secure/Mother-Insecure/Father.

3.1 | Research Question 1: Is the number of insecure or disorganized attachments important in predicting internalizing and externalizing behavioral problems?

3.1.1 | Internalizing behavioral problems

When attachment networks were considered in terms of security/insecurity, planned comparisons revealed a non-significant difference in T scores between children who had insecure attachment patterns with both parents and children who either had insecure attachment to a single parent or with no parent [$t(1092) = -0.25$, $p = 0.81$; $d = 0.08$, 95% CI = $-0.07, 0.23$]. The equivalence test was non-significant [$t(320.4) = 1.58$, $p = 0.06$], suggesting that group sizes were insufficient to determine whether the observed effect was statistically different from zero. However, children who were classified as insecurely attached to one parent had more internalizing behavioral problems than children who were securely attached to both parents [$t(1093) = -2.77$, $p = 0.006$, $d = 0.18$, 95% CI = $0.05, 0.32$]. We did not find a significant difference in children's internalizing behavioral problems between the attachment network groups when dichotomizing attachment classifications as organized or disorganized.

3.1.2 | Externalizing behavioral problems

We did not find a significant difference in children's externalizing behavioral problems between the attachment network groups in terms of security/insecurity. However, for orga-

TABLE 5 Planned comparisons for Research Question 3: Which integrative model best predicts behavioral problems outcomes?

Outcome /Informant	COMPLETE-CASE DATASET												IMPUTED DATASET											
	I-1 vs. S _M -I _F /I _M -S _F /S-S				S _M -I _F /I _M -S _F vs. S-S				S _M -I _F vs. I _M -S _F				I-1 vs. S _M -I _F /I _M -S _F /S-S				S _M -I _F /I _M -S _F vs. S-S							
	df	t	p		df	t	p		df	t	p		df	t	p		df	t	p					
Internalizing behavioral problems																								
Mother	774	0.14	0.87	775	-2.24	0.03		775	-0.15	0.88		1093	0.14	0.89		1093	-2.53	0.01						
Father	763	-0.47	0.64	764	-1.94	0.05		763	-0.17	0.87		1093	-1.22	0.22		1095	-2.12	0.04						
Mother/Father	755	0.00	1.00	755	-2.38	0.02		755	-0.14	0.89		1093	-0.64	0.52		1094	-2.77	0.006						
Externalizing behavioral problems																								
Mother	784	2.12	0.03	785	-1.27	0.20		785	1.37	0.17		1097	1.92	0.06		1105	-0.74	.046						
Father	756	1.27	0.20	757	-0.99	0.32		756	0.51	0.61		1094	0.49	0.62		1101	-1.02	0.31						
Mother/Father	756	2.14	0.03	758	-1.10	0.27		756	1.30	0.19		1092	1.44	0.15		1100	-1.03	0.30						
D-D vs. nonD _M -D _F /D _M -nonD _F /nonD-nonD				nonD _M -D _F /D _M -nonD _F vs. nonD-nonD				nonD _M -D _F vs. D _M -nonD _F				D-D vs. nonD _M -D _F /D _M -nonD _F /nonD-nonD				nonD _M -D _F /D _M -nonD _F vs. nonD-nonD								
Internalizing behavioral problems																								
Mother	789	-0.92	0.36	792	0.92	0.35		790	-0.29	0.77		950	-0.60	0.55		953	1.47	0.14						
Father	732	-1.72	0.08	734	-2.17	0.03		735	-0.21	0.83		951	-1.73	0.08		957	-1.52	0.13						
Mother/Father	725	-1.61	0.11	726	-0.92	0.35		727	-0.67	0.51		950	-1.39	0.16		954	-0.02	0.98						
Externalizing behavioral problems																								
Mother	798	2.07	0.04	786	-1.02	0.31		799	-0.01	0.99		959	2.08	0.04		937	-0.28	0.78						
Father	729	1.62	0.11	735	-2.45	0.01		733	0.23	0.82		950	1.22	0.22		957	-2.40	0.02						
Mother/Father	718	2.17	0.03	730	-2.06	0.04		727	0.09	0.93		949	1.95	0.05		964	-1.47	0.14						

Abbreviations: D_M-nonD_F, Disorganized/Mother-Organized/Father; D-D, Disorganized/Mother-Disorganized/Father; I_M-S_F, Insecure/Mother-Secure/Father; I-I, Insecure-Insecure; nonD_M-D_F, Organized/Mother-Disorganized/Father; nonD-nonD, Organized/Mother-Organized/Father; S-S, Secure-Secure; S_M-I_F, Secure/Mother-Insecure/Father.

nized/disorganized attachment classifications, planned comparisons indicated a significant difference between children who showed a disorganized attachment to both parents and those who were disorganized with either a single parent or with none [$t(956) = 2.18$, $p = 0.03$, $d = 0.47$, 95% CI = 0.13, 0.82]. We did not find a significant externalizing behavioral problems T score difference between children who were classified as organized with both parents and those who were disorganized with a single parent [$t(959) = -1.59$, $p = 0.11$; $d = 0.12$, 95% CI = -0.05 , 0.28]. The equivalence test was non-significant [$t(252.55) = 1.00$, $p = 0.16$], suggesting that data were insufficient to draw robust conclusions on these groups' potential null mean differences.

3.2 | Research Question 2: Does the quality of attachment to one caregiver predict internalizing and externalizing behavioral problems better than to the other?

3.2.1 | Internalizing behavioral problems

We did not find significant differences in the average of mother and father reported internalizing behavioral problems between the attachment network groups on either the secure/insecure [$t(377) = -0.24$, $p = -0.81$; $d = 0.02$, 95% CI = -0.17 , 0.22] or the organized/disorganized levels [$t(176) = 0.44$, $p = 0.66$; $d = 0.18$, 95% CI = -0.12 , 0.48]. Equivalence testing was significant for the secure/insecure attachment network comparison [$t(379.48) = 1.78$, $p = 0.04$], but non-significant for the organized/disorganized attachment network comparison [$t(166.91) = -0.015$, $p = 0.44$].

3.2.2 | Externalizing behavioral problems

No significant differences emerged in the average of mother and father reported externalizing behavioral problems between the two secure/insecure [$t(383) = 1.59$, $p = 0.11$; $d = 0.16$, 95% CI = -0.04 , 0.36] and the organized/disorganized [$t(179) = -0.46$, $p = 0.64$; $d = 0.05$, 95% CI = -0.25 , 0.34] attachment networks. In both planned comparisons, equivalence testings were non-significant [$t(380) = -0.40$, $p = 0.34$] in the secure/insecure attachment network comparison, and $t(168.49) = 1.01$, $p = 0.18$] in the organized/disorganized attachment network comparison.

3.3 | Research Question 3: Which attachment network model best predicts children's internalizing and externalizing behavioral problems?

3.3.1 | Internalizing behavioral problems

In performing planned comparisons between the secure/insecure attachment networks, we found no difference between children who had insecure attachment patterns with both parents and those who did not [$t(1093) = -0.64$, $p = 0.52$]; $d = 0.08$, 95% CI = -0.07 , 0.23]. The equivalence test was non-significant [$t(320.4) = 1.54$, $p = 0.06$], suggesting that data were insufficient to draw robust conclusions about a meaningful effect. We found that children who were classified as securely attached to both parents had lower internalizing behavioral problems than those who were securely attached to a single parent [$t(1094) = -2.77$, $p = 0.006$, $d = 0.18$, 95% CI = 0.05, 0.32]. In addition, results indicated no

significant difference in parent-reported behavioral problems for children who were classified as securely attached only to mother and those classified as securely attached only to father [$t(1093) = 0.23, p = 0.82; d = 0.02, 95\% \text{ CI} = -0.17, 0.22$]. The equivalence test was significant [$t(412.86) = 1.80, p = 0.04$], suggesting that the difference in mean behavioral problems between these groups was negligible.

3.3.2 | Externalizing behavioral problems

Planned comparisons revealed that children who were disorganized with both parents were non-significantly different on externalizing behavioral problems T scores from children who had one or no disorganized attachments within their network [$t(949) = 1.95, p = 0.05$]. However, field specific effect size (Schuengel et al., 2021) was medium, and confidence intervals did not include zero [$d = 0.47, 95\% \text{ CI} = 0.13, 0.82$], suggesting that children who were disorganized with both parents had higher externalizing behavioral problems T scores from children who had one or no disorganized attachments within their network. In addition, we found no significant difference in reported behavioral problems between children who were disorganized with one parent and children with no disorganized classifications [$t(964) = -1.47, p = 0.14; d = 0.12, 95\% \text{ CI} = -0.05, 0.28$]. The equivalence test was non-significant [$t(252.55) = 1.00, p = 0.16$], suggesting that data was insufficient to draw robust conclusions on these groups' potential null mean differences. Additionally, we found no significant difference in reported behavioral problems for children who were classified as disorganized only with mother versus those who were disorganized only with father [$t(955) = -1.47, p = 0.47; d = 0.05, 95\% \text{ CI} = -0.25, 0.34$]. The equivalence test was not significant [$t(170.99) = -1.01, p = 0.16$], indicating that the data were insufficient to draw robust conclusions about whether the mean behavioral problems difference between these groups was different from zero.

4 | SENSITIVITY ANALYSES

4.1 | Single parent behavioral problems report

In the following, we report only on results that differed from mother-father average behavioral problems reports in the pooled dataset. For the complete set of results refer to Tables 3–5.

4.1.1 | Research Question 1: Externalizing behavioral problems

Secure/insecure attachment networks were associated with mother-reported behavioral problems. Children who were insecurely attached to both parents were reported to have significantly more externalizing behavioral problems compared to children who had either one or no insecure attachments within their network [$t(1095) = 2.07, p = 0.04, d = 0.25, 95\% \text{ CI} = 0.10, 0.40$]. However, no significant behavioral problems T scores difference was found between children with insecure attachment to one parent and children without any insecure attachments [$t(1104) = -0.68, p = 0.49$], and the equivalence test was significant [$t(879.28) = 2.42, p = 0.008$].

Regarding organized/disorganized attachment, whereas in both father-report and average of mother-father reports attachment network was associated with externalizing behavioral problems, the significant planned comparisons differed. Specifically, when assessing father-report behavioral problems, we did not find differences in externalizing behavioral

problems between children who were disorganized with both parents and those who were disorganized with either a single parent or with none of the parents [$t(955) = 1.49, p = 0.14$]. Equivalence testing was non-significant [$t(33.32) = -0.59, p = 0.72$]. However, children who had one disorganized attachment had higher externalizing behavioral problems T scores than children who were organized with both [$t(960) = -2.38, p = 0.02, d = 0.18, 95\% \text{ CI} = 0.02, 0.35$].

4.1.2 | Research Question 3: Externalizing behavioral problems

Planned comparisons for father-reported behavioral problems somewhat differed from the results we obtained when assessing externalizing behavioral problems via the average of mother-father reports. Unlike the results obtained for the average of mother-father behavioral problem reports, children who were disorganized with a single parent had higher externalizing behavioral problems T scores compared with those who were classified as organized with both parents and those [$t(957) = -2.40, p = 0.02, d = 0.18, 95\% \text{ CI} = 0.02, 0.35$].

4.2 | Complete-case data set

In the following, we report complete-case planned comparisons that differed from the pooled dataset main study analyses of mother-father average behavioral problem reports. For the complete set of results refer to Tables 3–5. For results using the complete-case, dataset internalizing and externalizing scores refer to Table S3.

4.2.1 | Research Question 1: Externalizing behavioral problems

Unlike the results obtained in the imputed dataset, planned comparisons performed in the complete-case dataset revealed that secure/insecure attachment networks were associated with the average of mother and father reported externalizing behavioral problems. Children who were insecurely attached to both parents were reported to have significantly more externalizing behavioral problems compared to children who had either one or no insecure attachments within their network [$t(755) = 2.34, p = 0.02$]; in both the imputed and the complete datasets, no significant T scores difference was found between children with insecure attachment to one parent and children without any insecure attachments.

In addition, organized/disorganized attachment networks were associated with the average of mother and father reported externalizing behavioral problems, though in a somewhat different order. Whereas in both the imputed and complete-case datasets children who had disorganized attachment patterns with both parents had higher mean behavioral problems T scores than children with either one or no disorganized attachment, only in the complete-case dataset did children who were classified as disorganized only with one parent show higher behavioral problems T scores than those who had no disorganized attachment to any of the parents [$t(729) = -2.19, p = 0.03$].

4.2.2 | Research Question 3: Externalizing behavioral problems

Planned comparisons performed in the complete-case dataset showed that, unlike the results obtained in the pooled dataset, children who were insecurely attached to both parents were reported to have significantly more externalizing behavioral problems

compared to children who had either one or no insecure attachments within their network [$t(756) = 2.14, p = 0.03$]. We also found that results from the complete-case dataset differed somewhat from the ones we obtained in the imputed dataset with respect to the organized/disorganized attachment networks. That is, children who were disorganized with both parents had higher externalizing behavioral problems T scores from children who had one or no disorganized attachments within their network [$t(718) = 2.17, p = 0.03$], and children who were disorganized with one parent had higher externalizing behavioral problems T scores than children who had no disorganized attachments to any of their parents [$t(730) = -2.06, p = 0.04$].

5 | DISCUSSION

In this study we aimed to address a fundamental question in attachment research: What role do attachment networks to mothers and fathers play in children's internalizing and externalizing behavioral problems outcomes? Evaluating 1,097 children and their parents across nine studies from Canada, Europe, and the USA revealed that the answer to this question depends both on the forced binary attachment classification (i.e., secure/insecure and organized/disorganized) and the nature of internalizing versus externalizing behavioral problems. Children who were insecurely attached to either one or two of their parents—irrespective of which parent—had more internalizing behavioral problems compared with children who were securely attached to both parents. Moreover, children who were disorganized with both parents had more externalizing behavioral problems compared with children who were organized with either two parents or a single parent, regardless of which parent. These findings add to growing literature and increased interest in investigating father-child attachment and its role in developmental trajectories, evidenced by a surge in the number of meta-analytic studies on the subject (Deneault et al., 2021 [this issue]; Schuengel et al., 2021), and in two recent special issues on the subject in *Attachment & Human Development* (Ahnert & Schoppe-Sullivan, 2020; Cowan & Cowan, 2019).

5.1 | The effect of secure/insecure attachment network on internalizing behavioral problems: It takes two?

When assessing associations between attachment configurations and internalizing behavioral problems, the number of secure attachment relationships within an early attachment network was important. Unlike our hypothesis (i.e., that the Additive-Hierarchical model would be corroborated), we obtained partial support for the Additive-Horizontal Model (Dagan & Sagi-Schwartz, 2018, 2020; $S-S < S_M-I_F = I_M-S_F = I-I$; see Figure 2a). As suggested by the Additive hypothesis, children with a single secure attachment had higher internalizing behavioral problems T scores compared with children with two secure attachment relationships. However, contrary to the Additive hypothesis, children who were insecurely attached to both parents exhibited similar internalizing behavioral problems T scores compared to those with one secure attachment. In addition, the Horizontal hypothesis was corroborated by the results, which indicated that children with a secure attachment to either mother or father exhibited non-significant differences in their mean internalizing T scores.

These results add an important dimension to previous meta-analytic findings on the link between early insecure attachment patterns to one parent and internalizing behavioral problems. Whereas a single child-parent insecure attachment was shown to be modestly associated with more internalizing behavioral problems ($d = 0.15, 95\% \text{ CI} = -0.06,$

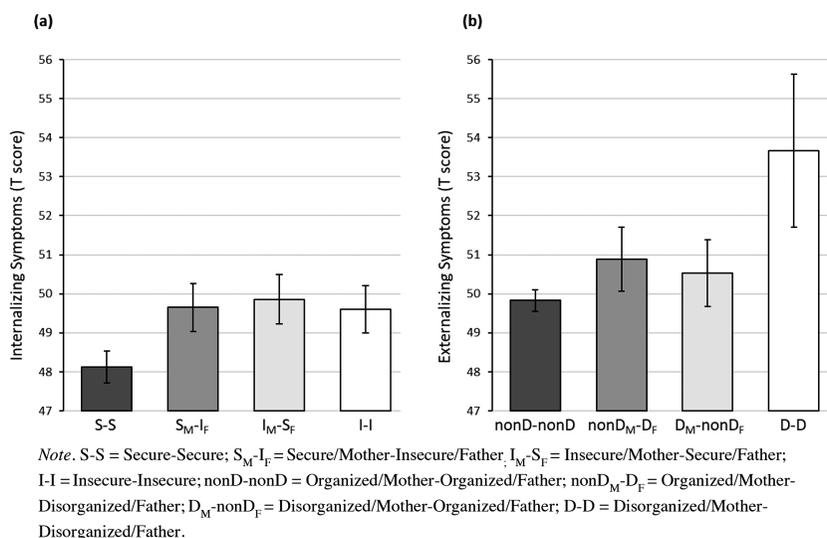


FIGURE 2 Bar charts depicting differences in symptoms T scores between the four integrative (a) secure/insecure and (b) organized/disorganized attachment network groups.

0.25, Groh et al., 2012; $d = 0.19$, 95% CI = 0.09, 0.29, Madigan et al., 2013; Deneault et al., 2021 [this issue]), our findings suggest that the quality of children's attachment to the other parent is also important. That is, a secure attachment to the second parent is significantly associated with fewer internalizing behavioral problems. Relatedly, our findings answer the question that was previously posed regarding the contributing role of father-child attachment to internalizing behavioral problems relative to that of the mother-child's: the available data suggest that there is no significant difference in importance between the two.

Unlike our expectations (i.e., that the Additive Hypothesis would be confirmed) and prior attachment network research (Kochanska & Kim, 2013), it appears that it takes two—and not merely one—secure attachment to primary caregivers to buffer children from increased vulnerability to experiencing internalizing behavioral problems. It is thus possible that simply having an insecure attachment relationship within the child's network is enough to introduce comparatively heightened and more prolonged distress at times of need (Groh & Narayan, 2019; Sroufe et al., 2005). Such elevated distress levels, in turn, may significantly increase internalizing behavioral problems (Hammen, 2005). An important caveat, however, is that this IPD only included samples of children from intact families with two heterosexual parents. Thus, findings may not be generalizable to families with same-sex parents or single-parent families.

Still, it remains unclear why a secure attachment to one parent does *not* buffer children with insecure attachment to another parent from experiencing increased internalizing behavioral problems. One factor that is worth considering is the different level of involvement in childrearing between mothers and fathers in intact two-parent families (Bakermans-Kranenburg et al., 2019; Brown et al., 2011; Renk et al., 2003). It is plausible that differential involvement in childrearing by mothers and fathers, may play a role in the effect on the child's development, including levels of internalizing behavioral problems, depending on the quality of attachment to the more involved parent. In this study, we were unable to assess levels of parental involvement, and it thus remains to be determined whether such differences in engagement by the parent with whom the child has an insecure attachment can explain the absence of a buffering effect when the child has a single secure attachment.

We did not find significant differences in externalizing behavioral problems T scores between the secure/insecure attachment network groups. This result is at odds with previous meta-analytic findings on the association between insecure attachment to a single child-parent (mostly mother-child) attachment and externalizing behavioral problems (Fearon et al., 2010), which indicated that the effect of this association was significant and of moderate strength ($d = 0.31$, 95% CI = 0.23, 0.40). Of note, in our study we did find a significant effect of secure/insecure attachment networks on mother-reported externalizing behavioral problems (i.e., S-S = S-I < I-I), which aligns with the significant association found between the security of a single parent-child attachment and mother-reported externalizing behavioral problems (Fearon et al., 2010). It is also worth noting that the magnitude of the meta-analytic effect that was reported on the single parent-child attachment was strongly driven by attachment disorganization ($d = 0.34$, 95% CI: 0.18, 0.50) rather than by any of the other insecure attachment subcategories (insecure-avoidant, $d = 0.12$, 95% CI = 0.03, 0.21; insecure-resistant, $d = 0.11$, 95% CI: -0.04, 0.26). Such different effect sizes highlight the relatively weak associations between organized categories of insecurity and externalizing behavioral problems, which echoes both (a) the null effect we obtained here when assessing secure/insecure attachment networks and externalizing behavioral problems, and (b) the significant effect we obtained when assessing the organized/disorganized attachment networks and externalizing behavioral problems (see below).

5.2 | The effect of organized/disorganized attachment network on externalizing behavioral problems: It takes only one?

When assessing externalizing behavioral problems on the level of attachment disorganization, the Additive-Hierarchical model was not corroborated, as we initially expected. Rather, we obtained support for the Buffering-Horizontal Model (Dagan & Sagi-Schwartz, 2018, 2020; nonD-nonD = nonD_M-D_F = D_M-nonD_F < D-D; see Figure 2b). In line with the Buffering hypothesis, it takes an organized attachment to one parent to offset the otherwise unfavorable heightened externalizing behavioral problems that children with two disorganized attachments experience. As in the case of secure/insecure attachment networks and internalizing behavioral problems, the Horizontal hypothesis was confirmed; that is, we found no difference in externalizing behavioral problems T scores between children who have organized attachment to mother or father.

These findings extend previous meta-analytic results that indicate a field-specific small to medium effect size (Schuengel et al., 2021) when examining the association between disorganized attachment to one parent and externalizing behavioral problems ($d = 0.34$, 95% CI: 0.18, 0.50; Fearon et al., 2010). Moreover, the findings regarding the null effect of organized/disorganized attachment networks on internalizing behavioral problems are in line with previous meta-analytic results that indicated that disorganized attachment to a single parent was non-significantly associated with internalizing behavioral problems ($d = 0.08$, 95% CI = -0.06, 0.22, Groh et al., 2012; $d = 0.12$, 95% CI = -0.02, 0.23, Madigan et al., 2013).

One potential explanation for the differential association between disorganized attachment network and externalizing and internalizing behavioral problems may be the presence of a confounding factor that is known to be associated with both disorganized attachment and externalizing behavioral problems. Decreased effortful control/self-regulation, for example, was shown to be associated with disorganized attachment when compared to children with organized attachment patterns; $d = 0.34$; Pallini et al., 2018; but see Fearon & Belsky, 2011). Effortful control/self-regulation capacities have also consistently been linked to externalizing behavioral problems in early life (Eisenberg et al., 2009, 2015; Olson et al., 2005), but much less consistently or sometimes even inversely to internalizing behavioral

problems (Eisenberg et al., 2009; Hankin et al., 2017; Oldehinkel et al., 2007; Oosterlaan et al., 1998). Other risk factors not assessed here, such as parental hostility and parental psychopathology are also associated with both attachment disorganization in infancy and aggressive behaviors in childhood (Lyons-Ruth, 1996), and may also explain some of the results reported here.

Of note, two of the five studies from which we extracted attachment disorganization classifications used modified SSPs (the PACS and the PAA) that are adapted for assessing preschool children. In these modified SSP assessments, attachment disorganization is classified as either controlling-caregiving or controlling-punitive. These disorganized manifestations are qualitatively different from the manner in which disorganization presents in infancy, and only one of these subtypes (controlling-punitive) has been shown to be associated with externalizing behavioral problems (Bureau et al., 2009; Moss et al., 2004). In this study we collapsed the two disorganized subtypes into one to allow for harmonization of all the disorganized datasets, which potentially affected the differential associations we observed between disorganized attachment networks and externalizing and internalizing behavioral problems.

5.3 | Study strengths and limitations

Given that answers to questions pertaining to early life attachment networks that include child-mother and father relationships are often part of labor-intensive observational, and often longitudinal investigations, such studies have been scarce and underpowered. A major strength of the IPD methodology used in the current study is that it allowed us to compile data from across studies to create a larger database of 1,097 families and increased statistical power to answer questions that in most cases were not originally considered. Relatedly, IPD methodology allowed for both synthesis and missing data imputation of behavioral problems outcomes, which together provided us with the opportunity to pool together a dataset that is powerful enough to assess previously unresolved questions regarding the predictive power of attachment networks on the development of internalizing and externalizing behavioral problems.

Alongside the strengths of IPD methodology, some of its essential weaknesses should be noted. Given IPD's reliance on complete and often unpublished datasets, the size of the pooled dataset is heavily reliant on the researcher's ability and willingness to retrieve and share data, which resulted in some unresolved data accessibility issues. Such potential data loss, together with several older datasets that did not assess attachment disorganization due to the novelty of this coding system at the time when data was coded, lowered statistical power for analysis of attachment network questions in terms of disorganization (e.g., the group of children who were classified as disorganized with both parents was limited to 33).

Given that children assessed in this study mainly come from two-parent traditional households, and that parents in this sample are mostly White and highly educated, the current sample is limited in its generalizability. Thus, future studies on attachment networks will benefit from assessing the questions at hand in both non-traditional families (e.g., same-sex parent families; Golombok, 2015), and in minority and non-Westernized samples, where parent roles may differ (e.g., Chinese families; Chuang et al., 2018). Additionally, children who grow up in unfavorable household environments, such as poverty, abuse and neglect, or where parents have psychopathology or frequent conflicts, tend to experience higher rates of internalizing and externalizing behavioral problems; it is unclear—and thus should be studied in the future—whether a network of secure/organized attachment to both parents in such vulnerable child populations plays a similar promotive factor as in the current normative-risk sample.

Of note, our sample was limited to below clinical cut-offs on internalizing and externalizing behavioral problems T scores; even in the “worst case scenarios”—where children were insecurely attached to, and/or disorganized with, both mothers and fathers—they are likely to exhibit a normative range of internalizing and externalizing behavioral problems. Given that by definition we assessed children whose two-parent family structure was intact, and that such households are themselves a protective factor for developing psychopathology (Perales et al., 2017), the observed normative psychopathology T scores are not surprising. Such psychopathology levels nonetheless limit our ability to generalize our results to more vulnerable and at-risk child populations.

It is worth noting that in this study, we did not assess whether and to what degree the quality of insecure attachment subcategories (i.e., insecure-avoidant and -resistant) might have influenced the observed links between attachment networks and internalizing and externalizing behavioral problems. We also did not assess the potential distinct quality of disorganization attachment’s secondary classifications (i.e., disorganized-secure and disorganized-insecure). Whereas such fine-tuned endeavors require a significantly larger sample size, it may be crucial in fine-tuning potential etiological models given the divergent meta-analytic and longitudinal links the two organized insecure attachment subcategories have shown in predicting internalizing and externalizing behavioral problems (Dagan et al., 2021; Dagan & Bernard, 2021).

Methodologically, we used the average of mother and father behavioral problem reports in order to minimize single informant biases; however, sensitivity analyses revealed that not all findings were robust against mother- and father-only reports. Also, whereas our study relied on parent-reported behavioral problems that are often used in observational studies, making our study adherent to standard practice, no non-familial reports were used. Parental reports tend not to converge with non-parental informants’ reports (e.g., teacher ratings; Achenbach et al., 1987a; Achenbach et al., 1987b), and there is currently no clinical gold-standard regarding the child’s “true” internalizing and externalizing behavioral problem level (De Los Reyes & Kazdin, 2005). Thus, non-familial informants who may observe the child’s behaviors in peer contexts more often than parents can add to the observational context the child’s behavioral problems. We therefore encourage future research to incorporate such multiplicity of reporters to increase confidence in the assessment of children’s behavioral problems (De Los Reyes et al., 2013).

Finally, whereas the significant pooled dataset results were replicated in the complete-case dataset sensitivity analyses, some of the imputed dataset results were not robust against results based on the complete-case dataset. In fact, a couple of the complete-case dataset results were better aligned with our hypotheses. First, complete-case dataset results showed that secure/insecure attachment networks predicted externalizing behavioral problems. Second, complete-case analysis indicated that organized/disorganized attachment networks predicted externalizing behavioral problems according to the Additive model (i.e., nonD-nonD < nonD-D < D-D). Overall, such discrepancies between the analytic samples call for replication of the results we obtained in our main analyses in larger samples (e.g., reanalysis of current dataset after adding additional accumulated data, and initiation of a multisite longitudinal study that involves assessment of attachment to mothers and fathers).

6 | CONCLUSION

The idea that the quality of the relationships with both mother and father are crucial to evaluating and understanding the etiology of internalizing and externalizing behavioral

problems is by no means new. Nonetheless, our findings add a novel attachment perspective to this notion, suggesting that children's attachment networks are significant in evaluating behavioral problem trajectories, at least in Westernized, normative risk populations.

Whereas future research is needed to evaluate both mechanisms and ecological constraints of the observed links between attachment networks and internalizing and externalizing behavioral problems, findings from the current IPD meta-analysis answer the call to move closer in the direction of understanding the interplay between children's attachment patterns to multiple caregivers which was brought to light almost three decades ago (Van IJzendoorn et al., 1992). Analyzing early attachment as a *network* of attachments—including discordant attachment patterns to mothers and fathers—can indeed be predictive of socioemotional outcomes.

Having two insecure or disorganized attachments within a two-parent attachment network is significantly associated with enhanced risk for elevated internalizing or externalizing behavioral problems, respectively, but only in the case of disorganization with one parent does it appear that the (organized) attachment pattern with the other parent plays a protective role. In any case, regarding the long-lasting question of the different roles that mother-child and father-child attachment relationships play in mental health developmental pathways, the current findings suggest that it may not matter whether the secure attachment is to mother or to father; at least when it comes to predicting internalizing and externalizing behavioral problems in low-risk, two-parent, same-sex families in Western countries, the quality of attachment patterns to mothers and fathers seems to be equally important.

ORCID

Or Dagan  <https://orcid.org/0000-0002-4674-5425>

Marinus H. van IJzendoorn  <https://orcid.org/0000-0003-1144-454X>

Cristina Colonnesi  <https://orcid.org/0000-0002-5740-7827>

NOTE

¹ In order to avoid a carryover effect from the first SSP with one parent to the second SSP with the other parent (Granqvist et al., 2016), the five studies that used (non-modified) SSPs in the current pooled sample were conducted in customary intervals of between 1-3 months, and adhered to the SSP instructions to curtail the SSP in cases where infants exhibited high distress. Of note, three of these five studies assessed mother-child and father-child SSP in a counterbalancing fashion.

REFERENCES

References marked with an asterisk indicate studies included in the meta-analysis.

- Achenbach, T. M. (1991). *Manual for the child behavior checklist/4-18 and 1991 profile*. University of Vermont, Department of Psychiatry.
- Achenbach, T. M., Edelbrock, C., & Howell, C. T. (1987a). Empirically based assessment of the behavioral/emotional problems of 2- and 3- year-old children. *Journal of Abnormal Child Psychology*, *15*(4), 629-650. <https://doi.org/10.1007/BF00917246>
- Achenbach, T. M., McConaughy, S. H., & Howell, C. T. (1987b). Child/adolescent behavioral and emotional problems: Implications of cross-informant correlations for situational specificity. *Psychological Bulletin*, *101*(2), 213. <https://doi.org/10.1037/0033-2909.101.2.213>
- Ahnert, L., & Schoppe-Sullivan, S. J. (2020). Fathers from an attachment perspective. *Attachment & Human Development*, *22*(1), 1-3. <https://doi.org/10.1080/14616734.2019.1589054>
- Ainsworth, M. D. S., Blehar, M. C., Waters, E., & Wall, S. N. (1978). Patterns of attachment: A psychological study of the strange situation. *Patterns of attachment: A psychological study of the strange situation*. Erlbaum. <https://doi.org/10.4324/9780203758045>
- An, D., Kochanska, G., Yeager, N., Sivagurunathan, N., Praska, R., Campbell, R., & Shin, S. Y. (2021). Children's emerging receptive, positive orientation toward their parents in the network of early attachment relationships. *Attachment & Human Development*, 1-23. <https://doi.org/10.1080/14616734.2021.1906722>

- Bakermans-Kranenburg, M. J., Lotz, A., & Dijk, K. A. (2019). Birth of a father: Fathering in the first 1,000 days. *Child Development Perspectives*, 13(4), 247–253. <https://doi.org/10.1111/cdep.12347>
- Bates, D., Mächler, M., Bolker, B., & Walker, S. (2015). Fitting linear mixed-effects models using lme4. *Journal of Statistical Software*, 67(1), 1–48. <https://doi.org/10.18637/jss.v067.i01>
- Belsky, J. (1981). Early human experience: A family perspective. *Developmental Psychology*, 17(1), 3–23. <https://doi.org/10.1037/0012-1649.17.1.3>
- Bowlby, J. (1969). *Attachment and loss: Vol. 1. Attachment*. Basic Books.
- Bowlby, J. (1973). *Attachment and Loss: Vol. 2. Separation: Anxiety and anger*. Basic Books.
- Bowlby, J. (1980). *Attachment and Loss: Vol. 3. Loss: Sadness and depression*. Basic Books.
- Bretherton, I. (1985). Attachment theory: Retrospect and prospect. *Monographs of the Society for Research in Child Development*, 50(1–2), 3–35. <https://doi.org/10.2307/3333824>
- Brown, G. L., McBride, B. A., Bost, K. K., & Shin, N. (2011). Parental involvement, child temperament, and parents' work hours: Differential relations for mothers and fathers. *Journal of Applied Developmental Psychology*, 32(6), 313–322. <https://doi.org/10.1016/j.appdev.2011.08.004>
- Bureau, J.-F., Deneault, A.-A., & Yurkowski, K. (2020). Preschool father-child attachment and its relation to self-reported child socioemotional adaptation in middle childhood. *Attachment & Human Development*, 22(1), 90–104. <https://doi.org/10.1080/14616734.2019.1589065>
- Bureau, J. F., Ann Easlerbrooks, M., & Lyons-Ruth, K. (2009). Attachment disorganization and controlling behavior in middle childhood: Maternal and child precursors and correlates. *Attachment & Human Development*, 11(3), 265–284. <https://doi.org/10.1080/14616730902814788>
- *Bureau, J., Yurkowski, K., Schmiedel, S., Martin, J., Moss, E., & Pallanca, D. (2014). Making children laugh: Parent-child dyadic synchrony and preschool attachment. *Infant Mental Health Journal*, 35(5), 482–494.
- Carone, N., Baiocco, R., Lingiardi, V., & Kerns, K. (2020). Child attachment security in gay father surrogacy families: Parents as safe havens and secure bases during middle childhood. *Attachment & Human Development*, 22(3), 269–289. <https://doi.org/10.1080/14616734.2019.1588906>
- Cassidy, J., & Marvin, R. S., & the MacArthur working group on attachment. (1992). *Attachment organisation in 2 1/2 to 4 1/2 years olds: Coding manual (Unpublished coding manual)*. University of Virginia.
- Chuang, S. S., Glozman, J., Green, D. S., & Rasmi, S. (2018). Parenting and family relationships in chinese families: A critical ecological approach. *Journal of Family Theory & Review*, 10(2), 367–383. <https://doi.org/10.1111/jftr.12257>
- Colonnesi, C., Draijer, E. M., Jan JM Stams, G., Van der Bruggen, C. O., Bögels, S. M., & Noom, M. J. (2011). The relation between insecure attachment and child anxiety: A meta-analytic review. *Journal of Clinical Child & Adolescent Psychology*, 40(4), 630–645.
- *Colonnesi, C., Wissink, I. B., Noom, M. J., Asscher, J. J., Hoeve, M., Stams, G. J. J. M., Polderman, N., & Kellaert-Knol, M. G. (2013). Basic trust: An attachment-oriented intervention based on mind-mindedness in adoptive families. *Research on Social Work Practice*, 23(2), 179–188. <https://doi.org/10.1177/1049731512469301>
- Cowan, P. A., & Cowan, C. P. (2019). Introduction: Bringing dads back into the family. *Attachment & Human Development*, 21(5), 419–425. <https://doi.org/10.1080/14616734.2019.1582594>
- Crittenden, P. M. (1992). Quality of attachment in the preschool years. *Development and Psychopathology*, 4(2), 209–241.
- Cyr, C., Euser, E. M., Bakermans-Kranenburg, M. J., & Van IJzendoorn, M. H. (2010). Attachment security and disorganization in maltreating and high-risk families: A series of meta-analyses. *Development and Psychopathology*, 22(1), 87–108. <https://doi.org/10.1017/S0954579409990289>
- Dagan, O., & Bernard, K. (2021) It takes a village: A call for engaging attachment with adjunct disciplines to clarify “in-house” clinical conundrums. *Attachment & Human Development*, 23(4), 455–467 <https://doi.org/10.1080/14616734.2021.1918455>
- Dagan, O., Groh, A. M., Madigan, S., & Bernard, K. (2021). A lifespan development theory of insecure attachment and internalizing symptoms: Integrating meta-analytic evidence via a testable evolutionary mis/match hypothesis. *Brain Sciences*, 11(9). <https://doi.org/10.3390/brainsci11091226>
- Dagan, O., & Sagi-Schwartz, A. (2018). Early attachment network with mother and father: An unsettled issue. *Child Development Perspectives*, 12(2), 115–121. <https://doi.org/10.1111/cdep.12272>
- Dagan, O., & Sagi-Schwartz, A. (2020). Infant attachment (to mother and father) and its place in human development: Five decades of promising research (and an unsettled issue). In J. J. Lockman & C. Tamis-LeMonda (Eds.), *The Cambridge handbook of infant development* (pp. 687–714). Cambridge University Press.
- De Los Reyes, A., & Kazdin, A. E. (2005). Informant discrepancies in the assessment of childhood psychopathology: A critical review, theoretical framework, and recommendations for further study. *Psychological Bulletin*, 131(4), 483–509. <https://doi.org/10.1037/0033-2909.131.4.483>
- De Los Reyes, A., Thomas, S. A., Goodman, K. L., & Kunder, S. M. A. (2013). Principles underlying the use of multiple informants' reports. *Annual Review of Clinical Psychology*, 9(1), 123–149. <https://doi.org/10.1146/annurev-clinpsy-050212-185617>

- Deneault, A.-A., Bakermans-Kranenburg, M. J., Groh, A. M., Fearon, P. R. M., & Madigan, S. (2021). Child-father attachment in early childhood and behavior problems: A meta-analysis. *New Directions for Child and Adolescent Development*, 2021, 43–66. <https://doi.org/10.1002/cad.20434>
- Easterbrooks, M. A., & Goldberg, W. A. (1984). Toddler development in the family: Impact of father involvement and parenting characteristics. *Child Development*, 55(3), 740–752. <https://doi.org/10.2307/1130126>
- *Eiden, R. D., Edwards, E. P., & Leonard, K. E. (2002). Mother-infant and father-infant attachment among alcoholic families. *Development and Psychopathology*, 14(2), 253–278. <https://doi.org/10.1017/S0954579402002043>
- Eisenberg, N., Taylor, Z. E., Widaman, K. F., & Spinrad, T. L. (2015). Externalizing symptoms, effortful control, and intrusive parenting: A test of bidirectional longitudinal relations during early childhood. *Development and Psychopathology*, 27(4), 953–968. <https://doi.org/10.1017/S0954579415000620>
- Eisenberg, N., Valiente, C., Spinrad, T. L., Cumberland, A., Liew, J., Reiser, M., Zhou, Q., & Losoya, S. H. (2009). Longitudinal relations of children's effortful control, impulsivity, and negative emotionality to their externalizing, internalizing, and co-occurring behavior problems. *Developmental Psychology*, 45(4), 988–1008. <https://doi.org/10.1037/a0016213>
- Fearon, R. P., Bakermans-Kranenburg, M. J., van IJzendoorn, M. H., Lapsley, A.-M., & Roisman, G. I. (2010). The significance of insecure attachment and disorganization in the development of children's externalizing behavior: A meta-analytic study. *Child Development*, 81(2), 435–456. <https://doi.org/10.1111/j.1467-8624.2009.01405.x>
- Fearon, R. P., & Belsky, J. (2011). Infant–mother attachment and the growth of externalizing problems across the primary-school years. *Journal of Child Psychology and Psychiatry*, 52(7), 782–791. <https://doi.org/10.1111/j.1469-7610.2010.02350.x>
- Golombok, S. (2015). *Modern families: Parents and children in new family forms*. Cambridge University Press.
- *George, M. R. W. (2010). *Parent-child attachment security and children's socio-emotional adjustment during the early school years*. University of Notre Dame.
- Goodman, R., Meltzer, H., & Bailey, V. (1998). The strengths and difficulties questionnaire: A pilot study on the validity of the self-report version. *European Child & Adolescent Psychiatry*, 7(3), 125–130. <https://doi.org/10.1007/s007870050057>
- Goossens, A., & van IJzendoorn, M. H. (1990). Quality of infants' attachments to professional caregivers: Relation to infant-parent attachment and day-care characteristics. *Child Development*, 61(3), 832–837. <https://doi.org/10.2307/1130967>
- Granqvist, P., Hesse, E., Fransson, M., Main, M., Hagekull, B., & Bohlin, G. (2016). Prior participation in the strange situation and overstress jointly facilitate disorganized behaviours: Implications for theory, research and practice. *Attachment & Human Development*, 18(3), 235–249. <https://doi.org/10.1080/14616734.2016.1151061>
- Groh, A. M., Roisman, G. I., van IJzendoorn, M. H., Bakermans-Kranenburg, M. J., & Fearon, R. P. (2012). The significance of insecure and disorganized attachment for children's internalizing symptoms: A meta-analytic study. *Child Development*, 83(2), 591–610. <https://doi.org/10.1111/j.1467-8624.2011.01711.x>
- Groh, A. M., & Narayan, A. J. (2019). Infant attachment insecurity and baseline physiological activity and physiological reactivity to interpersonal stress: A meta-analytic review. *Child Development*, 90(3), 679–693. <https://doi.org/10.1111/cdev.13205>
- Grossmann, K. E., Grossmann, K., Huber, F., & Wartner, U. (1981). German children's behavior towards their mothers at 12 months and their fathers at 18 months in Ainsworth's Strange Situation. *International Journal of Behavioral Development*, 4, 157–181.
- Grossmann, K., Grossmann, K. E., Fremmer-Bombik, E., Kindler, H., Scheuerer-Englisch, H., & Zimmermann, P. (2002). The uniqueness of the child-father attachment relationship: Fathers' sensitive and challenging play as a pivotal variable in a 16-year longitudinal study. *Social Development*, 11(3), 307–331. <https://doi.org/10.1111/1467-9507.00202>
- Hammen, C. (2005). Stress and depression. *Annual Review of Clinical Psychology*, 1, 293–319. <https://doi.org/10.1146/annurev.clinpsy.1.102803.143938>
- Hankin, B. L., Davis, E. P., Snyder, H., Young, J. F., Glynn, L. M., & Sandman, C. A. (2017). Temperament factors and dimensional, latent bifactor models of child psychopathology: Transdiagnostic and specific associations in two youth samples. *Psychiatry Research*, 252, 139–146. <https://doi.org/10.1016/j.psychres.2017.02.061>
- Ioannidis, J. P. A. (2017). Meta-analyses can be credible and useful: A new standard. *JAMA Psychiatry*, 74(4), 311–312. <https://doi.org/10.1001/jamapsychiatry.2017.0035>
- Kennedy, M., Betts, L., Dunn, T., Sonuga-Barke, E., & Underwood, J. (2014). Applying Pleck's model of paternal involvement to the study of preschool attachment quality: A proof of concept study. *Early Child Development and Care*, 185(4), 601–613. <https://doi.org/10.1080/03004430.2014.944907>
- Kerns, A. K., Klepac, L., & Cole, A. (1996). Peer relationships and preadolescents' perceptions of security in the child-mother relationship. *Developmental Psychology*, 32(3), 457–466. <https://doi.org/10.1037/0012-1649.32.3.457>
- Kochanska, G., & Kim, S. (2013). Early attachment organization with both parents and future behavior problems: From infancy to middle childhood. *Child Development*, 84(1), 283–296. <https://doi.org/10.1111/j.1467-8624.2012.01852.x>

- Kozłowska, K., & Hanney, L. (2002). The network perspective: An integration of attachment and family systems theories. *Family Process*, 41(3), 285–312. <https://doi.org/10.1111/j.1545-5300.2002.41303.x>
- Ladd, G. W., & Profilet, S. M. (1996). The Child Behavior Scale: A teacher-report measure of young children's aggressive, withdrawn, and prosocial behaviors. *Developmental Psychology*, 32(6), 1008–1024. <https://doi.org/10.1037/0012-1649.32.6.1008>
- *Laurent, H. K., Kim, H. K., & Capaldi, D. M. (2008). Prospective effects of interparental conflict on child attachment security and the moderating role of parents' romantic attachment. *Journal of Family Psychology*, 22(3), 377–388. <https://doi.org/10.1037/0893-3200.22.3.377>
- Lakens, D. (2017). Equivalence tests: A practical primer for t tests, correlations, and meta-analyses. *Social Psychological and Personality Science*, 8(4), 355–362. <https://doi.org/10.1177/1948550617697177>
- Lamb, M. E. (1978). Qualitative aspects of mother- and father-infant attachments. *Infant Behavior and Development*, 1, 265–275. [https://doi.org/10.1016/S0163-6383\(78\)80038-1](https://doi.org/10.1016/S0163-6383(78)80038-1)
- Lehman, E. B., Denham, S. A., Moser, M. H., & Reeves, S. L. (1992). Soft object and pacifier attachments in young children: The role of security of attachment to the mother. *Child psychology & psychiatry & allied disciplines* (Vol. 33, Issue 7, pp. 1205–1215). Pergamon Press. <https://doi.org/10.1111/j.1469-7610.1992.tb00939.x>
- Lyons-Ruth, K. (1996). Attachment relationships among children with aggressive behavior problems: The role of disorganized early attachment patterns. *Journal of Consulting and Clinical Psychology*, 64(1), 64–73.
- Madigan, S., Atkinson, L., Laurin, K., & Benoit, D. (2013). Attachment and internalizing behavior in early childhood: A meta-analysis. *Developmental Psychology*, 49(4), 672–689. <https://doi.org/10.1037/a0028793>
- Madigan, S., Bakermans-Kranenburg, M. J., Van IJzendoorn, M. H., Moran, G., Pederson, D. R., & Benoit, D. (2006). Unresolved states of mind, anomalous parental behavior, and disorganized attachment: A review and meta-analysis of a transmission gap. *Attachment & Human Development*, 8(2), 89–111. <https://doi.org/10.1080/14616730600774458>
- Main, M. (2000). The organized categories of infant, child, and adult attachment: Flexible vs. inflexible attention under attachment-related stress. *Journal of the American Psychoanalytic Association*, 48(4), 1055–1096; discussion 1175–1187. <https://doi.org/10.1177/00030651000480041801>
- Main, M., & Cassidy, J. (1988). Categories of response to reunion with the parent at age 6: Predictable from infant attachment classifications and stable over a 1-month period. *Developmental Psychology*, 24(3), 415.
- Main, M., & Hesse, E. (1990). Parents' unresolved traumatic experiences are related to infant disorganized attachment status: Is frightened and/or frightening parental behavior the linking mechanism? *Attachment in the preschool years: Theory, research, and intervention* (pp. 161–182). University of Chicago Press.
- Main, M., & Solomon, J. (1990). Procedures for identifying disorganized/disoriented infants during the Ainsworth Strange Situation. In M. Greenberg, D. Cicchetti, & M. Cummings (Eds.), *Attachment in the preschool years* (pp. 121–160). University of Chicago Press.
- Main, M., & Weston, D. R. (1981). The quality of the toddler's relationship to mother and to father: Related to conflict behavior and the readiness to establish new relationships. *Child Development*, 52(3), 932–940.
- McConnachie, A. L., Ayed, N., Jadva, V., Lamb, M., Tasker, F., & Golombok, S. (2020). Father-child attachment in adoptive gay father families. *Attachment & Human Development*, 22(1), 110–123 <https://doi.org/10.1080/14616734.2019.1589067>
- Moss, E., Cyr, C., & Dubois-Comtois, K. (2004). Attachment at early school age and developmental risk: Examining family contexts and behavior problems of controlling-caregiving, controlling-punitive, and behaviorally disorganized children. *Developmental Psychology*, 40(4), 519. <https://doi.org/10.1037/0012-1649.40.4.519>
- Oldehinkel, A. J., Hartman, C. A., Ferdinand, R. F., Verhulst, F. C., & Ormel, J. (2007). Effortful control as modifier of the association between negative emotionality and adolescents' mental health problems. *Development and Psychopathology*, 19(2), 523–539 <https://doi.org/10.1017/S0954579407070253>
- Olson, S. L., Sameroff, A. J., Kerr, D. C. R., Lopez, N. L., & Wellman, H. M. (2005). Developmental foundations of externalizing problems in young children: The role of effortful control. *Development and Psychopathology*, 17(1), 25–45 <https://doi.org/10.1017/S0954579405050029>
- Oosterlaan, J., Logan, G. D., & Sergeant, J. A. (1998). Response inhibition in AD/HD, CD, Comorbid AD/HD+CD, anxious, and control children: A meta-analysis of studies with the stop task. *Journal of Child Psychology and Psychiatry*, 39(3), 411–425. <https://doi.org/10.1111/1469-7610.00336>
- Pallini, S., Chirumbolo, A., Morelli, M., Baiocco, R., Laghi, F., & Eisenberg, N. (2018). The relation of attachment security status to effortful self-regulation: A meta-analysis. *Psychological Bulletin*, 144(5), 501–531. <https://doi.org/10.1037/bul0000134>
- Parker, K., & Wang, W. (2013). *Modern parenthood*. Pew research center's social & demographic trends project (p. 14).
- Perales, F., Johnson, S. E., Baxter, J., Lawrence, D., & Zubrick, S. R. (2017). Family structure and childhood mental disorders: New findings from Australia. *Social Psychiatry and Psychiatric Epidemiology*, 52(4), 423–433. <https://doi.org/10.1007/s00127-016-1328-y>
- Pleck, J. H. (2010). Paternal involvement: Revised conceptualization and theoretical linkages with child outcomes. In M. E. Lamb (Ed.), *The role of the father in child development* (5th ed., pp. 58–93). Wiley.

- R. Core Team. (2021). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing. <https://www.r-project.org/>
- Renk, K., Roberts, R., Roddenberry, A., Luick, M., Hillhouse, S., Meehan, C., Oliveros, A., & Phares, V. (2003). Mothers, fathers, gender role, and time parents spend with their children. *Sex Roles, 48*(7–8), 305–315.
- Riley, R. D., Lambert, P. C., & Abo-Zaid, G. (2010). Meta-analysis of individual participant data: Rationale, conduct, and reporting. *Bmj (Clinical Research Ed.), 340*, c221. <https://doi.org/10.1136/bmj.c221>
- Russell, L. (2020). *emmeans: Estimated Marginal Means, aka Least-Squares Means. R package version 1.4.4*. <https://CRAN.R-project.org/package=emmeans>
- Sagi-Schwartz, A., & Aviezer, O. (2005). Correlates of attachment to multiple caregivers in kibbutz children from birth to emerging adulthood: The Haifa longitudinal study. In K. E. Grossmann, K. Grossmann, & E. Waters (Eds.), *Attachment from infancy to adulthood* (pp. 165–197). Guilford Press.
- *Sagi-Schwartz, A., Lamb, M. E., Lewkowicz, K. S., Shoham, R., Dvir, R., & Estes, D. (1985). Security of infant-mother, -father, and -metapelet attachments among kibbutz-reared Israeli children. *Monographs of the Society for Research in Child Development, 50*(1–2), 257–275. <https://doi.org/10.2307/3333837>
- *Schoppe-Sullivan, S. J., Diener, M. L., Mangelsdorf, S. C., Brown, G. L., McHale, J. L., & Frosch, C. A. (2006). Attachment and sensitivity in family context: The roles of parent and infant gender. *Infant and Child Development, 15*(4), 367–385.
- Schuengel, C., Bakermans-Kranenburg, M. J., & Van IJzendoorn, M. H. (1999). Frightening maternal behavior linking unresolved loss and disorganized infant attachment. *Journal of Consulting and Clinical Psychology, 67*(1), 54–63. <https://doi.org/10.1080/02646839808404575>
- Schuengel, C., Verhage, M. L., & Duschinsky, R. (2021). Prospecting the attachment research field: A move to the level of engagement. *Attachment & Human Development, 2021*. <https://doi.org/10.1080/14616734.2021.1918449>
- Spruit, A., Goos, L., Weenink, N., Rodenburg, R., Niemeyer, H., Stams, G. J., & Colonnaesi, C. (2020). The relation between attachment and depression in children and adolescents: A multilevel meta-analysis. *Clinical Child and Family Psychology Review, August*. <https://doi.org/10.1007/s10567-019-00299-9>
- Sroufe, L. A., Egeland, B., Carlson, E., & Collins, W. A. (2005). *The development of the person: The Minnesota study of risk and adaptation from birth to adulthood*. Guilford.
- *Steele, H., Steele, M., & Fonagy, P. (1996). Associations among attachment classifications of mothers, fathers, and their infants. *Child Development, 67*(2), 541–555. <https://doi.org/10.1111/j.1467-8624.1996.tb01750.x>
- Stewart, L. A., Clarke, M., Rovers, M., Riley, R. D., Simmonds, M., Stewart, G., & Tierney, J. F., & PRISMA-IPD Development Group (2015). Preferred reporting items for a systematic review and meta-analysis of Individual Participant Data: The PRISMA-IPD statement. *Jama, 313*(16), 1657–1665. <https://doi.org/10.1001/jama.2015.3656>
- Suess, G. J., Grossmann, K. E., & Sroufe, L. (1992). Effects of infant attachment to mother and father on quality of adaptation in preschool: From dyadic to individual organisation of self. *International Journal of Behavioral Development, 15*(1), 43–65.
- van IJzendoorn, M. H., Sagi, A., & Lambermon, M. W. E. (1992). The multiple caretaker paradox: Data from Holland and Israel. *New Directions for Child and Adolescent Development, 1992*(57), 5–24. <https://doi.org/10.1002/cd.23219925703>
- Verhage, M. L., Fearon, R. M. P., Schuengel, C., van IJzendoorn, M. H., Bakermans-Kranenburg, M. J., Madigan, S., Roisman, G. I., Oosterman, M., Behrens, K. Y., Wong, M. S., Mangelsdorf, S., Priddis, L. E., Brisch, K.-H., & Collaboration on Attachment Transmission Synthesis (2018). Examining ecological constraints on the intergenerational transmission of attachment via individual participant data meta-analysis. *Child Development, 89*(6), 2023–2037. <https://doi.org/10.1111/cdev.13085>
- Verhage, M. L., Schuengel, C., Duschinsky, R., van IJzendoorn, M. H., Fearon, R. M. P., Madigan, S., Oosterman, M. (2020). The Collaboration on Attachment Transmission Synthesis (CATS): A move to the level of Individual-Participant-Data meta-analysis. *Current Directions in Psychological Science, 0963721420904967*. <https://doi.org/10.1177/0963721420904967>
- *Volling, B. L., Yu, T., Gonzalez, R., Kennedy, D. E., Rosenberg, L., & Oh, W. (2014). Children's responses to mother-infant and father-infant interaction with a baby sibling: Jealousy or joy? *Journal of Family Psychology, 28*(5), 634–644. <https://doi.org/10.1037/a0037811>
- Waters, E., & Deane, K. E. (1985). Defining and assessing individual differences in attachment relationships: Q-methodology and the organization of behavior in infancy and early childhood. *Monographs of the Society for Research in Child Development, 50*(1–2), 41–65. <https://doi.org/10.2307/3333826>

SUPPORTING INFORMATION

Additional supporting information may be found in the online version of the article at the publisher's website.

How to cite this article: Dagan, O., Schuengel, C., Verhage, M. L., Van IJzendoorn, M. H., Sagi-Schwartz, A., Madigan, S., Duschinsky, R., Roisman, G. I., Bernard, K., Bakermans-Kranenburg, M., Bureau, J.-F., Volling, B. L., Wong, M. S., Colonnesi, C., Brown, G. L., Eiden, R. D., Fearon, R. M. P., Oosterman, M., Aviezer, O., Cummings, E. M. & The Collaboration on Attachment to Multiple Parents and Outcomes Synthesis (2021). Configurations of mother-child and father-child attachment as predictors of internalizing and externalizing behavioral problems: An individual participant data (IPD) meta-analysis. *New Directions for Child and Adolescent Development*, 2021, 67–94. <https://doi.org/10.1002/cad.20450>

Grandmothers are part of the parenting network, too! A longitudinal study on coparenting, maternal sensitivity, child attachment and behavior problems in a Chinese sample

Xi Liang¹ | Yige Lin¹ | Marinus H. Van IJzendoorn^{1,2} | Zhengyan Wang¹

¹ Research Center for Child Development, Beijing Key Laboratory of Learning and Cognition, School of Psychology, Capital Normal University, Beijing, China

² Research Department of Clinical, Education and Health Psychology, Faculty of Brain Sciences, University College London, London, UK

Correspondence

Marinus H. Van IJzendoorn and Zhengyan Wang, School of Psychology, Capital Normal University, 23 Baiduizi Jia, Haidian, Beijing, 100048, China.
Email: marinusvanijzendoorn@gmail.com and wangzhengyan@cnu.edu.cn

Funding information

National Natural Science of China, Grant/Award Number: 31971006; General Project of Science and Technology Plan of Beijing Municipal Education Commission, Grant/Award Numbers: KM20201002820, KM201910028003

Abstract

Grandmothers are important in Chinese families. This study explored the early emerging mother-grandmother-infant network and its association with child's socioemotional development in multi-generational families in a non-WEIRD country. The analytic sample included 60 children (T1: $M_{\text{age}} = 6.5$ months) and their caregivers residing in Beijing. Measures used were the Strange Situation Procedure (SSP), the Lausanne Trilogue Play (LTP), the Maternal Behavior Q-Sort (MBQS), and the Infant-Toddler Social and Emotional Assessment. Structural equation and path modeling revealed that (1) more grandmaternal neutral/watching coparenting behaviors at the first assessment were related to more secure infant-mother attachment relationships at the second assessment (T2: $M_{\text{age}} = 1$ year); (2) maternal sensitivity at T2 was a partial mediator between earlier undermining and neutral/watching coparenting behaviors and young children's

This is an open access article under the terms of the Creative Commons Attribution-NonCommercial-NoDerivs License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.

© 2021 The Authors. *New Directions for Child and Adolescent Development* published by Wiley Periodicals LLC.

externalizing problems at the final assessment (T3: $M_{\text{age}} = 2$ years). Findings are discussed in terms of the roles played by mother-grandmother coparenting network in the children's socioemotional development.

KEYWORDS

attachment, coparenting, externalizing problems, grandmothers, internalizing problems, Lausanne Trilogue Play, Strange Situation Procedure

1 | INTRODUCTION

Infants' early dyadic experience in a relational network with parents and caregivers has been widely recognized to play an important role in children's socioemotional development (Bakermans-Kranenburg, 2021; Dagan & Sagi-Schwartz, 2020; Van IJzendoorn et al., 1992). In addition, coparenting receives increasing attention as research has suggested that it predicts children's adjustment in unique ways (McHale & Sirotkin, 2019). Coparenting usually refers to a shared activity and responsibility between two caregivers for the care and raising of their child(ren) (McHale, 2007). Most coparenting studies include Western families from WEIRD countries (Henrich et al., 2010) and mainly focus on the mother-father-child network or "triangle" (Teubert & Pinguart, 2010), whereas mother-grandmother coparenting is a common phenomenon in most Asian cultures. In the current longitudinal study, we explore for the first time the associations between observations of mother-grandmother-infant network and child socioemotional development in the large but understudied Chinese culture.

From the perspective of intergenerational solidarity, the mutuality of support between grandparents and adult children may promote intergenerational cohesion (Bengston & Schrader, 1982). In addition, Chinese grandparents tend to consider the well-being of the family before their own interests (Goh, 2006; Goh & Kuczynski, 2010), and they are often willing to put aside their own lives to support their adult children. This is also consistent with the Confucian value of filial piety that governed family relationships in China for thousands of years (F. Chen et al., 2011). In the Confucian system, both the roles and the duties of two generations are connected through mutual interdependence (Hwang, 1999). In large Chinese cities (e.g., Beijing), well-educated and highly skilled individuals are encouraged to stay and pursue better career development opportunities. In this context of fierce competition and economic pressures, grandparents temporarily or permanently move to the large city, live with their adult children, and provide childcare, not only because of cultural expectation, but also to provide instrumental and potentially emotional support to their offspring. This is evident in both domestic and internationally migrating Chinese families (Qi, 2018; Zhu et al., 2019).

A survey indicated that Chinese fathers who live with children aged 2 and younger spent only 0.73 h a day on care in 2017, whereas mothers or grandparents spent more than 3 h per day on childcare (Du et al., 2018). According to recent data collected in the China Longitudinal Aging Social Survey (CLASS), 60% of the elderly were taking care of their grandchildren in 2014, and half of them were providing care more than 9 h a day (Song et al., 2018). Grandmothers play a pivotal role in urban Chinese families, and the coparenting dynamics operative in parent-grandparent-child network, parent-child relationship and children's socioemotional development have become an issue of increasing attention (Li &

Liu, 2019; Li & Liu, 2020). Given that grandmaternal involvement usually begins from baby's birth in China, understanding the mother-grandmother-infant network during infancy is important, without denying the importance of fathers in the Chinese context.

In Western cultures, coparenting of mothers and *maternal* grandmothers has been studied most frequently and this rather exclusive focus on matrilineal caregivers might reflect a skewed distribution of tasks and responsibilities in child rearing with larger roles for the mothers and their mothers (Bakermans-Kranenburg et al., 2019; Barnett et al., 2012; Daly & Perry, 2017). In the traditional Chinese patrilineal kinship system, however, women are under the tutelage of male kin throughout their lifetime, in particular through the three obediences (“三从”), their father when unmarried, their husband within marriage, and their son in their old age (Pang-White, 2013). Taking care of grandchildren has been consequently seen as a responsibility of the *paternal* grandparents who live in the same household or in close proximity, and in the past maternal grandparents were not expected to contribute as much (Ng & Wang, 2019). In the context of rapid social change, for example, the implementation of the “One-Child Policy” and the rapid economic development since the 1970s, C. Zhang et al. (2019) revealed however that maternal grandmothers have become more involved in childcare than in previous generations, especially in the contemporary urban “4-2-1 family” (four grandparents, two parents, and one child), certainly a rather extended network of relationships woven around the child.

McHale (1995) identified two dimensions of coparenting relationships between mothers and fathers, *supportive* coparenting, in which mother and father support each other in their caregiving and parenting decisions, and *undermining* coparenting, in which one or both caregivers actively undermine their partner's parenting. We assume that this differentiation could also be applied to the coparenting alliance between mothers and grandmothers (McHale et al., 2013). Moreover, mother-grandmother coparenting may involve conflicting expectations in which grandparents are expected to “be there” while at the same time not to “interfere” (Mason et al., 2007; Thomas, 1990). Hoang and Kirby (2020) also indicated that in Asian cultures overcontrol and overinvolvement from the grandparents might be a major issue contributing to potential conflict and tension in the coparenting relationship. Thus, a third possible element, *neutral/watching*, was added in this study to capture the moments of “be there” but not “interfere.”

There have been only few empirical studies of mother-grandmother coparenting during early childhood in China. Three recent studies highlighted the contribution of the harmonious parent-grandparent coparenting relationship (higher level of coparenting agreement, closeness and support, and lower level of coparenting conflict and undermining) to the parent-preschooler relationship and preschooler's socioemotional outcomes (Li & Liu, 2019; Li & Liu, 2020; Li et al., 2020). However, taking care of an infant instead of a preschooler is a “24/7” job, whether by a parent or by a grandparent who is on call; thus, the coparenting dynamics operative in parent-grandparent-infant network may be different from the preschooler studies. In the somewhat similar and interdependent Turkish culture (see the cultural distance between Turkey and China on child rearing values computed by Muthukrishna et al., 2020), Salman-Engin et al. (2018) examined mothers and infants playing together with grandmothers in Turkish families. They found that grandmothers tried to draw attention and showed more distracting behaviors to infants and less watching/not affectively engaged behaviors in the triangle when compared with mothers. Based on these results, we expected that Chinese grandmothers may display similar patterns of triadic behavior in their relational network. Moreover, Salman-Engin et al. (2018) also revealed that the coparental network involving maternal grandmothers was characterized by significantly higher family warmth than when the coparental network involved paternal grandmothers. We expected this difference between maternal and paternal grandmothers to be present in Chinese families as well.

From a family system perspective on attachment, family relationships at the triadic level (mother-grandmother-child) may influence the quality of the attachment relationship at the dyadic level (mother-child) via direct and indirect mechanisms (Bakermans-Kranenburg, 2021; Brown et al., 2010; Dagan & Sagi-Schwartz, 2020; Van IJzendoorn et al., 1992). It is possible that infants who witness cooperative, coordinated, and supportive coparental interactions perceive their caregivers as trustworthy caregivers to whom they can turn in times of distress, danger, or illness (Fearon et al., 2006). In contrast, infants who are exposed to discordant, conflicted, and competitive coparental interactions may experience feelings of insecurity and uncertainty towards each coparent (Caldera & Lindsey, 2006). In addition, from Davies and Cummings' (1994) emotional security hypothesis it may be derived that children's repeated exposure to undermining behaviors between caregivers over time contributes to emotional insecurity, and subsequent difficulties with regulating their own emotions leading to more behavior problems (Davies & Martin, 2013). A meta-analysis of 59 studies evaluated the link between four dimensions of coparenting between mothers and fathers (cooperation, agreement, conflict, and triangulation) and children's attachment and behavior problems (Teubert & Pinquart, 2010). Based on the small but significant effects for the direct associations between coparenting and children's outcomes found in this meta-analysis, we expect coparenting behaviors of mothers and grandmothers also to be a predictor of child's socioemotional outcomes.

According to Belsky's (1984) process model of the determinants of parenting contextual sources of support and stress, the support from grandmothers with childcare might be a double-edged sword for mothers' parenting. On the bright side, the support of grandparents with childcare helps mothers to attend to their children and at the same time focus on doing well at work (Hoang & Kirby, 2020; Mustillo et al., 2021). The support that social networks provide may enhance mothers' self-esteem and parental efficacy, and consequently, increase the patience and sensitivity that mothers need in the parenting role (Leerkes & Crockenberg, 2002; Li & Liu, 2019). On the darker side, the tension and conflict in the parent-grandparent-child network may become a source of stress and disruption of mothers' parenting (Barnett et al., 2012). Mothers and paternal grandmothers come from different families and sometimes from different regions or social classes, and it might be more difficult for them to share parenting values, styles, and practices than for mothers and maternal grandmothers (C. Zhang et al., 2019). In general, conflicts about childrearing attitudes and practices between two generations in the daily interactions seem to be common, especially among well-educated and highly skilled mothers whose exposure to Western values may lead them to resist the authority of their own mother or mother-in-law. Mothers appear to feel that when differences in opinions about parenting occur, the strength of the daughter-mother bond makes the conflict negotiation an easier process (C. Zhang et al., 2019), but the competition of authority in parenting between mothers and paternal grandmothers may often result in suspicion and hostility (Zou et al., 2015).

An important component of parenting is sensitive responsiveness. Maternal sensitivity is characterized by a mother's ability to effectively notice, interpret, and respond to the child's cues and signals (Ainsworth et al., 1978/2015). It is not only central to the parenting behavior in early childhood, but it is also a key predictor of child-mother secure attachment development (De Wolff & Van IJzendoorn, 1997; Verhage et al., 2016). Despite the lack of support for the link between observed parental coparenting and maternal sensitivity in one study (Brown et al., 2010), a more recent study found that both supportive and undermining coparenting reported by parents were associated with maternal emotional availability (Kim et al., 2021), of which caregiver sensitivity is a central component (Biringen et al., 2014). Moreover, empirical studies have provided evidence for associations between maternal sensitivity and child's socioemotional outcomes (attachment: Liang et al., 2021;

externalizing problems: Xing et al., 2016) in the Chinese culture. Against this background, we also have reason to hypothesize that coparenting's impact on child's socioemotional outcomes could be indirect and mediated by the quality of dyadic caregiver-child interactions (e.g., maternal sensitivity) in the parent-grandparent-child network.

To date, there are limited studies on the direct and indirect effects of parent-grandparent coparenting on child's behavior problems. Barnett et al. found that mother's perception of supportive coparenting from grandmothers was not linked to child's behavior problems directly or indirectly via mother's positive and harsh parenting behaviors (Barnett et al., 2011), but mother-grandmother conflict presented a risk for child's behavior problems directly and indirectly via mother's negative parenting behaviors (Barnett et al., 2012). These studies indicated that the coparenting process between mother and grandparent might be more complex than that between mother and father. Noticeably, the relevant studies on parent-grandparent coparenting in Western cultures focused on high-risk families, and the results cannot be automatically extended to Chinese three-generation families. Though some researchers explored the current parent-grandparent coparenting relationship and its influence on children's socioemotional development in China, most studies are cross-sectional (Li & Liu, 2019; Xing et al., 2016). Only a few studies paid attention to the longitudinal association between the parent-grandparent co-parenting relationship and children's socioemotional development (Li et al., 2020), but they relied on self-reported coparenting, rather than observations of coparenting quality.

The present exploratory study was conceptualized to address the dearth of studies on early emerging mother-grandmother-infant network and its influence on children's socioemotional development in multigenerational families in a Chinese culture. We chose to approach this issue by systematically observing and evaluating triadic family interaction among "mother-grandmother-infant" triads. Two main research questions guided our research:

The first question asks whether there are any differences between coparenting behaviors in mother-maternal grandmother-infant network and mother-paternal grandmother-infant network, and whether there are differences between mothers' and grandmothers' coparenting behaviors. We expected more supportive coparenting behaviors and less undermining coparenting behaviors in the mother-maternal grandmother-infant network than in the mother-paternal grandmother-infant network. We also hypothesize that grandmothers exhibit higher levels of supportive, lower levels of undermining and more neutral/watching coparenting behaviors than mothers because mothers are expected to play the role of primary caregiver feeling the strains and stresses of raising a child. The second question addresses the extent to which mother-grandmother coparenting behaviors are associated with child's socioemotional outcomes (attachment, externalizing, and internalizing behaviors) and whether the relations between coparenting and child development are mediated by maternal sensitivity. We expect more supportive, less undermining and more neutral/watching coparenting behaviors to be associated with more secure infant-mother attachment and less behavior problems, (partly) mediated by higher levels of observed maternal sensitivity.

2 | METHODS

2.1 | Participants

This study was part of a longitudinal study that has been following 96 infants (54 girls) and their families from infancy to school age since 2010 (for more information, see Liang

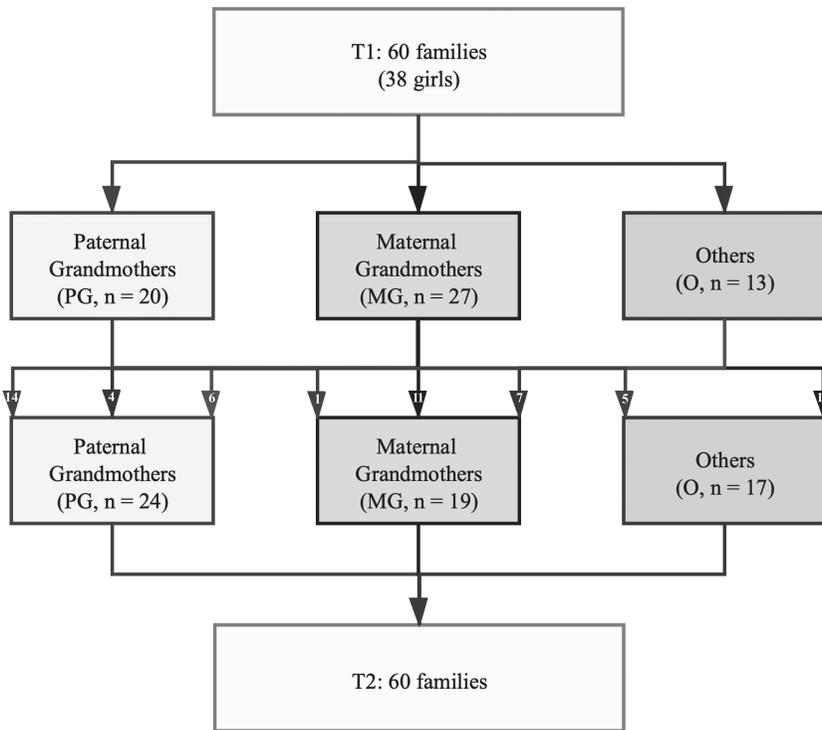


FIGURE 1 Flowchart of participants. *Note:* The numbers of the infants who were coparented by their paternal grandmothers at 6 months old were shown in the green triangles; the numbers of the infants who were coparented by their maternal grandmothers at 6 months were shown in the blue triangles; the numbers of the infant who were coparented by others at 6 months were shown in the purple triangles

et al., 2019; Wu et al., 2017). All families from the original sample allowed two research assistants to visit their homes when infants were aged 6 months old (T1: $M = 194$ days, $SD = 11.8$), 76 families were visited by two research assistants when children were aged 1 year old (T2: $M = 450.2$ days, $SD = 30.2$), 74 families visited the laboratory when children were at the same age, and 77 families visited the laboratory when children were 2 years old (T3: $M = 742.8$ days, $SD = 29.1$). In the present study, 36 children and their families were excluded from the final data analysis because in these families no female grandparents participate in any data collection. In the final 60 families (38 girls), 47 grandmothers (maternal grandmothers: 57.45%) were videotaped in family interaction tasks at T1 and 43 grandmothers (maternal grandmothers: 44.19%) were videotaped in family interaction tasks at T2. See Figure 1 for a flowchart of recruitment.

2.2 | Procedure

Home visits had two parts: (a) a triadic family interaction involving mother, grandmother, and child and (b) a dyadic infant-mother interaction. During the home visits, research assistants worked with the family to identify an area relatively free from distraction where family interactions could be videotaped. In both dyadic and triadic interactions, caregivers were instructed to play with their infant like normally they would do. The design of triadic family interaction tasks was modified from the Lausanne Trilogue Play paradigm (LTP; Fivaz-Depeursinge & Corboz-Warnery, 1999; see for a recent application of the LTP

in attachment research Witte et al., 2020). Two caregivers were arranged to sit on the floor and the infant was arranged to sit on a standard infant carrier seat suitable for the child's age. They formed an equilateral triangle to encourage face-to-face triogue interactions. The caregivers' positions faced the infant's seat and were oriented toward one another at an approximately 60° angle to facilitate their interaction with both the infant and one another. Caregivers were asked not to move the infant's seats because the cameras could not record them adequately if they moved. The entire interaction was recorded by two cameras (one for each caregiver's face). Mothers and their children engaged in a 20-min semi-structured free-play task with a standardized set of toys after the triadic family interaction (see Liang et al., 2015, 2019 for more details).

McHale (2007) and Salman-Engin et al (2018) recommended to observe the coparenting patterns at 3 months post-partum, because a crystallized coparenting pattern has often not firmly taken hold prior to 3 months. In Beijing women employees usually are allowed to have at least 98 days off after having given birth (Decree of the State Council of the People's Republic of China, 1988/2012). Accordingly, mothers and grandmothers may adjust their coparenting patterns after mothers go back to work. Thus, in this study we evaluated the coparental network at 6 months post-partum. At the 6-month assessment, research assistants brought three sets of toys, including a colorful cloth book, a color gel pen, and a piece of paper, as well as two rattle and squeaker sound toys. At the 1-year assessment, research assistants brought another three sets of toys, including a keyboard xylophone toy, a building rings stacker, and two cups of figure puppets. In each visit, they instructed mothers and grandmothers using these toys each at a time. On average, the triadic family interaction took 10 minutes.

Following Ainsworth et al. (1978/2015), the widely used Strange Situation Procedure (SSP) was implemented to evoke infant-mother attachment behaviors at the 1-year laboratory visit. Families were assigned a 2-h slot in advance of the test day, at which time a research assistant led them to the observation room from the campus of the university. Care was taken to ensure children were reasonably calm and comfortable in the lobby adjacent to the observation room, while the mother was instructed on the SSP. The research assistant then introduced the dyad to the unfamiliar room and served as timekeeper, with a second female research assistant acting as "stranger."

The mothers were asked to complete questionnaires to provide or update information on family demographics and their child's behavior problems during each data collection.

2.3 | Measures

2.3.1 | Coparenting

To evaluate triangular interactions and observed coparenting during the triadic family interaction tasks, a variation of Belsky et al.'s (1995) coparenting coding system was used. To quantify coparenting behaviors, two recordings of each family were reviewed in four steps. The first step involved identifying coparenting incidents, that is, occasions in which one caregiver initiated one activity and the other caregivers explicitly or implicitly supported and/or undermined the other caregiver's parenting goals, desires, or intentions. The second step in coding involved evaluating grandmother's coparenting behaviors as supportive, undermining or neutral/watching during the episodes of initiated activities by mother. The third step in coding involved evaluating mother's coparenting behaviors as supportive, undermining or neutral/watching during the episodes of initiated activities by grandmother. Finally, the frequencies of different coparenting behaviors within the same dimensions were aggregated. Considering the duration of some videos was more or less

than 10 minutes (range was 8.47–13.28 minutes), the frequencies of different coparenting behaviors were standardized to a period of 10 minutes.

Supportive coparenting behaviors included repeat, agree, promoting the interaction between infant and the other caregiver, supplement to enrich the activities, turning the infant's attention to the other caregiver, inviting the other caregiver to participate in the interaction, receiving the invitation from the other caregiver and simultaneously initiated behaviors with the same goals. Undermining coparenting behaviors included ignore, disagree, interference, interrupt, oppose or stop the other caregiver's ongoing behaviors, contempt, and simultaneously initiated behaviors with different goals. Neutral/watching behaviors meant one caregiver being engaged in the task, but not performing any coparenting initiatives (e.g., one caregiver is quietly watching the interaction between infant and the other caregiver). For 30 of families, two trained coders coded the behaviors independently. This allowed for verification of inter-rater reliability, which was found to be satisfactory, with average intraclass correlation ICC = 0.88.

2.3.2 | Maternal sensitivity

Maternal sensitivity was assessed using the Maternal Behavior Q-Sort (MBQS) based on the dyadic interaction tasks during each visit by two graduate students. Per standard guidelines (Pederson et al., 2009), the 72 items of the MBQS, each describing potential maternal behaviors, were first sorted into nine clusters, ranging from very similar to very unlike the observed mother's behaviors. For 20 families, two trained assistants sorted the items independently. This allowed for verification of inter-rater reliability, which was found to be satisfactory, with intraclass correlation ICC = 0.95. In a second step, this sort representing the observer's description of the mother's behavior during the visit was correlated with the standard criterion sensitivity sort provided by Pederson et al. (2009). Correlation scores vary from -1.0 (least sensitive) to 1.0 (prototypically sensitive).

2.3.3 | Infant-mother attachment relationship

SSP coding and categorization into three-way distributions were performed according to the detailed criteria of the Ainsworth coding system by reliable coders (Ainsworth et al., 1978/2015). All recorded SSPs were rated by a graduate student trained by ZW (who was trained to reliability by MHvIJ). Ten SSPs were also coded by a second coder, with inter-coder agreement $kappa = 0.83$. The child's pattern of attachment behavior was classified as insecure-avoidant (A; $n = 2$), secure (B; $n = 45$), or insecure-resistant (C; $n = 8$). All children were further categorized into one of the eight subcategories (Ainsworth et al., 1978/2015). Following previous transformations of subcategories, we computed a continuous variable of attachment security. The B3 classification received the highest score (5), A1 and C2 received the lowest score (1); and A2 and C1 received a score of (2); B4 received the score of (3), and B1 and B2 received a score of (4) (e.g., see Van der Mark et al., 2002). After we computed the continuous variable of attachment security, the intraclass correlation coefficient (ICC) between the two coders for the 10 SSPs was 0.89.

2.3.4 | Child's behavior problems

Two subscales (externalizing, 18 items; and internalizing, 26 items) of the Infant-Toddler Social and Emotional Assessment (ITSEA; Carter et al., 2003)-Chinese version (J. Zhang

et al., 2009) was used to assess children's behavior problems at 2 years of age. Mothers are asked to rate each item on a scale of 0 (not true/very rare), 1 (somewhat true/sometimes), and 2 (true/frequent) based on their children's behaviors during the past 30 days. High scores in these subscales indicate more behavior problems. The Cronbach's α were 0.81 and 0.83, respectively, which are similar to those in J. Zhang et al. (2009) translated version.

2.4 | Data analyses

First, descriptive statistics and bivariate correlations were computed. Then, the observed behaviors of coparents in the "mother-paternal grandmother-baby" and "mother-maternal grandmother-baby" conditions were contrasted using independent and paired *t*-tests at each visit. Effect sizes (Hedges' *g* for independent-samples *t*-test and Hedges's *g* for paired-samples *t*-test) were calculated on Uanboro's (2017) website. Finally, structural equation modeling was computed to separately analyze the proposed models for mother-grandmother coparenting behaviors, maternal sensitivity, infant-mother attachment, and children's behavior problems in the longitudinal study using Mplus 8.0 (Muthén & Muthén, 1998–2017). The significance of the indirect effects was determined via bootstrapping. We used the bootstrapping function to obtain 1,000 random samples to derive estimates of the direct and indirect effects and their 95% confidence intervals (CIs). Missing data was handled using the full information maximum-likelihood (FIML) method. Maternal age and infant gender were not included as control variable, because no statistically significant differences were found with behavior problems. It should be noted that the structural equation models are exploratory as the number of participants to the number of parameters in the various models does not provide sufficient statistical power for definite conclusions. Our analyses may lead to grounded hypotheses for further work in larger samples.

3 | RESULTS

3.1 | Descriptive analysis

Descriptive statistics (means, standard deviations, sample sizes, skewness, and kurtosis) and zero-order correlations for all study variables are presented in Table 1. Most of the significant correlations were in the expected direction, but only one significant correlation was noted ($r = 0.46$) between mother's supportive and undermining coparenting behaviors at T1. On basis of the correlations of the three coparenting behaviors between mothers and grandmothers at T1 and T2, two latent variables at each time point, coparenting-supportive and coparenting-undermining, were estimated by mothers' coparenting behaviors and grandmothers' coparenting behaviors, respectively.

3.2 | Coparenting behaviors across mother-paternal grandmother-infant network and mother-maternal grandmother-infant network

Paternal and maternal grandmothers. Multiple independent *t*-tests contrasting grandmothers' coparenting behaviors during the interaction revealed no significant differences between paternal and maternal grandmothers' group in supportive, undermining, or neutral/watching behaviors at T1 and T2. Furthermore, in analyses of maternal coparenting

TABLE 1 Descriptive statistics and bivariate correlations for all study variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
<i>T1: Six months old</i>																
1. M: Supportive coparenting	1															
2. M: Undermining coparenting	0.46**	1														
3. M: Neutral/watching coparenting	-0.10	0.02	1													
4. G: Supportive coparenting	0.34*	0.07	-0.39**	1												
5. G: Undermining coparenting	0.30*	0.45**	0.08	0.02	1											
6. G: Neutral/watching coparenting	-0.061**	-0.63**	-0.20	-0.31*	-0.39**	1										
<i>T2: One year old</i>																
7. M: Supportive coparenting	0.35*	0.00	0.17	0.17	0.09	-0.23	1									
8. M: Undermining coparenting	0.28	0.35*	-0.19	0.23	0.03	-0.25	0.12	1								
9. M: Neutral/watching coparenting	0.04	0.18	0.07	-0.17	0.20	-0.09	-0.06	-0.15	1							

(Continues)

TABLE 1 (Continued)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
10. G: Supportive coparenting	0.12	-0.11	-0.08	0.48**	-0.12	-0.21	0.42**	0.33*	-0.41**	1						
11. G: Undermining coparenting	0.45*	0.24	0.01	0.08	0.25	-0.25	0.19	0.24	-0.19	0.09	1					
12. G: Neutral/watching coparenting	-0.26	0.07	0.12	-0.31	-0.14	0.18	-0.51**	-0.38*	-0.25	-0.37*	-0.28	1				
13. Maternal sensitivity	-0.14	-0.35*	0.33*	-0.19	0.05	0.25	-0.06	-0.08	0.34*	-0.16	-0.34*	0.08	1			
14. Infant-Mother attachment	-0.24	-0.16	-0.01	-0.14	-0.02	0.38*	0.01	-0.01	0.06	-0.27	-0.16	0.29	0.28*	1		
<i>T3: Two years old</i>																
15. Externalizing problems	-0.02	-0.25	0.03	0.05	0.07	-0.12	-0.11	-0.14	-0.02	0.15	0.02	-0.16	-0.33*	-0.22	1	
16. Internalizing problems	-0.37*	-0.30	0.38*	-0.10	-0.25	0.07	0.22	0.06	-0.13	0.25	-0.02	0.05	0.20	0.06	-0.01	1
Mean	22.89	15.84	52.22	37.59	18.92	175.58	22.69	12.16	114.68	28.47	13.11	183.44	0.70	3.69	48.26	48.94
SD	10.83	10.84	62.24	17.48	11.21	124.92	14.10	6.71	76.26	12.91	6.09	95.30	0.14	1.26	8.87	8.61
<i>n</i>	46	46	46	46	46	46	44	44	44	44	44	44	56	55	53	53
Skewness	0.13	1.30	1.86	0.59	0.40	0.55	1.32	0.35	1.15	0.49	0.35	0.72	-0.86	-1.00	0.44	0.09
Kurtosis	-0.79	1.72	4.16	0.03	-0.75	-0.68	3.12	-1.13	1.84	-0.48	0.15	-0.07	0.23	0.05	-0.29	-0.33

Note: M, mother; G, grandmother.

* $p < 0.05$.** $p < 0.01$.

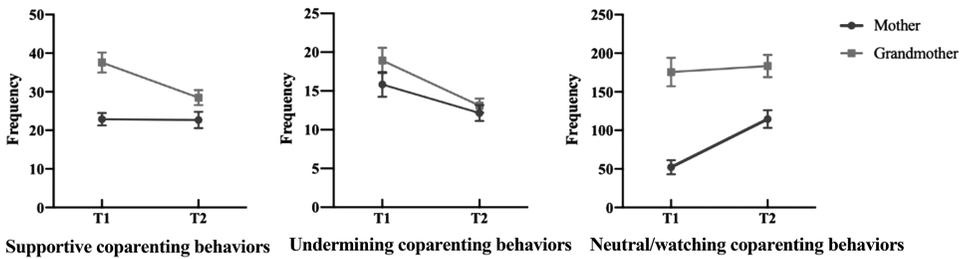


FIGURE 2 Frequency of different coparenting behaviors observed in the triadic family interaction tasks from 6 months to 1 year old. *Note:* At T1, $n = 47$ (paternal grandmother = 20, maternal grandmother = 27); At T2, $n = 43$ (paternal grandmother = 24, maternal grandmother = 19)

behaviors to paternal grandmothers and maternal grandmothers during the interaction at T1 and T2 revealed no significant differences either, except for maternal supportive coparenting behaviors to maternal grandmother that occurred significantly more often than to paternal grandmother at T1 [$t(45) = 2.27, p < 0.05$, Hedges' $g = 0.73$]. Because of the small numbers of families involved in each of the networks we decided to merge the two sets, also because the comparisons between paternal and maternal grandmothers would not survive Bonferroni corrected tests.

3.3 | Differences in behavior among coparents

Grandmothers and mothers. Multiple paired t -tests contrasting coparenting behaviors during the interactions revealed significant differences between mothers and grandmothers as coparents in support and neutral/watching at both T1 and T2. Grandmothers as coparents when compared to mothers as coparents were more likely to support mothers' initiations [$t_{T1}(45) = -6.13, p < 0.01$, Hedges' $g = -1.10, t_{T2}(43) = -2.63, p < 0.05$, Hedges' $g = -0.42$, respectively]. In addition, grandmothers as coparents when compared to mothers as coparents were more likely to be neutral/watching [$t_{T1}(45) = -5.58, p < 0.01$, Hedges' $g = -1.23, t_{T2}(43) = -3.35, p < 0.01$, Hedges' $g = -0.78$, respectively]. There were no significant differences between mothers and grandmothers for undermining coparenting behaviors. See Figure 2 for the frequency of different coparenting behaviors during triad interactions across time.

3.4 | Direct and indirect effect analysis

The structural equation modeling for supportive coparenting is presented in Figure 3. The model fitted the data adequately [$\chi^2(13) = 14.28, p = 0.35, CFI = 0.96, TLI = 0.91, RMSEA = 0.04, SRMR = 0.08$]. The results did not support the hypothesis that supportive coparenting behavior at 6 months old would be associated with maternal sensitivity and infant-mother attachment at 1 year old; and supportive coparenting behavior at 1 year old was not associated with behavior problems at 2 years old. In addition, our expectation was not supported that the maternal sensitivity at 1 year old would mediate links between supportive coparenting behavior and children's attachment security with mothers and behavior problems. Table 2 presents the estimated values and 95% CIs of path coefficients for three indirect paths. Figure 3 presents the standardized point estimates and 95% CIs of path coefficients for direct paths.

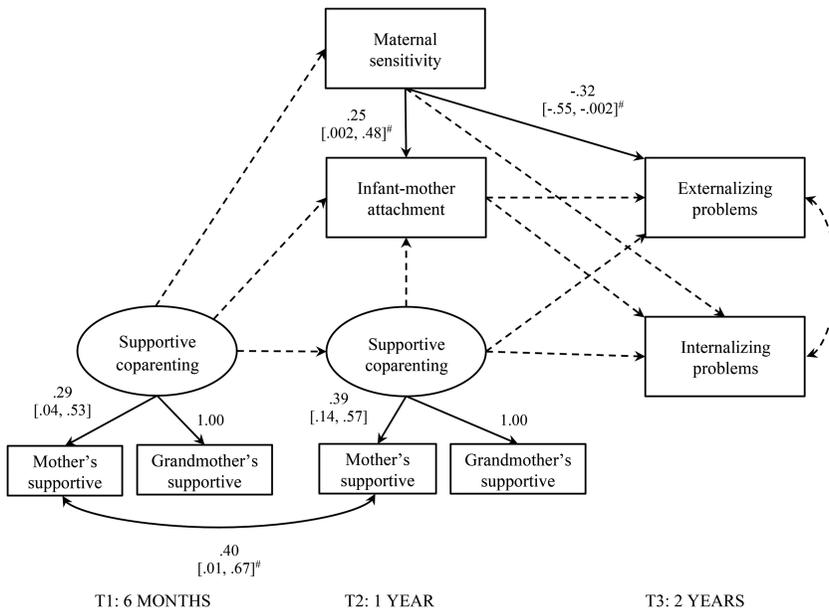


FIGURE 3 Structural model for mother-grandmother supportive coparenting behaviors, maternal sensitivity, infant-mother attachment, and child's behavior problems. Note: [#]90% CIs

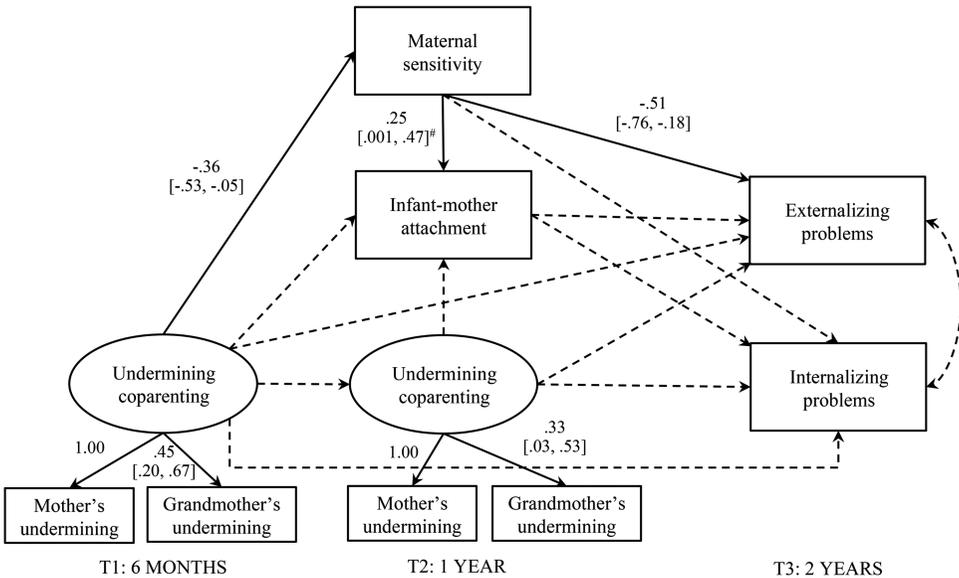


FIGURE 4 Structural model for mother-grandmother undermining coparenting behaviors, maternal sensitivity, infant-mother attachment, and child's behavior problems. Note: [#]90% CIs

The structural equation modeling for undermining coparenting is presented in Figure 4 and fitted the data adequately [$\chi^2(12) = 13.13, p = 0.36, CFI = 0.97, TLI = 0.93, RMSEA = 0.04, SRMR = 0.07$]. The results supported the hypothesis that higher undermining coparenting behavior at 6 months old was related to lower maternal sensitivity at 1 year of age ($\beta = -0.36, p < 0.01$). In addition, a total of 1,000 bootstrap samples indicated that

TABLE 2 Indirect paths from coparenting behaviors (T1) to infant-mother attachment (T2) and behavior problems (T3) via maternal sensitivity (T2)

Indirect paths	Unstandardized estimate	95% CI
1. Supportive coparenting → Maternal sensitivity → Attachment	−0.00	[−0.01, 0.00]
2. Supportive coparenting → Maternal sensitivity → EPs	0.03	[−0.01, 0.11]
3. Supportive coparenting → Maternal sensitivity → IPs	−0.03	[−0.11, 0.01]
4. Undermining coparenting → Maternal sensitivity → Attachment	−0.01	[−0.03, 0.00]
5. Undermining coparenting → Maternal sensitivity → EPs	0.15	[0.03, 0.34]
6. Undermining coparenting → Maternal sensitivity → IPs	−0.06	[−0.22, 0.03]
7. M: Neutral/watching coparenting → Maternal sensitivity → Attachment	0.02	[−0.02, 0.07]
8. M: Neutral/watching coparenting → Maternal sensitivity → EPs	−0.28	[−0.68, −0.02]
9. M: Neutral/watching coparenting → Maternal sensitivity → IPs	0.24	[−0.02, 0.72]
10. G: Neutral/watching coparenting → Maternal sensitivity → Attachment	0.01	[−0.01, 0.04]
11. G: Neutral/watching coparenting → Maternal sensitivity → EPs	−0.21	[−0.50, −0.01]
12. G: Neutral/watching coparenting → Maternal sensitivity → IPs	0.18	[−0.01, 0.46]

Note. M, mother; G, grandmother; EPs, externalizing problems; IPs, internalizing problems. Bold indicates the significant indirect paths.

95% CI for the indirect effect of the maternal sensitivity at 1 year between the undermining coparenting behavior at 6 months old and children's externalizing problems at 2 years did not include zero (95% CI: 0.03, 0.34), thus indicating this indirect effect was statistically significant. These results showed that more undermining coparenting behaviors at 6 months were associated with children's higher levels of externalizing problems at 2 years old indirectly, via lower maternal sensitivity at 1 year old. Table 2 presents the estimated values and 95% CIs of path coefficients for three indirect paths. Figure 4 presents the standardized point estimates and 95% CIs of path coefficients for direct paths.

The path model for neutral/watching coparenting is presented in Figure 5 and fitted the data well ($\chi^2(6) = 4.19$, $p = 0.65$, CFI = 1.00, TLI = 1.00, RMSEA = 0.00, SRMR = 0.05). The results supported the hypothesis that higher grandmothers' neutral/watch coparenting behavior at 6 months was associated with higher maternal sensitivity ($\beta = 0.33$, $p < 0.01$) and more secure infant-mother attachment ($\beta = 0.42$, $p < 0.01$) at 1 year old. In addition, a total of 1,000 bootstrap samples indicated that 95% CI for the indirect effect of the maternal sensitivity at 1 year old between the neutral/watching coparenting behavior at 6 months old and children's externalizing problems at 2 years old did not include zero (95% CI_{mother} [−0.68, −0.02]; 95% CI_{grandmother} [−0.50, −0.01]). Table 2 presents the estimated values and 95% CIs of path coefficients for three indirect paths. Figure 5 presents the standardized point estimates and 95% CIs of path coefficients for direct paths. Most of the significant

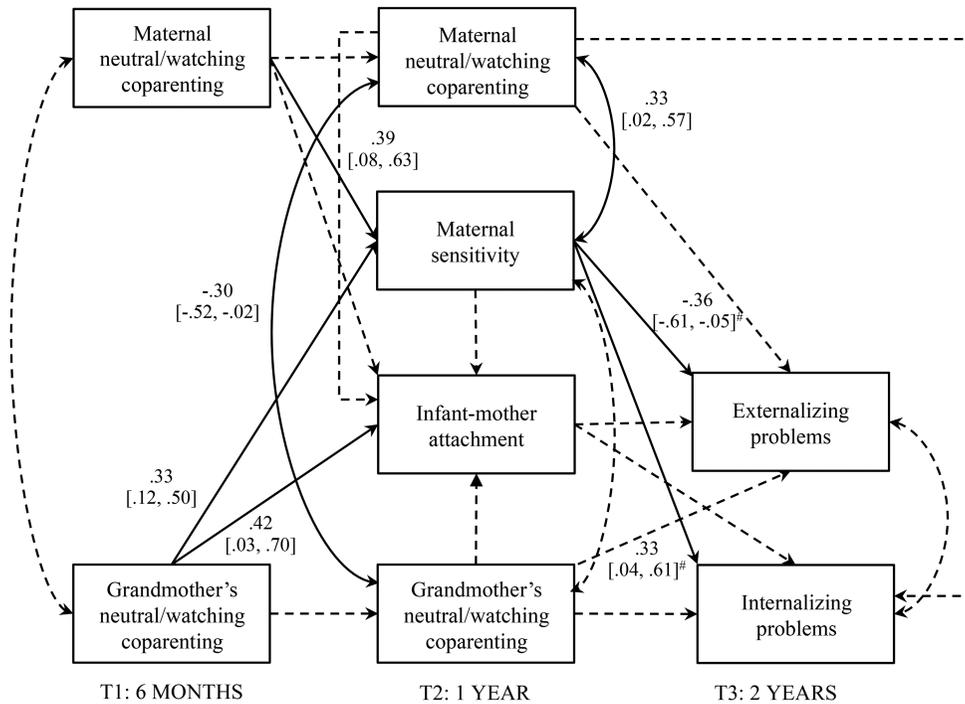


FIGURE 5 Path model for mother-grandmother neutral/watching coparenting behaviors, maternal sensitivity infant-mother attachment, and child's behavior problems. *Note:* [#]90% CIs

paths were in the expected direction, and only one path in an unexpected direction was noted ($\beta = 0.33$, $p < 0.1$) from maternal sensitivity at T2 to child's internalizing problems at T3 but this path was not significant at the conventional $p < 0.05$ level.

4 | DISCUSSION

The first aim of this study was to explore the differences between coparenting behaviors in mother-maternal grandmother-infant network and mother-paternal grandmother-infant network, and to examine the differences in how Chinese mothers and grandmothers engage in triangular interactions with each other. The second aim was to clarify the associations between mother-grandmother coparenting behaviors and children's socioemotional development, testing the mediating role of maternal sensitivity between coparenting and child development. To our knowledge this is the first longitudinal study to observe coparenting behaviors in parent-grandparent-child network in three-generational Chinese families in infancy.

Concerning the first question our study suggests that a bilateral pattern of grandmothers' childcare support instead of an exclusively patrilineal pattern was present in our participating families, with 57.45% and 44.19% of the observed families using maternal grandmother childcare at 6 months and 1 year old, respectively. A similar trend has been reported in other Chinese cities (Ma et al., 2011). In the comparison of coparenting behaviors across mother-paternal grandmother-infant network and mother-maternal grandmother-infant network, we only found that maternal supportive coparenting behaviors to maternal grandmother occurred more often than to paternal grandmother at six months.

Although both maternal and paternal grandmothers played with their grandchild in a cooperative way in the presence of the mothers suggesting family harmony, mothers may feel a somewhat greater degree of intimacy with their own mothers, especially during the early stage of coparenting relationship. These results are in line with previous research in Vietnamese and Turkish families (Hoang et al., 2020; Salman-Engin et al., 2018). A Chinese saying states that “everything will flourish if the family is in harmony” and this might influence mostly grandmothers who were born in the 1950s or 1960s. Thus, grandmothers seem likely to maintain family harmony by practicing tolerance and avoiding confrontation (Qi, 2018), and young mothers would consciously reduce conflict with grandmothers due to filial piety that is deeply rooted in Chinese society (Cheng & Chan, 2006).

It should be noted that when infants were six months old mothers who performed more supportive behaviors also tended to exhibit more undermining behaviors in the triadic interactions. However, a few months later this behavioral pattern disappeared, and it was not observed in grandmothers. Since parents may often experience the simultaneous presence of contradictory emotions regarding grandmother's involvement (Zartler et al., 2021), during the earlier stage of coparenting it might be difficult for mothers to develop effective strategies to deal with these ambivalent feelings. An alternative interpretation might be that in those families in which coparenting behaviors occur at high frequency both supportive and undermining interactions may be observed at elevated levels and consequently become positively correlated.

Examining the differences in how Chinese mothers and (maternal or paternal) grandmothers engaged in triangular interactions with each other, we found that grandmothers as compared with mothers were more likely to exhibit more supportive coparenting behaviors and more neutral/watching coparenting playing a third-party role. No significant differences between mothers and grandmothers were observed for undermining coparenting behaviors. These findings are partially in line with our expectation that despite considerable time-investment by the grandmothers still the Chinese mothers firmly took their role as principal caregivers in the mother-grandmother-infant network. Our study also highlighted that grandmother seems cautious not to rock the boat in the triadic network and leave the mother in the lead. They seemed to prefer harmony in the triad and abstained as much from undermining interactions as the mothers did.

Concerning the second question about the role of the coparenting network in shaping child socioemotional development we found that indeed coparenting behaviors in the mother-grandmother-infant network were associated with infant-mother attachment and child externalizing problems in both direct and indirect ways. Coparenting behaviors did relate to infant-mother attachment, but unexpectedly, only more grandmothers' neutral/watching coparenting behaviors related to a more secure attachment relationship to mothers. In other words, when mothers initiated an activity with infants, more quietly watching behaviors exhibited by grandmothers had a positive association with secure infant-mother attachment. One might speculate that grandmother's leaving more room for the mother in a coparenting relationship and not actively interfering with their dyadic interactions facilitates child's emergence of more secure attachments to his or her mother.

Counterintuitively however both supportive and undermining coparenting behaviors in the attachment network did not relate to infant-mother attachment. This might be explained in two ways. On the one hand, grandmother's active and potentially interfering coparenting behaviors can be considered a distraction or disruption of infant attention to mother's initiations, regardless of being supportive or undermining of the mother's initiatives. Consequently, the developing infant-mother attachment security might benefit more from grandmothers' neutral/watching coparenting behaviors. On the other hand, grandmothers who are frequently just quietly watching the dyadic interaction between

infants and mothers might give the mother the impression that she is doing an adequate job and would like to give mothers sufficient autonomy in childcare decisions. This may stimulate the mother's feelings of parenting efficacy conducive of a secure attachment relationship with her child. This seems consistent with family systems theory suggesting that subsystems have implicit boundaries and rules of interactions established and maintained by subsystem members (Cox & Paley, 1997; Minuchin, 1985). Mother-grandmother-infant network may have more established and less permeable boundaries when grandmothers exhibit more neutral/watching coparenting behaviors.

The role of maternal sensitivity as a mediator of coparenting and its impact on child development becomes clear when we trace the influence of coparenting on child externalizing behaviors. Early neutral/ watching coparenting by mothers as well as by grandmothers were associated with more maternal sensitive interactions with the infant later in the first year which in its turn related to lower levels of externalizing problems at age 2 years. Similarly, more early undermining coparenting was associated with less maternal sensitivity later in the first year which predicted more externalizing behavior problems by the end of the second year. The positive effect of neutral/watching coparenting and the negative effect of undermining coparenting behaviors on both maternal sensitivity and children's development is consistent with the emotional security theory stating that children are vulnerable to interparental conflict as it is acutely noticed by children and leads to chronic stress with far reaching neurobiological sequelae (Cummings & Miller-Graff, 2015). Neutral/watching coparenting shows the harmony between mothers and grandmothers in the presence of the child and the absence of intergenerational conflict.

Maternal sensitivity did not play a mediating role in the association between supportive coparenting and externalizing, and supportive coparenting did not predict externalizing problems, which is not consistent with a previous study (e.g., Barnett et al., 2011) and with our expectation. One of the reasons might be that supportive coparenting can be easily misunderstood as interference and overcontrolling. As Hoang and Kirby (2020) suggested, conflict and tension between two generations might not only simply stem from disagreements about child-rearing attitudes and practices. Controlling overinvolvement from the grandparents might be another important issue contributing to the discordant, conflicted, and competitive coparental relationships. Especially levels of psychological control among the older generations were found to be rather high (Hoang et al., 2020). Thus, it is possible that from the perspective of the mothers the meaning of supportive coparenting by grandmothers is ambiguous and that some mothers may interpret grandmother's supportive coparenting behavior as interference instead of helpful. Neutral/watching coparenting behaviors seem to point unequivocally in the direction of respect for mothers' parenting competence and thus may be less easily interpreted as corrective criticism.

It should be noted that internalizing behavior problems seemed more difficult to predict than externalizing problems. We only found one significant prediction from early neutral/watching coparenting by the grandmother to higher levels of maternal sensitive interactions with the child at 1 year. But unexpectedly, higher maternal sensitivity was in its turn related to more internalizing problems at 2 years of age. We offer three speculative interpretations. First, in a previous study a U-shaped relation was found in which the lower and higher extremes of sensitivity were associated with higher levels of internalizing problems (Liang et al., 2019). Due to lack of statistical power, we could not test this possibility. Another explanation is the presence of a bidirectional relation between maternal sensitivity and children's anxious or otherwise internalizing behaviors that might call for more sensitive investment, care, and protection by the parents. And last but not least, internalizing behavior problems in infants are by their nature much more difficult to observe and report by parents compared to externalizing issues that make themselves clearly visible in

oppositional or aggressive interactions (Kok et al., 2013). Further research is needed to examine these options in more detail.

As this is work in progress some limitations of the current study also should be mentioned. Generalization of the findings may be limited because of the small and selective sample that consisted of rather highly educated, middle- to high-income families from a large metropolitan area. Would equivalent results be expected if a similar study was applied to a different population? Two large-scale studies indicated that grandparental co-residence served different functions for families depending on children's age (Riem et al., 2021) and their specific circumstances, such as family income, parental education, *hukou* status, and subjective social status (Han et al., 2020). Specifically, children in economic vulnerable families tended to benefit more from living with grandparents compared to their more privileged peers in terms of lower levels of behavior problems (Han et al., 2020). Accordingly, we expect that mother-grandmother coparenting network may play a greater role in the families with fewer resources facing economic stress. It is recommended that observational longitudinal studies like ours should be performed in a more economically diverse population to assess the generalizability of our findings.

In addition, families were observed in a limited number of interaction settings and coded by only three global and restricted coparenting dimensions. Conceptually, coparenting is a complex multidimensional construct (Feinberg, 2003; Van Egeren & Hawkins, 2004). Empirically, we know that Chinese co-resident grandmothers actively engage in a multitude of children's activities such as eating, getting to sleep, bathing, feeding, and in household activities like cleaning and preparing food (H.-M. Chen & Lewis, 2015; Leung & Fung, 2014; Low & Goh, 2015; Sandel et al., 2006). Future research should try to capture a more comprehensive phenotyping of coparenting and further explore the dynamics of mother-grandmother network in more diverse coparenting contexts. Finally, a study of coparenting in attachment networks is not complete without more emphasis on the children's active role in shaping the network interactions and relationships, and in influencing the affiliative relationship between mother and grandmother. The child-grandmother attachment is of course also a potentially important component of the multigenerational network with substantial impact on the child's socioemotional development. And conspicuously absent in our study are the fathers who might spent less time in caregiving due to long working hours but nevertheless might have a major impact on the relationships between grandmother, mother, and grandchild, for the better or the worse (Wang & Schoppe-Sullivan, 2021).

Despite such limitations, the current exploratory study contributes to the emerging literature on the role of relational networks in children's socioemotional development from the perspective of attachment theory, and it demonstrates grandmothers' important role in a Chinese cultural context. In this cultural context mother-grandmother coparenting network predicted infant-mother attachment security and children's externalizing problems. In general, the search for precursors of attachment security may need to extend beyond dyadic sensitivity. It may well be the case that "sensitive coparenting goes beyond good parenting" (Margolin et al., 2001) and also relies on the quality of interactions between the various coparents in the network. That is, the degree to which the child becomes securely attached to his or her mother may at least partly depend on a harmonious attachment relationship between coparents, emerging from the grandmother's wisdom to be a patient companion rather than a threatening intruder. In order to unravel the mechanisms underlying the development of infant-mother attachment relationship in Chinese three generational families, an exclusive focus on maternal behavior clearly is insufficient. Instead, our research highlights the importance of going beyond the mother-child dyad and even beyond the infant's attachments to multiple caregivers toward the impact of attachment

relationships between all members of the multigenerational family system when examining precursors of Chinese children's socioemotional development.

ACKNOWLEDGEMENTS

We would like to thank all the families and research assistants who have participated in the Beijing Longitudinal Study 2010 (BELONGS2010).

AUTHOR CONTRIBUTIONS

X. L. collected the data, performed the statistical analysis, interpreted the results, and drafted the manuscript. Y. L. prepared the data and drafted the manuscript. M. V. IJ. advised on the statistical analyses and helped to revise the full manuscript. Z. W. designed the study. All authors read and approved the final manuscript.

CONFLICT OF INTEREST

This was not an industry-supported study. None of the authors has any financial conflict of interest.

ORCID

Xi Liang  <https://orcid.org/0000-0002-1968-2465>

Marinus H. Van IJzendoorn  <https://orcid.org/0000-0003-1144-454X>

Zhengyan Wang  <https://orcid.org/0000-0003-0178-804X>

REFERENCES

- Ainsworth, M. D. S., Blehar, M. C., Waters, E., & Wall, S. N. (2015). *Patterns of attachment: A psychological study of the Strange Situation*. Psychology Press. (Original work published 1978)
- Bakermans-Kranenburg, M. J. (2021). The limits of the attachment network. *New Directions for Child and Adolescent Development*, 2021, 117–124. <https://doi.org/10.1002/cad.20432>
- Bakermans-Kranenburg, M. J., Lotz, A., Dijk, K. A., & Van IJzendoorn, M. (2019). Birth of a father: Fathering in the first 1,000 days. *Child Development Perspectives*, 13(4), 247–253. <https://doi.org/10.1111/cdep.12347>
- Barnett, M. A., Mills-Koonce, W. R., Gustafsson, H., Cox, M., & Family Life Project Key Investigators. (2012). Mother-grandmother conflict, negative parenting, and young children's social development in multigenerational families. *Family Relations*, 61(5), 864–877. <https://doi.org/10.1111/j.1741-3729.2012.00731.x>
- Barnett, M. A., Scaramella, L. V., McGoron, L., & Callahan, K. (2011). Coparenting cooperation and child adjustment in low-income mother-grandmother and mother-father families. *Family Science*, 2(3), 159–170. <https://doi.org/10.1080/19424620.2011.642479>
- Belsky, J. (1984). The determinants of parenting: A process model. *Child Development*, 55(1), 83–96. <https://doi.org/10.2307/1129836>
- Belsky, J., Crnic, K., & Gable, S. (1995). The determinants of coparenting in families with toddler boys: Spousal differences and daily hassles. *Child Development*, 66(3), 629–642. <https://doi.org/10.2307/1131939>
- Bengston, V., & Schrader, S. (1982). Parent-child relations. In (D. Mangen & W. Peterson Eds.), *Research instruments in social gerontology*. Vol., 2 (pp. 115–186). University of Minnesota Press.
- Biringen, Z., Derscheid, D., Vliegen, N., Closson, L., & Easterbrooks, M. A. (2014). Emotional availability (EA): Theoretical background, empirical research using the EA Scales, and clinical applications. *Developmental Review*, 34(2), 114–167. <https://doi.org/10.1016/j.dr.2014.01.002>
- Brown, G. L., Schoppe-Sullivan, S. J., Mangelsdorf, S. C., & Neff, C. (2010). Observed and reported supportive coparenting as predictors of infant-mother and infant-father attachment security. *Early Child Development and Care*, 180(1–2), 121–137. <https://doi.org/10.1080/03004430903415015>
- Caldera, Y. M., & Lindsey, E. W. (2006). Coparenting, mother-infant interaction, and infant-parent attachment relationships in two-parent families. *Journal of Family Psychology*, 20(2), 275–283. <https://doi.org/10.1037/0893-3200.20.2.275>
- Carter, A. S., Briggs-Gowan, M. J., Jones, S. M., & Little, T. D. (2003). The infant-toddler social and emotional assessment (ITSEA): Factor structure, reliability, and validity. *Journal of Abnormal Child Psychology*, 31(5), 495–514. <https://doi.org/10.1023/a:1025449031360>
- Chen, F., Liu, G., & Mair, C. A. (2011). Intergenerational ties in context: Grandparents caring for grandchildren in China. *Social Forces*, 90(2), 571–594. <https://doi.org/10.1093/sf/sor012>
- Chen, H.-M., & Lewis, D. C. (2015). Chinese grandparents' involvement in their adult children's parenting practices in the United States. *Contemporary Family Therapy*, 37(1), 58–71. <https://doi.org/10.1007/s10591-014-9321-7>

- Cheng, S. T., & Chan, A. C. M. (2006). Filial piety and psychological well-being in well older Chinese. *Journals of Gerontology: Series B*, 61(5), 262–269. <https://doi.org/10.1093/geronb/61.5.p262>
- Cox, M. J., & Paley, B. (1997). Families as systems. *Annual Review of Psychology*, 48, 243–267. <https://doi.org/10.1146/annurev.psych.48.1.243>
- Cummings, E. M., & Miller-Graff, L. E. (2015). Emotional security theory: An emerging theoretical model for youths' psychological and physiological responses across multiple developmental contexts. *Current Directions in Psychological Science*, 24(3), 208–213. <https://doi.org/10.1177/0963721414561510>
- Dagan, O., & Sagi-Schwartz, A. (2020). Infant attachment (to mother and father) and its place in human development: Five decades of promising research (and an unsettled issue). In (J. J. Lockman & C. S. Tamis-LeMonda Eds.), *The cambridge handbook of infant development: brain, behavior, and cultural context* (pp. 687–714). Cambridge University Press.
- Daly, M., & Perry, G. (2017). Matrilateral bias in human grandmothering. *Frontiers in Sociology*, 2, 11. <https://doi.org/10.3389/fsoc.2017.00011>
- Davies, P. T., & Cummings, E. M. (1994). Marital conflict and child adjustment: An emotional security hypothesis. *Psychological Bulletin*, 116(3), 387–411. <https://doi.org/10.1037/0033-2909.116.3.387>
- Davies, P. T., & Martin, M. J. (2013). The reformulation of emotional security theory: The role of children's social defense in developmental psychopathology. *Development and Psychopathology*, 25(4pt2), 1435–1454. <https://doi.org/10.1017/s095457941300070>
- De Wolff, M. S., & Van IJzendoorn, M. H. (1997). Sensitivity and attachment: A meta-analysis on parental antecedents of infant attachment. *Child Development*, 68(4), 571–591. <https://doi.org/10.1111/j.1467-8624.1997.tb04218.x>
- Du, F., Wang, W., & Dong, X. (2018). *Shijian dou qu na'r le? Zhongguo shijian liyong diaocha yanjiu baogao [Where has time gone? Research report of Chinese time use survey]*. Chinese Social Science Press.
- Fearon, R. M. P., Van IJzendoorn, M. H., Fonagy, P., Bakermans-Kranenburg, M. J., Schuengel, C., & Bokhorst, C. L. (2006). In search of shared and nonshared environmental factors in security of attachment: A behavior-genetic study of the association between sensitivity and attachment security. *Developmental Psychology*, 42(6), 1026–1040. <https://doi.org/10.1037/0012-1649.42.6.1026>
- Feinberg, M. E. (2003). The internal structure and ecological context of coparenting: A framework for research and intervention. *Parenting: Science and Practice*, 3(2), 95–131. https://doi.org/10.1207/S15327922PAR0302_01
- Fivaz-Depeursinge, E., & Corboz-Warnery, A. (1999). *The primary triangle: A developmental systems view of fathers, mothers, and infants*. Basic Books.
- Goh, E. C. L. (2006). Raising the precious single child in urban China—An intergenerational joint mission between parents and grandparents. *Journal of Intergenerational Relationships*, 4(3), 6–28. https://doi.org/10.1300/j194v04n03_02
- Goh, E. C. L., & Kuczynski, L. (2010). Only children and their coalition of parents: Considering grandparents and parents as joint caregivers in urban Xiamen, China. *Asian Journal of Social Psychology*, 13(4), 221–231. <https://doi.org/10.1111/j.1467-839X.2010.01314.x>
- Han, W.-J., Whetung, T., & Mao, X. (2020). One roof, three generations: Grandparental co-residence and child outcomes in China. *Family Process*, 59(3), 1144–1160. <https://doi.org/10.1111/famp.12484>
- Henrich, J., Heine, S., & Norenzayan, A. (2010). Beyond WEIRD: Towards a broad-based behavioral science. *Behavioral and Brain Sciences*, 33(2–3), 111–135. <https://doi.org/10.1017/S0140525X10000725>
- Hoang, N.-P. T., Haslam, D., & Sanders, M. (2020). Coparenting conflict and cooperation between parents and grandparents in Vietnamese families: The role of grandparent psychological control and parent-grandparent communication. *Family Process*, 59(3), 1161–1174. <https://doi.org/10.1111/famp.12496>
- Hoang, N.-P. T., & Kirby, J. N. (2020). A Meta-ethnography synthesis of joint care practices between parents and grandparents from Asian cultural backgrounds: Benefits and challenges. *Journal of Child and Family Studies*, 29(3), 605–619. <https://doi.org/10.1007/s10826-019-01553-y>
- Hwang, K. (1999). Filial piety and loyalty: Two types of social identification in Confucianism. *Asian Journal of Social Psychology*, 2(1), 163–183. <https://doi.org/10.1111/1467-839x.00031>
- Kim, C. Y., Fredman, S. J., & Teti, D. M. (2021). Quality of coparenting and infant-mother attachment: The mediating role of maternal emotional availability. *Journal of Family Psychology*, <https://doi.org/10.1037/fam0000846>
- Kok, R., Linting, M., Bakermans-Kranenburg, M. J., Van IJzendoorn, M. H., Jaddoe, V. W. V., Hofman, A., Verhulst, F. C., & Tiemeier, H. (2013). Maternal sensitivity and internalizing problems: Evidence from two longitudinal studies in early childhood. *Child Psychiatry & Human Development*, 44(6), 751–765. <https://doi.org/10.1007/s10578-013-0369-7>
- Leerkes, E. M., & Crockenberg, S. C. (2002). The development of maternal self-efficacy and its impact on maternal behavior. *Infancy*, 3(2), 227–247. https://doi.org/10.1207/s15327078in0302_7
- Leung, C., & Fung, B. (2014). Non-custodial grandparent caregiving in Chinese families: Implications for family dynamics. *Journal of Children's Services*, 9(4), 307–318. <https://doi.org/10.1108/JCS04-2014-0026>
- Li, X., & Liu, Q. (2020). Parent-grandparent coparenting relationship, marital conflict and parent-child relationship in Chinese parent-grandparent coparenting families. *Children and Youth Services Review*, 109, 104733. <https://doi.org/10.1016/j.childyouth.2019.104733>

- Li, X., & Liu, Y. (2019). Parent-grandparent coparenting relationship, maternal parenting self-efficacy, and young children's social competence in Chinese urban families. *Journal of Child and Family Studies*, 28(4), 1145–1153. <https://doi.org/10.1007/s10826-019-01346-3>
- Li, X., Zhou, S., & Guo, Y. (2020). Bidirectional longitudinal relations between parent-grandparent co-parenting relationships and Chinese children's effortful control during early childhood. *Frontiers in Psychology*, 11, 152. <https://doi.org/10.3389/fpsyg.2020.00152>
- Liang, X., Liu, M., Wang, M., Yu, J., Wang, Z., & Lu, S. (2019). Infant withdrawal and behavior problems in urban Chinese toddlers: Roles of maternal sensitivity to infant distress and emerging delay ability. *Infant Mental Health Journal*, 40(2), 248–262. <https://doi.org/10.1002/imhj.21763>
- Liang, X., Wang, Z., Liu, H., Lin, Q., Wang, Z., & Liu, Y. (2015). Adult attachment status predicts the developmental trajectory of maternal sensitivity in new motherhood among Chinese mothers. *Midwifery*, 31(1), 68–73. <https://doi.org/10.1016/j.midw.2014.05.011>
- Liang, X., Wang, Z., & Yu, J. (2021). Family socioeconomic status and toddlers' social adjustment in rural-to-urban migration and urban families: The roles of maternal sensitivity and attachment security. *Psychological Development and Education*, 37(6), 792–799. <https://doi.org/10.16187/j.cnki.issn1001-4918.2021.06.05>
- Low, S. S. H., & Goh, E. C. L. (2015). Granny as nanny: Positive outcomes for grandparents providing childcare for dual-income families. Fact or myth? *Journal of Intergenerational Relationships*, 13(4), 302–319. <https://doi.org/10.1080/15350770.2015.1111003>
- Ma, C., Shi, J., Li, Y., Wang, Z., & Tang, C. (2011). Family change in urban areas of China: Main trends and latest findings. *Sociological Studies*, 2, 182–216. http://en.cnki.com.cn/Article_en/CJFDTOTAL-SHXJ201102009.htm
- Margolin, G., Gordis, E., & John, R. S. (2001). Coparenting: A link between marital conflict and parenting in two-parent families. *Journal of Family Psychology*, 15(1), 3–21. <https://doi.org/10.1037/0893-3200.15.1.3>
- Mason, J., May, V., & Clarke, L. (2007). Ambivalence and the paradoxes of grandparenting. *The Sociological Review*, 55(4), 687–706. <https://doi.org/10.1111/j.1467-954x.2007.00748.x>
- McHale, J. P. (1995). Coparenting and triadic interactions during infancy: The roles of marital distress and child gender. *Developmental Psychology*, 31(6), 985–996. <https://doi.org/10.1037/0012-1649.31.6.985>
- McHale, J. P. (2007). When infants grow up in multiperson relationship systems. *Infant Mental Health Journal*, 28(4), 370–392. <https://doi.org/10.1002/imhj.20142>
- McHale, J. P., Salman, S., Strozier, A., & Cecil, D. K. (2013). V. Triadic interactions in mother-grandmother coparenting systems following maternal release from jail. *Monographs of the Society for Research in Child Development*, 78(3), 57–74. <https://doi.org/10.1111/mono.12021>
- McHale, J. P., & Sirotkin, Y. S. (2019). Coparenting in diverse family system. In M. H. Bornstein (Ed), *Handbook of Parenting: Vol.3. Being and Becoming a Parent* (3rd edn., pp. 137–166). Routledge.
- Minuchin, P. (1985). Families and individual development: Provocations from the field of family therapy. *Child Development*, 56(2), 289–302. <https://doi.org/10.2307/112970>
- Muthén, L. K., & Muthén, B. O. (1998–2017). *Mplus user's guide* (8th edn.). Muthén & Muthén.
- Muthukrishna, M., Bell, A. V., Henrich, J., Curtin, C. M., Gedranovich, A., McInerney, J., & Thue, B. (2020). Beyond western, educated, industrial, rich, and democratic (WEIRD) psychology: Measuring and mapping scales of cultural and psychological distance. *Psychological Science*, 31(6), 678–701. <https://doi.org/10.1177/0956797620916782>
- Mustillo, S., Li, M., & Wang, W. (2021). Parent work-to-family conflict and child psychological well-being: Moderating role of grandparent coresidence. *Journal of Marriage and Family*, 83(1), 27–39. <https://doi.org/10.1111/jomf.12703>
- Ng, F. F., & Wang, Q. (2019). Asian and Asian American parenting. In (M. H. Bornstein Ed.), *Handbook of parenting: Vol.4. social conditions and applied parenting* (3rd edn., pp. 108–169). Routledge.
- Nvzhigong laodong baohu tebieguiding [Special provisions on labor protection of female], Pub. L. No. 619, *Zhonghua renmin gongheguo guowuyuanling* [Decree of the State Council of the People's Republic of China] (1988 & rev.2012). http://www.gov.cn/zwggk/2012-05/07/content_2131567.htm
- Pang-White, A. A. (2013). Zhu Xi on family and women: Challenges and potentials. *Journal of Chinese Philosophy*, 40(3–4), 436–455. <https://doi.org/10.1111/1540-6253.12051>
- Pederson, D., Moran, G., & Bento, S. (2009). *Assessing maternal sensitivity and quality of mother-infant interactions using "The Maternal Behavior Q-Sort (MBQS)"*. Pederson-Moran MBQS manual. (Unpublished manuscript). Department of Psychology, University of Western Ontario.
- Qi, X. (2018). Floating grandparents: Rethinking family obligation and intergenerational support. *International Sociology*, 33(6), 761–777. <https://doi.org/10.1177/0268580918792777>
- Riem, M. M. E., Lodder, P., Guo, J. V.-V., M, V. I. J., M, H., Bakermans-Kranenburg, M. J., & De Carli, P. (2021). Predictive models of maternal harsh parenting during COVID-19 in China, Italy, and Netherlands. *Frontiers in Psychiatry*, 12, 722453. <https://doi.org/10.3389/fpsyg.2021.722453>
- Salman-Engin, S., Sümer, N., Sağel, E., & McHale, J. (2018). Coparenting in the context of mother-father-infant versus mother-grandmother-infant triangular interactions in Turkey. *Journal of Child and Family Studies*, 27(10), 3085–3095. <https://doi.org/10.1007/s10826-018-1094-4>

- Sandel, T. L., Cho, G. E., Miller, P. J., & Wang, S.-h. (2006). What it means to be a grandmother: A cross-cultural study of Taiwanese and Euro-American grandmothers' beliefs. *Journal of Family Communication*, 6(4), 255–278. https://doi.org/10.1207/s15327698jfc0604_2
- Song, J., Wang, J., & Qin, T. (2018). A study on relationship between grandchildren care and working for Chinese elderly. *Population & Economics*, 228(3), 92–103. <https://doi.org/10.3969/j.issn.1000-4149.2018.03.009>
- Teubert, D., & Pinquart, M. (2010). The association between coparenting and child adjustment: A meta-analysis. *Parenting: Science and Practice*, 10(4), 286–307. <https://doi.org/10.1080/15295192.2010.492040>
- Thomas, J. L. (1990). The grandparent role: A double bind. *The International Journal of Aging and Human Development*, 31(3), 169–177. <https://doi.org/10.2190/80j9-fgk7-2966-qhcb>
- Uanboro, J. O. (2017). *Effect size calculators [Computer software]*. Sage. <https://effect-size-calculator.herokuapp.com/>
- Van der Mark, I. L., Bakermans-Kranenburg, M. J., & Van IJzendoorn, M. H. (2002). The role of parenting, attachment, and temperamental fearfulness in the prediction of compliance in toddler girls. *British Journal of Developmental Psychology*, 20(3), 361–378. <https://doi.org/10.1348/026151002320620299>
- Van Egeren, L. A., & Hawkins, D. P. (2004). Coming to terms with coparenting: Implications of definition and measurement. *Journal of Adult Development*, 11(3), 165–178. <https://doi.org/10.1023/b:jade.0000035625.74672.0b>
- Van IJzendoorn, M. H., Sagi, A., & Lambermon, M. W. E. (1992). The multiple caretaker paradox: Data from Holland and Israel. *New Directions for Child Development* 57, 5–24. <https://doi.org/10.1002/cd.23219925703>
- Verhage, M. L., Schuengel, C., Madigan, S., Fearon, R. M. P., Oosterman, M., Cassibba, R., Bakermans-Kranenburg, M. J., & Van IJzendoorn, M. H. (2016). Narrowing the transmission gap: A synthesis of three decades of research on intergenerational transmission of attachment. *Psychological Bulletin*, 142(4), 337–366. <https://doi.org/10.1037/bul0000038>
- Wang, J., & Schoppe-Sullivan, S. (2021). The roles of mothers' perceptions of grandmothers' gatekeeping and fathers' parenting competence in maternal gatekeeping. *Family Relations*, Advance online Publication. <https://doi.org/10.1111/fare.12569>
- Witte, A. M., Bakermans-Kranenburg, M. J., Van IJzendoorn, M. H., Szepeswol, O., & Shai, D. (2020). Predicting infant-father attachment: The role of pre- and postnatal triadic family alliance and paternal testosterone levels. *Attachment & Human Development*, 22(6), 653–667. <https://doi.org/10.1080/14616734.2019.1680713>
- Wu, M., Liang, X., Lu, S., & Wang, Z. (2017). Infant motor and cognitive abilities and subsequent executive function. *Infant Behavior and Development*, 49(11), 204–213. <https://doi.org/10.1016/j.infbeh.2017.09.005>
- Xing, S., Zhou, Q., Archer, M., Yue, J., & Wang, Z. (2016). Infant temperamental reactivity, maternal and grandparental sensitivity: Differential susceptibility for behavior problems in China. *Early Human Development*, 101(10), 99–105. <https://doi.org/10.1016/j.earlhumdev.2016.08.014>
- Zarter, U., Schmidt, E.-M., Schadler, C., Rieder, I., & Richter, R. (2021). A blessing and a curse" couples dealing with ambivalence concerning grandparental involvement during the transition to parenthood: A longitudinal study. *Journal of Family Issues*, 42(5), 958–983. <https://doi.org/10.1177/0192513X20950786>
- Zhang, C., Fong, V. L., Yoshikawa, H., Way, N., Chen, X., & Lu, Z. (2019). The rise of maternal grandmother child care in urban Chinese families. *Journal of Marriage and Family*, 81(5), 1174–1191. <https://doi.org/10.1111/jomf.12598>
- Zhang, J., Wang, H., Shi, S., Huang, X., Liu, G., Lian, G., & Shi, J. (2009). Reliability and validity of standardized Chinese version of urban infant-toddler social and emotional assessment. *Early Human Development*, 85(5), 331–336. <https://doi.org/10.1016/j.earlhumdev.2008.12.012>
- Zhu, M., Keene, D. E., & Monin, J. K. (2019). Their happiness is my happiness"—Chinese visiting grandparents grandparenting in the US. *Journal of Intergenerational Relationships*, 17(3), 311–326. <https://doi.org/10.1080/15350770.2019.1575781>
- Zou, X., Mei, Y., & Wu, Y. (2015). Causes of the conflict between mother and daughter-in-law: Using a mixed methods analysis integrating qualitative and quantitative approach. *Acta Scientiarum Universitatis Pekinensis*, 51(1), 187–194. <https://doi.org/10.13209/j.0479-8023.2015.020>

How to cite this article: Liang, X., Lin, Y., Van IJzendoorn, M. H., & Wang, Z. (2021). Grandmothers are part of the parenting network, too! A longitudinal study on coparenting, maternal sensitivity, child attachment and behavior problems in a Chinese sample. *New Directions for Child and Adolescent Development*, 2021, 95–116. <https://doi.org/10.1002/cad.20442>

REVIEW

The limits of the attachment network

Marian J. Bakermans-Kranenburg

Clinical Child & Family Studies, Vrije Universiteit, Amsterdam, The Netherlands

Correspondence

Marian J. Bakermans-Kranenburg, Clinical Child & Family Studies, Vrije Universiteit, Amsterdam, The Netherlands, Email: m.j.bakermans@vu.nl; contact@marianbakermanskranenburg.nl

Abstract

From the beginning, theories of attachment and caregiving have given rise to questions about minimum and maximum numbers of attachment figures. The child's tendency to direct attachment behavior to a specific figure rather than to whoever is nearby has led to the idea of monotropy, suggesting that a child would thrive best with one special attachment figure. From an evolutionary perspective kinship caregiving networks are more plausible as they would increase the chances of survival, and in hunter-gatherer and agricultural communities paternal care and kinship networks providing care for young children were indeed common. A recent development in cultural evolution is the invention of organized day care and children's homes and institutions. Although the attachment network may increase in size with the child's cognitive development, research on institutionalized care demonstrates that high numbers of caregivers preclude secure attachments. The limiting factor to attachment networks may however not be the number of caregivers, but the opportunities for the child to learn contingencies in social relationships that have an attachment component.

KEYWORDS

alloparents, daycare, institutionalized care, kinship networks, monotropy

This is an open access article under the terms of the Creative Commons Attribution-NonCommercial-NoDerivs License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.

© 2021 The Authors. *New Directions for Child and Adolescent Development* published by Wiley Periodicals LLC.

1 | INTRODUCTION

The famous African proverb: “It takes a village to raise a child” originates from the Nigerian Igbo culture and proverb “Oran a azu nwa”, meaning “it takes a community or village to raise a child”. Does that imply that the caregiving network is basically *unlimited*, and the more individuals feeling responsible for the caretaking of a child, the better? This raises questions about the consistency and stability of care, and whether there may be limits to the attachment network that a child can deal with. Starting with the definition of an attachment relationship and caregivers as attachment figures, we will review the ideas of monotropy and alloparenting, discuss day care and institutionalized care for children, and indicate what factors limit the attachment network as suggested by the available evidence.

2 | CAREGIVERS AS ATTACHMENT FIGURES

Central to this paper is the *size* of the attachment network, independent of its quality, although the two may be related. The question is thus not: “How many *secure* attachment relationships can a child establish?” but: Is there a *maximum to the number* of caregivers with whom the child can establish an attachment relationship? Two notions are important. First, not all caregivers are attachment figures. Caregivers serve multiple functions for children, and not all of these are attachment related. There may be many caregivers around a child, but not all of them will be part of the child’s attachment network. Second, it is helpful to be reminded of the distinction between safety and security. As noted elsewhere (Van IJzendoorn & Bakermans-Kranenburg, 2021), Bowlby (1969) distinguished between the two in an unpublished manuscript by tracing the etymology of “safe” to the Latin word “salvus”, that is, the absence of injury, and “secure” as originating from “se cura”, that is, being without a care (see Duschinsky, 2020). The primary function of attachment figures and attachment relationships is to provide safety, increasing the child’s chances for survival and reproductive fitness. In the best scenario, attachment relationships and figures also provide security. In an insecure attachment relationship, the caregiver may still provide safety even in the absence of security. When the limits of the attachment network are discussed, the focus is not on attachment security. The attachment relationships within this network may be secure or insecure.

What is an attachment relationship? Ainsworth (1989) outlined five conditions for affectional bonds: persistency over time (not transitory), specificity (not interchangeable with anyone else), emotional significance (Ainsworth notes joy on reunion—however, that seems more specific to *secure* relationships), the wish to maintain contact or proximity, dependent on age and context, and distress at involuntary separation. For attachment relationships Ainsworth phrased an additional, sixth criterion: when distressed, the individual seeks security and comfort in the relationship with the other. That does not imply that any figure to whom the child turns in times of distress is an attachment figure: The distressed child who runs to the pool attendant after being pushed under water by peers seeks safety and perhaps comfort from the pool attendant, but this fleeting relationship does not meet the five conditions of an affectional bond, and is thus not an attachment relationship.

It should be noted that these six conditions are not always considered as compelling. When Fearon and Schuengel (2021) suggest that children can rely on many individuals as lasting or temporary attachment figures, this seems at odds with the first condition for an affectional relationship (and thus also for an attachment relationship), that is, persistency over time. Indeed, foster parents or teachers may be temporary attachment figures in children’s lives. Persistency may be affected by factors such as intensity and

duration of the relationship: the dyad should have the opportunity to learn interpersonal contingencies, to come to know and predict each other's behaviors and responses. In an examination of attachment formation in foster children using a diary, foster parents reported patterns of attachment behavior within 2 months for the majority of children (Stovall-McClough & Dozier, 2004). However, in a study on previously institutionalized children with independent observation of the degree to which children had developed a preferred relationship with the adoptive parent, only a third of the children showed full differentiation of the parent from other adults at 1–3 months after adoption. Ninety percent did so 7–9 months after adoption, with children exposed to greater preadoption adversity (including more care setting changes) taking longer to form an attachment to their adoptive parents (Carlson et al., 2014). These findings point to two conclusions with regard to persistency: First, attachment formation seems to request at least some months of interaction, and second, lack of persistency of caregivers in the past may lead to longer trajectories to form new attachments—which in turn points to the salience of persistency.

3 | MONOTROPY VERSUS KINSHIP NETWORKS

The child's tendency to direct attachment behavior to a specific figure rather than to whoever is nearby (the specificity condition) has been represented and misrepresented with the term "monotropy". Bowlby used the term monotropy first in 1958, and then refers to it in the first volume of his trilogy on Attachment in 1969 (Duschinsky, 2020). In 1958 he defines monotropy as "the tendency for instinctual responses to be directed towards a particular individual or group of individuals and not promiscuously towards many" (p. 370), meaning a restriction on the individuals or groups towards whom a response is directed on the basis of experience (Hinde, 1986). The term is meant to highlight the personal significance for the child of attachment figures, who are not interchangeable with other adults. However, in 1969 Bowlby refers to monotropy omitting the second half of his own 1958 definition and he notes the bias of a child to attach himself "especially to one figure" (Bowlby, 1969/1982). Duschinsky (2020) clarifies, based on his letters where he refutes the idea of only one attachment figure as "nonsense", that Bowlby never meant to say that a child would ideally have only one attachment figure, nor a "special" attachment figure.

Nevertheless, it has been argued that from an evolutionary perspective there may be good reasons for something like monotropy (Cassidy, 2016). In case of danger, the child knows instantaneously to whom it should turn for protection, without any doubt about who is in charge or would provide the best care or protection at the moment. Moreover, the caregiver knows that he or she is the responsible one so will not hesitate or wait to respond—and when she is the biological parent, this will also maximize her inclusive fitness. These two processes, especially when acting in concert, increase the child's chances of survival. However, a caregiver that is solely responsible for the child is also a big risk, and thus evolutionary improbable. First, the death of this one and only caregiver would be deadly to the child that has no alternative caregiver. Second, a caregiver who is always "on charge" would easily be overburdened and not able to provide for the child, especially in case of more than one offspring. Sara Hrdy (2009) notes in *Mothers and Others* that it takes 13,000,000 calories to provide for a child from birth to independence. Mothers need others to do so. Indeed, the sociobiological perspective leads to the expectation that not only mothers take responsibility for childcare. Fathers would take such responsibility as well, especially if their paternity is reasonably certain, but also other close relatives such as grandparents, aunts and uncles, and older siblings would increase their inclusive fitness

by investing the care of a specific child. Allomothering is observed in most group-living primates. The benefits of alloparenting are manifold: it provides inexperienced mothers with the opportunity to practice mothering skills, allows some freedom for the mother, and increases the child's chances of survival if the mother dies (Hrdy, 1976, 2009). At the same time, children with multiple attachments may still prefer their principal attachment figure in times of stress (Bowlby, 1969/1982), which points to a hierarchy of attachment relationships.

In hunter-gatherer communities paternal care and kinship networks providing care for young children were common, including breastfeeding by non-related females (Smith, 1980). This was even more true in settled communities. When the subsistence agricultural and peasant activities were away from the home, shared care has been common. This included grandmothers, other wives of the same husbands, and older siblings (Kaye, 1962). Based on a survey in 186 non-industrial societies, Weisner and Gallimore (1977) found that only in five of them the mother was indicated as the almost exclusive caretaker of the child during infancy. In early childhood, others had important caretaking roles in 80% of these societies. These alloparents ease the caregiving burden, and make the lives of the mother easier. But is it also the more the merrier for the child? Or is there reason to believe that there is not only a minimum number of caregivers, but also a maximum?

4 | EAT AN ELEPHANT ONE BITE AT A TIME

In most of the modern western world, shared care is the rule. It may however be the case that this is easier to deal with for somewhat older children than for young infants. Evidence for that idea comes from a study in Scotland in the 1960s, that is reviewed here because of the insights in the development of attachments over time. Schaffer and Emerson (1964) report on 60 children in Glasgow who were followed throughout their first year. The families of these children lived in a working-class area in Glasgow, in tiny flats in proximity to the child's grandparents. Although the mothers in these families had the chief responsibility for child care, many of them spent the afternoon with their children in the maternal grandmother's home, with other family members providing social contact and alloparental child care.

During regular home visits, research assistants asked the mothers about their infants' behaviors when they were left alone in a room, left with other people, put down after being held, left in their pram outside a shop, left in their cot at night, etc. The mothers were asked whether, in each of these situations, the infant showed any form of protest, how intense the protest was, and to whom it was directed, that is, whose departure did elicit their protest. Seven such response-to-separation items formed what was called an "attachment scale". Attachment was thus based on protest against the separation of a specific person, although, considering Ainsworth's (1969) criteria for affectional bonds and attachment relationships, protest against an involuntary separation marks an affectional bond but is not the hallmark of attachment. In the Glasgow study, 71% of the children showed selective protests first with one person—their mother—mostly starting at around 6 months of age, and later with additional persons. 29% showed selective protests with more than one person from the first measurement. Six months later the average number of attachment figures had increased, with 22% of the children showing separation protest with only their mother, 78% with more than one person, and as many as 28% showing such protest with five or more persons (Schaffer & Emerson, 1964).

If we take separation protest as an indicator for attachment, these data indicate two things. First, at the end of the first year of life, most children seemed to have established

attachment relationships with more than one caretaker. Second, the number attachment relationships increased with the cognitive development of the child. For the development of the first attachment relationship(s), the child needs to be able to distinguish the attachment figure from other adults and to have a mental representation of the attachment figure in his or her absence (Piaget's criterion of object conservation). Having distinct representations of several different attachment figures, with accompanying expectations about behavioral do's and don'ts in each of the specific relationships, requires more complex cognitive processes and may thus only be feasible for somewhat older children. It follows that the attachment network may increase in size with the child's cognitive development. At the same time, not every caregiver is an attachment figure, and not every social relationship is an attachment relationship. The additional attachment figures were in the Glasgow study, in order of prevalence, fathers, grandparents, friends or neighbors, siblings, other relatives, or other children. Mothers were the primary attachment figures in these traditional families where only one mother had a full-time job, but the majority of children had a network of caregivers with whom they had established attachment relationships based on frequent interactions over an extended period.

Shared care is thus rather common in human history, and in many parts of the world. However, a rather recent development in cultural evolution is the invention of organized professional day care on the one hand, and children's homes and institutions for 24/7 care on the other hand.

5 | DAY CARE

For children attending day care, their parents provide continuity of care for a substantial part of their lives: evenings, nights, and weekends. Most studies indicate that day care attendance does not negatively impact the child's attachment relationships at home (e.g., NICHD Early Child Care Research Network, 1997; Howes & Spieker, 2016), that children can establish attachment relationships with their day care providers (Ahnert, Pinquart, & Lamb, 2006), and that a secure attachment relationship with the day care professional may even compensate for an insecure infant-parent attachment relationship (Van IJzendoorn et al., 1992). It has been estimated that the total number of caretakers who substantially interact with children attending day care amounts to but generally does not exceed 10 (Smith, 1980). For a young infant that may be a number exceeding the number of distinct representations the child is able to have in mind, but for 3- or 4-year-old children this number does not seem to overcharge their cognitive system. Importantly, the parents are continuous factors in the children's lives, which may make it easier for them to handle a variety of caregivers during the day (but not during the night, as practiced in kibbutzim with collective sleeping arrangements, Sagi et al., 1994). Nevertheless, high infant-caregiver ratios increase the risk of insecure attachment. In a large Israeli study, children experiencing infant-caregiver ratios of 3:1 or less were more often securely attached to their mother than children experiencing higher infant-caregiver ratios, and infants who entered center day care in the first year of life were less often securely attached than infants in individual or family care in their first year of life (Sagi et al., 2002). Moreover, in the NICHD study the number of caregivers in day care and the child-caregiver ratio were (negative) indices of the quality of child care, which in turn predicted children's developmental outcomes (Vandell et al., 2010). Thus, continuity and stability of day care providers should be among the most important ambitions of day care centers, especially for young children. The same may be true for children who due to their intellectual capacities may have difficulties dealing with several different caretakers.

6 | INSTITUTIONALIZED CARE: TOO MANY ELEPHANTS

In contrast with children attending day care, for children in residential care facilities there is no home to return to at the end of the day. The number of children worldwide that are housed in institutions is estimated at 7.5 million children (Desmond et al., 2020). A recent meta-analysis on more than 300 studies, including more than 100,000 children in 65 countries showed that growing up in an institution is associated with severe delays in physical growth, brain development, cognition, and attention; and an overrepresentation of atypical attachments (Van IJzendoorn et al., 2020). For physical growth and for head circumference, an indicator for brain development, the effect sizes were $d = 1.18$ and $d = 1.44$, respectively, indicating more than a standard deviation difference between institutionalized children and their peers. Comparison of the meta-analytic results with the findings from the Bucharest Early Intervention Project (Nelson, Fox, & Zeanah, 2014) indicates that these effects cannot be accounted for by selection mechanisms. Moreover, dose-response associations between duration of institutionalization and delays in developmental outcomes point to the devastating effects of spending time in residential care facilities, in spite of the availability of healthy food and medical care. This supports the idea that such developmental delays are associated the structural neglect that is inherent to institutional care with its multiple shifts and frequent change of caregivers (Van IJzendoorn et al., 2011).

In one of our own studies in Ukraine (Dobrova-Krol et al., 2010) children were reported to have had more than 50 caregivers before their fourth birthday, the same number as was noted by Tizard and Rees (1975) in London in the 1970s. Children at the Mitera Babies Centre in Greece had an average of 29 caregivers over a 6-month period (Stevens, 1971). In those situations, children do not thrive. Apparently, there is a maximum number of caregivers that children can deal with. The situation may be somewhat better in small group homes, such as SOS villages. However, although the number of studies on small group homes is modest, the results are mixed, and child outcomes are hardly any better than in conventional institutions (Van IJzendoorn & Bakermans-Kranenburg, 2021). The evidence showing that children recover rapidly in many (though not all) domains of development when placed in a foster or adoptive family only adds fuel to the idea that in terms of the number of caregivers “less is more”. These findings highlight the urgent need for transitions from institutional care to family-based care, and recommendations for further action on the global, national and local levels have been done (Goldman et al., 2020).

7 | CONCLUSION

Attachment networks provide havens of safety for the child in a complex and potentially dangerous world. The chances for child survival and procreation increase if the burden of caretaking is not on the shoulders of a single person, and indeed, the child is well prepared to establish a network of attachment relationships. However, a child needs to spend time with a caregiver to build up a library of shared experiences to create (feelings of) contingency with that specific caregiver. The younger a child is, the more difficult it will be to have distinct representations of different attachment figures, limiting the number of attachment relationships. The number of attachment figures may increase in size with the child's cognitive development. Having said that, research on institutionalized care clearly demonstrates that the caregiving net can be spread too wide. High numbers of caregivers preclude stability and feelings of safety.

About four decades ago, Smith (1980) estimated that the number of caretakers who substantially interact with the child in most cultures does not exceed ten, and that care

shared between up to five caretakers would not lead to problems in attachment formation. The past 40 years have not seen systematic research on the number of attachment relationships children can deal with. Doing such research should take into account the child's cognitive development and temperament. But for toddlers and school age children the pertinent question is perhaps not: "How many attachment figures is the maximum?" but a better question may be: "What social relationships have an attachment component, without being defined by this component? And what are the conditions for optimizing the quality of this attachment component?" Many relationships in children's lives are not unidimensional. A parent is not only an attachment figure, but also an educator, and sometimes a playmate. A teacher is mostly an educator, but sometimes an attachment figure. Sibling and peer relationships have attachment components that can be more or less pronounced depending on developmental stage and context. The limiting factor may not be the number of caregivers, but the number of opportunities for the child to learn contingencies, the time for relationships to become emotionally significant, the richness of experiences that fuel expectations based on persistency over time. If these conditions are met, safety and comfort in times of distress can be found in a network of such relationships.

ACKNOWLEDGEMENTS

The author was supported by a European Research Council grant (ERC AdG 669249)

CONFLICT OF INTEREST

No conflict of interest.

REFERENCES

- Ainsworth, M. D. S. (1989). Attachments beyond infancy. *American Psychologist*, *44*, 709–716
- Bowlby, J. (1958). The nature of the child's tie to his mother. *The International Journal of Psycho-analysis*, *39*(5), 350–373.
- Bowlby, J. (1969/1982) *Attachment*. Penguin, p. 249.
- Bowlby, J. (1969) *Anxiety, stress and homeostasis* (unpublished manuscript). The John Bowlby Archive, Wellcome Collections London, PP/Bow/H10.
- Carlson, E. A., Hostinar, C. E., Mliner, S. B., & Gunnar, M. R. (2014). The emergence of attachment following early social deprivation. *Development and Psychopathology*, *26*, 479–489.
- Cassidy, J. (2016). The nature of the child's ties. In Cassidy, J., & Shaver, P. R. (Eds.), *Handbook of attachment: Theory, research, and clinical applications* (3rd ed., pp. 3–24). New York: Guilford
- De Schipper, J. C., & Schuengel, C. (2010). Attachment behaviour towards support staff in young people with intellectual disabilities: Associations with challenging behaviour. *Journal of Intellectual Disability Research*, *54*, 584–596. <https://doi.org/10.1111/j.1365-2788.2010.01288.x>
- Desmond, C., Watt, K., Saha, A., Huang, J., & Lu, C. (2020). Prevalence and number of children living in institutional care: Global, regional, and country estimates. *Lancet Child & Adolescent Health*, *4*, 370–377, published online March 6. [https://doi.org/10.1016/S2352-4642\(20\)30022-5](https://doi.org/10.1016/S2352-4642(20)30022-5).
- Dobrova-Krol, N. A., Bakermans-Kranenburg, M. J., Van IJzendoorn, M. H., & Juffer, F. (2010). The importance of quality of care: Effects of perinatal HIV infection and early institutional rearing on preschoolers' attachment and indiscriminate friendliness. *Journal of Child Psychology and Psychiatry*, *51*, 1368–1376. <https://doi.org/10.1111/j.1469-7610.2010.02243.x>.
- Duschinsky, R. (2020). *Cornerstones of attachment research*. Oxford University Press.
- Fearon, P. F. & Schuengel, C. (2021). What kinds of relationships count as attachment relationships? In Thomson, R., & Berlin, L. (Eds.), *Attachment: The fundamental questions*. Guilford.
- Goldman, P. S., Bakermans-Kranenburg, M. J., Bradford, B., Christopoulos, A., Ken, P. L. A., Cuthbert, C., Duchinsky, R., Fox, N. A., Grigoras, S., Gunnar, M. R., Ibrahim, R. W., Johnson, D., Kusumaningrum, S., Agastya, N. L. P. M., Mwangangi, F. M., Nelson, C. A., Ott, E. M., Reijman, S., van IJzendoorn, M. H., ... Sonuga-Barke, E. J. S. (2020). Institutionalisation and de-institutionalisation of children II: policy and practice recommendations. *The Lancet Child & Adolescent Health*, *4*, 606–633
- Hinde (1986) *Ethology*. Fontana, p. 230.
- Howes, C., & Spieker, S. (2016). Attachment relationships in the context of multiple caregivers. In Cassidy, J., & Shaver, P. R. (Eds.), *Handbook of attachment: Theory, research, and clinical applications* (pp. 314–329). Guilford.

- Hrdy, S. B. (1976). Care and exploitation of nonhuman primate infants by conspecifics other than the mother. In Rosenblatt, J. S., Hinde, R. A., & Beer, C. (eds.), *Advances of the study of behaviour* (Vol. 6). Academic Press
- Hrdy, S. B. (2009). *Mothers and others. The evolutionary origins of mutual understanding*. Harvard University Press.
- Kaye, B. (1962). *Bringing up children in Ghana*. George Allen & Unwin.
- Nelson, C. A., Fox, N. A., & Zeanah, C. H. (2014). *Romania's abandoned children: deprivation, brain development, and the struggle for recovery*. Cambridge, MA: Harvard University Press.
- NICHD Early Child Care Research Network (1997). The effects of infant child care on infant-mother attachment security: Results of the NICHD Study of Early Child Care. *Child Development, 68*, 860–879.
- Sagi, A., Donnell, F., Van IJzendoorn, M. H., Mayseless, O., & Aviezer, O. (1994). Sleeping out-of-home in a kibbutz communal arrangement - It makes a difference for infant-mother attachment. *Child Development, 65*, 992–1004.
- Sagi, A., Koren-Karie, N., Gini, M., Ziv, Y., & Joels, T. (2002). Shedding further light on the effects of various types and quality of early child care on infant-mother attachment relationship: The Haifa Study of Early Child Care. *Child Development, 73*, 1166–1186.
- Schaffer, H. R. & Emerson, P. E. (1964). The development of social attachments in infancy. *Monographs of the Society for Research in Child Development, 29*(3), 1–77.
- Smith, P. K. (1980). Shared care of young children – Alternative models to monotropism. *Merrill-Palmer Quarterly Journal of Developmental Psychology, 26*, 371–389.
- Stevens, A. G. (1971). Attachment behaviour, separation anxiety, and stranger anxiety. In Schaffer, H. R. (Ed.), *The origins of human social relations*. Academic Press.
- Stovall-McClough, K. C., & Dozier, M. (2004). Forming attachments in foster care: Infant attachment behaviors during the first 2 months of placement. *Development and Psychopathology, 16*, 253–271. <https://doi.org/10.1017/S0954579404044505>
- Tizard, B. & Rees, J. (1975). The effects of early institutional rearing on the behaviour problems and affectional relationships of four-year-old children *Journal of Child Psychology and Psychiatry, 16*, 61–73.
- Van IJzendoorn, M. H. & Bakermans-Kranenburg, M. J. (2021). 'Tear down your institutions'. Empirical and evolutionary perspectives on institutional care in SOS Children's Villages. *American Psychologist, 76*.
- Van IJzendoorn, M. H. & Bakermans-Kranenburg, M. J. (2021). Replication crisis lost in translation? On translational reluctance and premature applications of attachment theory. *Attachment & Human Development, 23*(4), 422–437.
- Van IJzendoorn, M. H., Bakermans-Kranenburg, M. J., Duschinsky, R., Goldman, P. S., Fox, N. A., Gunnar, M. R., Johnson, D. E., Nelson, C. A., Reijman, S., Skinner, G. C. M., Zeanah, C. H., & Sonuga-Barke, E. J. S. (2020). Institutionalisation and de-institutionalisation of children I: A systematic and integrative review of evidence regarding effects on development. *The Lancet Psychiatry, 7*(8), 703–720.
- Van IJzendoorn, M. H., Palacios, J., Sonuga-Barke, E. J. S., Gunnar, M. R., Vorria, P., McCall, R. B., LeMare, L., Bakermans-Kranenburg, M. J., Dobrova-Krol, N. A., & Juffer, F. (2011). Children in institutional care: Delayed development and resilience. *Monographs of the Society for Research in Child Development, 76*(4), 8–30. <https://doi.org/10.1111/j.1540-5834.2011.00626>
- Van IJzendoorn, M. H., Sagi, A. & Lambermon, M. W. E. (1992). The multiple caretaker paradox: Data from Holland and Israel. *New Directions for Child and Adolescent Development 57*, 5–24. <https://doi.org/10.1002/cd.23219925703>
- Vandell, D. L., Belsky, J., Burchinal, M., Vandergrift, N., & Steinberg, L. (2010). Do effects of early child care extend to age 15 years? Results from the NICHD study of early child care and youth development. *Child Development, 81*, 737–756.
- Weisner, T. S. & Gallimore, R. (1977). My brother's keeper: Child and sibling caretaking. *Current Anthropology, 18*, 169–190.

How to cite this article: Bakermans-Kranenburg, M. J. (2021). The limits of the attachment network. *New Directions for Child and Adolescent Development, 2021*, 117–124. <https://doi.org/10.1002/cad.20432>

REVIEW

Admissibility of attachment theory, research and assessments in child custody decision-making? Yes and No!

Tommie Forslund  | Mårten Hammarlund  | Pehr Granqvist 

Department of Psychology, Stockholm University, Stockholm, Sweden

Correspondence

Tommie Forslund, Department of Psychology, Stockholm University, Frescati Hagväg 14, 114 19, Stockholm, Sweden.
Email: tommie.forslund@psychology.su.se

Funding information

Swedish Research Council, Grant/Award Number: 2017-03315; Swedish research Council for Health, Working Life, and Welfare, Grant/Award Number: 2017-01182

Abstract

Attachment theory, research, and assessments have become increasingly applied to settle child custody cases. We discuss such applications in relation to admissibility criteria for scientific evidence and testimony proposed by Faigman et al. (2014). We argue that attachment theory and research can provide valid “framework evidence”; group-based attachment research has yielded general principles suitable as a frame of reference for pertinent court decisions. In particular, child custody decision-making should generally be guided by research indicating that children benefit from attachment networks. In contrast, assessments of attachment quality fall short of providing valid “diagnostic evidence”; information that a specific individual/dyad is a “true” instance of a general group-level principle. In particular, such assessments do not yield valid information about whether a particular caregiver has better caregiving skills than another caregiver and will better support child development. We conclude that attachment theory and research should be admissible for framework but not for diagnostic testimony.

KEYWORDS

admissibility, attachment theory, child custody, evidence

This is an open access article under the terms of the Creative Commons Attribution-NonCommercial-NoDerivs License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.

© 2021 The Authors. *New Directions for Child and Adolescent Development* published by Wiley Periodicals LLC.

INTRODUCTION

Attachment theory and research have long held that children are able to develop attachment relationships with more than one caregiver simultaneously (e.g., Dagan & Sagi-Schwartz, 2018; van IJzendoorn et al., 1992). Yet, there are different theories concerning attachment networks, centered on whether one particular attachment relationship is of special importance to child development (Dagan & Sagi-Schwartz, 2018). Theory and research on attachment networks are brought to a head in child custody cases, where courts must decide on custody, time allocation, and overnights with non-custodial caregivers (Bacro et al., 2021). On the one hand, courts' decision-making may have important effects on children's attachment networks (Steinbach, 2019). On the other hand, theory and research regarding attachment networks could potentially contribute to child custody decision-making (Lamb, 2018).

Developments in child custody—toward individualized decision-making grounded in the best interest of the child standard—have resulted in frequent references to attachment theory and research, and attempts to assess attachment quality, to inform decision-making (Forslund et al., 2021). Such approaches are complicated for several reasons. First, attachment theory and research have been interpreted as supporting contrasting positions (for a discussion, see Lamb, 2018), and there are different scholarly opinions concerning the use of attachment assessments (George et al., 2011). Second, misunderstandings regarding attachment theory and research are common among child custody professionals (McIntosh, 2011). Third, courts often have difficulties interpreting and using social science evidence (e.g., Faigman et al., 2014, 2016; Neal et al., 2019).

Previous discussions of the use of attachment theory in child custody cases have largely been restricted to a psychological perspective, reviewing pertinent theory and research (e.g., Forslund et al., 2021). Widening that discussion, we herein examine the use of attachment theory and research, with a focus on attachment networks, in the light of admissibility criteria for scientific evidence in court (Faigman et al., 2014, 2016). This paper is divided into two major parts. In the first, we elaborate on factors that have inspired a strong interest in attachment theory in child custody. In the second, we apply Faigman et al. (2014, 2016) scientific framework and specific admissibility criteria to the use of attachment theory, research, and assessments in child custody cases.¹

1 | PART I: PROBLEMS FACING THE FAMILY COURTS

In this section, we review factors that have pushed attachment theory, research and assessments into service and have contributed to difficulties in child custody cases. We highlight difficulties associated with defining and assessing children's best interests, interpreting social science evidence in court, and misunderstandings concerning attachment networks. We conclude by outlining Faigman et al. (2014, 2016) scientific framework.

1.1 | Children's best interests and the rise of attachment theory, research, and assessments in child custody cases

Child custody decision-making has seen notable changes in many countries, from presumptions favouring one parent based on parental sex to individualized decision-making grounded in the "best interest of the child" standard (UN General Assembly, 1989). It has, however, proven difficult to define and apply the standard consistently (Emery et al., 2005).

This may partly be due to a lack of guidance in the United Nations Convention on the Rights of the Child (UNCRC) for how to interpret the standard. In fact, children's best interests may be indeterminate in practice, because evaluations must weigh a multitude of factors that can influence children, with an eye to probable long-term child development (Mnookin, 2014).

Definitional issues also have implications for assessment. Surveys have shown that a majority of child custody professionals expect evaluations to include interviews with parents and children, psychological testing of parents, and parent-child observations (Ackerman et al., 2021; Bow & Quinnell, 2001). Yet, there is no agreed-upon battery of standardized assessments, and professionals must therefore decide what information to gather, how to gather the information, and how to weigh the information (Forslund et al., 2021). Together with increased pressure to base recommendations on scientific evidence, this has led to a demand for theories with high credibility regarding caregiving, child-caregiver relationships, and child development (e.g., Bjerre et al., 2021; Skivenes & Sørsdal, 2018). This has, in turn, contributed to a notable interest in attachment theory and research, and attempts to assess attachment quality to inform child custody decision-making (McIntosh, 2011). Attachment theory may even have become a master theory to which other ways of conceiving childcare and child-caregiver relationships have become subordinated (Smith et al., 2017).

1.2 | Interpreting evidence relating to attachment theory, research, and assessments in court

Gathering and interpreting social science evidence for court use is challenging (Faigman et al., 2016). Best-practice guidelines call for empirically based methods, but many instruments used to assess custody-relevant constructs lack sufficient validity (Emery et al., 2005). Interpretation is also complicated; professionals often make scientifically unjustified claims and judges regularly admit evidence with poor scientific validity (Neal et al., 2019; Scott & Emery, 2014). In discussing such problems, scholars have emphasized a fundamental tension between what scientists typically do and what courts ask them to do (e.g., Faigman et al., 2016; Neal et al., 2019). Specifically, courts must decide whether and how knowledge from group-based research can be helpful for decision-making regarding individual cases. Faigman et al. (2014) note that these two levels are analytically separate and term the process of going from the general to the specific “group (G) to individual (i) inference” (G2i). They further argue that courts have paid too little attention to such inferences and must devise methods for how to grapple with the G2i problem.

The noted problems translate to the use of attachment theory, research and assessments (Forslund et al., 2021). For instance, there are widespread misunderstandings concerning the nature of attachment (Granqvist et al., 2017), attachment networks (Dagan & Sagi-Schwartz, 2018), and attachment assessments (van IJzendoorn, Bakermans, et al., 2018; van IJzendoorn, Steele, et al., 2018). Such misunderstandings are indeed common in child custody settings, and result in misapplications (e.g., McIntosh, 2011). Attachment theory has also been interpreted as supporting contrasting positions regarding child custody. It has sometimes been argued that the theory emphasizes the special importance of one “psychological caregiver” and cautions against early overnights with non-custodial parents (e.g., McIntosh, 2011; Tornello et al., 2013). Others have argued that the theory supports maternal custody, as reflected by the Tender Years Doctrine (e.g., Hacker & Halperin Kadari, 2013). In yet other instances it has been argued that the theory supports joint custody, alternating residence and overnight stays (Lamb, 2018; Warshak, 2014). Furthermore, there

are different opinions concerning the use of assessments of attachment quality in child custody cases. Whereas some scholars have argued that such assessments can enhance evaluations (e.g., George et al., 2011; McIntosh, 2011), others have cautioned against their use in such high-stakes situations (e.g., Granqvist, 2016; van IJzendoorn, Bakermans, et al., 2018; van IJzendoorn, Steele, et al., 2018).

A consensus statement recently outlined three principles that may guide family court professionals: the child's need for familiar, non-abusive caregivers; the value of continuity of good-enough care; and the benefits of attachment networks (Forslund et al., 2021). The consensus statement should be useful but there is a need for further elaboration. Most notably, the consensus statement mainly had a psychological perspective, reviewing pertinent theory and research, and discussing assessments of attachment quality in relation to psychometrics properties. However, as discussed in the next section, admissibility criteria in law go beyond psychometrics.

1.3 | Framework and diagnostic science, admissibility criteria

Faigman et al. (2014, 2016) argue that admissibility of scientific evidence should be guided, like science itself, by the distinction between general and case-specific findings. When group-based research regarding general principles constitutes a frame of reference, without claims that a specific individual is an example of a general principle, it amounts to *framework science* and *evidence/testimony*. When an individual is claimed to be an instance of a general principle, it constitutes *diagnostic science* and *evidence/testimony*. While framework evidence can be admissible in the absence of instruments for diagnostic assessment, the opposite is not true, and stricter demands are therefore put on diagnostic evidence.

Faigman et al. also set out five specific criteria for assessing admissibility on the two respective levels. First, evidence should be *relevant* (i.e., related to some specific issue in dispute). Second, it should have *qualifications* (i.e., be provided by someone with sufficient knowledge, skill, experience or training). Third, it should have *scientific validity* (i.e., testability and replicability, known error rates, adequate standards, accessibility in peer-reviewed journals, and general acceptance).² Fourth, it should provide *added value* (i.e., be helpful in answering the issue in dispute). Fifth, courts should exclude evidence that may cause unfair prejudice or be misleading relative to its probative value (*exclusion on prejudice grounds*). Faigman et al. emphasize the crucial importance of validity, but argue that all criteria are necessary considerations in determining admissibility and that evidence should meet all criteria. Yet, when thresholds are met for each criteria, a relative weakness on one criteria can be compensated by strengths on others. Applying these criteria to attachment theory, research and assessments should further illuminate the admissibility of attachment-related concepts in child custody cases.

2 | PART II: THE SCIENTIFIC FRAMEWORK AND ATTACHMENT THEORY, RESEARCH, AND ASSESSMENTS

In this section, we apply Faigman et al. (2014, 2016) framework for admissibility of scientific evidence/testimony to the use of attachment theory, research and assessments in child custody evaluations and decision-making. We first discuss attachment theory, research, and assessments in relation to the aforementioned admissibility criteria proposed by Faigman et al. For each criterion, we elaborate on key considerations with regard to the

framework versus the diagnostic level. We then discuss the extent to which we believe that attachment theory, research, and assessments should currently be regarded admissible as framework and diagnostic evidence/testimony.

2.1 | Admissibility criteria and attachment theory, research and assessments

2.1.1 | Relevance

In order for framework evidence/testimony to be relevant, it should relate to a specific issue in dispute. Theory and research on attachment in general, and attachment networks in particular, have been heavily concerned with questions integral to child custody decision-making. First, theory and research have addressed whether one particular attachment relationship has primacy and influences children's development of other attachment relationships. Such research has found that child-caregiver attachments show much independence and depend on each caregiver's sensitivity to the child's signals (Fox, et al., 1991; Lucassen et al., 2011; van IJzendoorn & De Wolff, 1997). Second, theory and research have addressed whether one particular attachment relationship is of special importance to children as a source of protection and comfort in times of distress (i.e., a safe haven; Bowlby, 1969/1982). Such research has found that children's preferences tend to be unrelated to attachment quality, fluctuate over time, and depend on contextual factors (Lamb, 2018; Umemura et al., 2013; Zimmermann, 2017). Third, theory and research have addressed whether a particular attachment relationship has special importance for child development (the hierarchical hypothesis), or whether caregivers have equal importance (the horizontal hypothesis). Comparing these hypotheses, a recent individual participant data (IPD) meta-analysis on attachment networks (Dagan et al., 2021; this issue) supported the horizontal hypothesis in relation to internalizing and externalizing behavior problems. At the same time, there are important unanswered questions regarding attachment networks. For instance, there is a lack of systematic research on the number of attachment relationships that young children can develop and maintain at different ages, and whether this is moderated by cognitive development (Bakermans-Kranenburg, 2021; this issue).

The relevance of framework evidence/testimony also depends on generalizability of scientific findings to pertinent populations and contexts. Unfortunately, most attachment network research has been conducted with intact two-parent families, rendering the generalizability to child custody contexts somewhat unclear (Dagan et al., 2021; this issue; Steinbach, 2019). There are for example no conclusive answers to questions such as time allocation and overnights, particularly for infants and toddlers. Indeed, attachment scholars hold contrasting positions on this matter, partly owing to differing considerations with regard to young children's cognitive-emotional ability to tolerate the separations inherent in alternating residences (Forslund et al., 2021). On the one hand, court decisions that result in little contact with one caregiver have been linked to a risk for little or no contact in the future (Cheadle et al., 2010). Considerably depriving a child of time with a parent is also a risk factor for insecurity in that attachment relationship (Hazen et al., 2015; Umemura & Jacobvitz, 2014). Conversely, some research suggests that alternating residence may have negative effects on young children (McIntosh et al., 2013; Tornello et al., 2013). The crucial factor may not be the number of caregivers, or overnights per se, but sufficient opportunities for developing expectancies on safe haven provision. Still, further research on attachment networks is needed, including the development and maintenance of attachment relationships to stepparents (Bakermans-Kranenburg, 2021; this issue).

The relevance of diagnostic evidence/testimony hinges on the ability of individual assessments to provide valid information regarding specific issues in dispute. In child custody, such issues include parents' caregiving skills, parents' ability to support child development, and child-caregiver relationship quality (e.g., Ackerman et al., 2021). Indeed, whether assessments of attachment quality can provide such information, and thereby aid decision-making, is one of the most common questions among child custody professionals (e.g., McIntosh, 2011). Yet, assessments of individual children's (and adults') attachment quality do not sufficiently answer such questions. As many as forty percent of all children (and adults) are classified insecure with regard to attachment (van IJzendoorn et al., 1999). Attachment-quality assessments are also susceptible to problems concerning differential diagnostics. For instance, individual children can display disorganized behavior without a disorganizing relational history, due to overstress, illness, or congenital self-regulatory difficulties (e.g., Granqvist et al., 2016; Padrón et al., 2014). Given the interest in parents' psychological profiles (Ackerman et al., 2021) it is important to note that assessments of parents' state of mind regarding attachment have the same problems for child custody decision-making as observations of child-caregiver attachment quality.

2.1.2 | Qualifications

In the context of framework evidence/testimony, the qualifications criterion requires that experts have sufficient and up-to-date knowledge and education. Unfortunately, professionals' training often include only the basics of attachment theory, and child custody professionals often have to acquire specialized education after their basic training (Ackerman et al., 2021). Attachment research has also become voluminous, which makes it difficult for professionals to keep track of developments (see Forslund & Duschinsky, 2021). Further, attachment researchers have not participated sufficiently in public debate (Goldberg, 2000). Finally, simplified accounts that build upon ordinary connotations of words like "security" have become widely circulated. Such factors have contributed to widespread misunderstandings about attachment theory (e.g., Forslund et al., 2021), and experts proffering attachment-related evidence in child custody cases therefore often lack qualifications.

Qualifications on the diagnostic level regard the expert's skills and experience with relevant assessment procedures. Alas, professionals who gather information about attachment typically lack training in attachment assessments. In fact, professionals sometimes devise their own attachment measures and use such information in their recommendations. For example, a vast majority of Swedish social workers reported that they "always or almost always" form an opinion about young children's attachment quality in their evaluations. Yet, none had training in a validated attachment method, and many drew overconfident conclusions regarding children's presumed attachment quality (Hammarlund et al., 2021). Further, a large majority regarded insecure attachment as indicative of deficient caregiving. Such overconfident appeals to attachment, which are suggestive of insufficient qualifications, may in part depend on the unmooring of academic constructs from their caveats when passing into practice (Nielsen, 2014).

Problems with qualifications regarding framework testimony should in part be remediable by expanding teaching in attachment theory in professional programs. The attachment community is also making strides in communicating more clearly, as reflected by recent consensus-statements countering misinformation (Forslund et al., 2021; Granqvist et al., 2017). Qualified diagnostic testimony is, however, less likely. This predicament is not only due to the scarcity of professionals trained in validated attachment measures, which could

of course be remediated given sufficient resources; as addressed in the following, it also pertains to the limited scientific validity of attachment instruments for diagnostic testimony.

2.1.3 | Scientific validity

Faigman et al. (2014) describe five subareas of scientific validity. Below, we discuss each in turn, with particular attention to considerations for scientific and diagnostic testimony.

Testability: Scientific theories and their principles must be falsifiable, and courts should require that framework evidence/testimony is based on sufficient testing and replication. Attachment theory is clearly testable, as reflected by the huge body of research on its central tenets. First, infants' predisposition to develop attachments to their caregivers ("the universality hypothesis") is observed across the world and not reducible to factors such as temperament or breast-feeding (e.g., Mesman et al., 2016). Second, caregiver sensitivity is important for children's attachment quality ("the sensitivity hypothesis"; De Wolff & van IJzendoorn, 1997; Verhage et al., 2016). Third, attachment quality contributes to child development ("the competence hypothesis"; Groh et al., 2017). The countless replications include different measures of attachment and child development, in different cultures and age groups, by different research teams. Attachment research clearly converges on a predicted pattern of findings at the group-level. Research on attachment networks have extended these basic premises to include the importance of each child-caregiver attachment relationship (e.g., Bacro et al., 2021, Dagan et al., 2021; this issue; Lamb, 2018).

In the context of diagnostic evidence/testimony, testability partly regards the establishment of a feedback loop that indicates the expert's success rate when making the pertinent assessment. In research, such feedback loops come in the form of reliability coders. There are also structures for practice in gold-standard attachment instruments, through intense training institutes followed by proficiency training, and coders have to pass difficult cut-offs on large sets of cases. Yet, sufficient reliability for group-level research does not mean validity for diagnostic testimony. The value of diagnostic tests also depends on how closely they approximate the task in court. An important caveat is that attachment instruments have typically been used in conditions of mild to moderate stress, and their validity in affectively charged situations, such as child custody disputes, is consequently unknown. Diagnostic instruments may also have to be re-normed periodically. Yet, the gold standard Strange Situation Procedure (SSP; Ainsworth et al. [1978] 2015) was developed in the U.S. during the 1970s. Researchers in some cultural settings have also experienced difficulties using the procedure and called for further cross-cultural validation research (e.g., True, 2021).

Error rates and standards: Framework science typically examines effects of one factor on another. In the context of framework evidence/testimony, the strength and robustness of such effects are crucial. Meta-analyses converge on small to moderate effects of caregiver sensitivity on child attachment quality (e.g., Lucassen et al., 2011; Verhage et al., 2016), and of child attachment quality on child development (e.g., Groh et al., 2017). Whilst these associations corroborate the validity of attachment theory, the unexplained variance emphasizes that development also depends on other factors. Complicating matters, theory and research on attachment networks also suggest that the strength of associations may depend on how parents divide caregiving tasks and their relative involvement in various aspects of caregiving (Bacro et al., 2021). For instance, fathers may on average become more involved as children grow older and serve a particularly salient function in

supporting children's exploration (i.e., as secure base; Bowlby, 1969/1982). Attachment quality with fathers may then become particularly associated with children's cognitive development and scholastic achievement. Mothers may instead have a particularly salient role as safe havens regulating distress, resulting in a more pronounced association with children's development of emotional competences. Again, an important caveat is the scarcity of research from child custody contexts, rendering the generalizability of effects to this setting unclear.

Error rates of methods are of course crucial also for diagnostic testimony, and there should be standards and best practice protocols that control operation and allow study of error rates. Standards in attachment research include stringent protocols for administration of gold-standard instruments, and adequate (moderate) test-retest reliability has been reported (e.g., Fraley, 2002). Still, coding manuals—no matter how carefully designed and validated—cannot cover all behavioral examples. Coders must therefore apply general principles to new behavioral instances, thereby inevitably introducing subjectivity. Error rates have in fact led scholars to conclude that measures of attachment quality have insufficient properties for individual-level prediction (Granqvist, 2016; van IJzendoorn, Bakermans, et al., 2018; van IJzendoorn, Steele, et al., 2018). More specifically, a diagnostic instrument must identify a high percentage of the instances and non-instances of the condition that it is designed to detect (i.e., true positives, true negatives). At the same time, it must avoid identification of the condition when it is absent and non-identification when it is present (i.e., false positives, false negatives). Based on inter-rater reliability data, measures of attachment quality have insufficient properties to allow reliable prediction of individual's "true" attachment quality. Additionally, they are insufficient in retrodicting individual children's caregiving experiences and in predicting their future development. For example, while a notable proportion of maltreated children do not display disorganized attachment a significant proportion who have not been maltreated do (Granqvist et al., 2017). This is not surprising because there are pathways to disorganized attachment that do not include maltreatment (Reisz et al., 2018). Attachment-based observations may also be differentially sensitive for mothers and fathers, with safe haven measures particularly suitable for mothers and secure base measures for fathers (Grossmann et al., 2008; Zimmerman, 2017).

Peer review and publication. Framework evidence should be accessible in peer-reviewed journals, and attachment research is indeed highly accessible. Although coding manuals for attachment instruments are generally not accessible in published report, attachment scholars have also become increasingly aware of the importance of publishing inconsistencies and caveats. One such example is a discussion regarding disorganized attachment as captured in the SSP (Duschinsky, 2015; Duschinsky & Solomon, 2017; Solomon et al., 2017). In brief, some indices of disorganization may be more indicative of a disorganized attachment system and relationship than other ones (Padrón et al., 2014; Reijman et al., 2018). For diagnostic evidence/testimony, a "second opinion" regarding an expert's method and assessment can be helpful, but reliable coders of gold-standard measures are difficult (and expensive) to acquire.

General acceptance. General acceptance of a theory and its research base is a requirement for framework evidence/testimony, and attachment theory is certainly well accepted. It even appears to be held in unrealistically high regard in some quarters (Smith et al., 2017). The categories used to describe attachment quality also have an allure (Duschinsky, 2015). Yet, there is a discussion whether continuous measures provide a better way of capturing individual variations in attachment quality (Groh et al., 2017). In brief, categories may oversimplify, reduce nuances, and mislead.

Diagnostic science also necessitates general acceptance of pertinent methods. However, few attachment measures are widely accepted for research, and no measure is widely

accepted for diagnostic science (van IJzendoorn et al., 2019). It is thus concerning that attachment instruments with very questionable properties are used to gather diagnostic evidence concerning caregiving skills in the family courts (for discussions, see Granqvist, 2016; van IJzendoorn, Bakermans, et al., 2018; van IJzendoorn, Steele, et al., 2018).

Financial, professional, or ideological self-interests can result in an unfounded belief in a field's research and methods, thereby compromising framework and diagnostic science. There is no reason to expect attachment scholars to be immune to such risks. Yet, a high number of attachment scholars, many of whom have invested time and effort into various methods, recently cautioned against their usage in high-stakes decision-making in the family courts (Forsslund et al., 2021). Indeed, even scholars who argued that measures of attachment quality could enhance child custody evaluations emphasized that attachment instruments should never be used in isolation, but only as part of a larger assessment battery that assigns more weight to direct assessment of caregiving behavior. Further, it was argued that use of attachment measures in custody contexts should require formally trained observers who follow standardized protocols, make multiple observations, and do not over-emphasize attachment categories. These conditions should currently render it unfeasible for most courts to undertake such assessments.

Intellectual rigor. Scientific experts should employ the same level of rigor in court as they do in scientific practice, by following protocols and standards. Framework testimony concerning attachment in child custody cases should thus be clear about the general support for benefits associated with attachment networks. At the same time, intellectual rigor entails openness about the scarcity of attachment research concerning some matters, and not exaggerating the associations between attachment quality and child development. Intellectual rigor in diagnostic testimony about attachment in child custody entails being clear about the limited psychometric properties of attachment instruments for individual-level prediction, and the lack of research validating such measures for affectively charged situations, such as child custody.

2.1.4 | Added value

The primary added value of framework science lies in its provision of a context in which a case at hand can be understood, and in educating courts about matters of which they know too little. Framework testimony concerning attachment networks may certainly be educative (Forsslund et al., 2021). For instance, a study on co-parenting arrangements initially reported that overnight arrangements with non-custodial parents was a risk factor for attachment insecurity with custodial caregivers (Solomon & George 1999). This study has often been used to caution against overnight arrangements, but a reanalysis actually showed that inter-parental conflict was a better predictor of insecurity (van IJzendoorn et al., 2019).

Framework evidence should also be distinguished from advocacy and argument. While attachment theory and research suggest that joint custody and alternating residence should often represent a long-term goal, it is important to note that this should not be seen as a black-and-white presumption. For instance, decision-making must also account for case-specific factors such as inter-parental conflict, intimate partner violence, child abuse, children's own wishes, physical distance between parents, and child age. Inter-parental conflict can for instance lead to difficulties collaborating with regard to custody, with the child caught in the middle (e.g., Kalmijn, 2016). Some research have also suggested that inter-parental conflict can have negative effect on children's attachment quality, but there is at present a scarcity of research on child attachment in such contexts.

Diagnostic evidence provides added value if it helps courts reason from a framework to a diagnostic judgment. Due to the factors discussed above, the ability of assessments of attachment quality to help courts reason from the framework level to diagnostic judgments is questionable. Appeals to attachment in individual cases may also be biased by advocacy when the respective parties call in experts (or purport information themselves). For instance, parents in child custody disputes may make incorrect claims about themselves and the other parent to “win” the case. In fact, the Committee on the Rights of the Child (CRC; 2013) notes that parents in custody disputes sometimes abuse the best interest standard.

2.1.5 | Exclusion on prejudice grounds

Courts should exclude evidence if its probative value is outweighed by a danger of prejudice, confusing an issue, or misleading the court. There are in fact indications that information about individual children’s presumed attachment quality overshadow other considerations and have undue impact (Alexius & Hollander, 2014; Granqvist, 2016; Bjerre et al., 2021). Faigman et al. (2016) note that courts are too deferential to scientific fields and expert witnesses, who should not dictate what constitutes “reasonable evidence.” Such deference may explain why Alexius and Hollander (2014) found that Swedish courts did not challenge information about children’s supposed “attachment problems,” or ask for the ways in which purported evidence was gathered. Granqvist et al. (2016) warned that misapplications are likely to harm already underprivileged segments of the population, such as parents in socio-economic adversity and parents with functional impairments. An accumulation of socio-economic adversity (e.g., ethnic minority, single parent, poverty) has, for example, been linked to a notable risk of disorganized attachment, and the magnitude of this risk is comparable to that of maltreatment (Cyr et al., 2010). Of course, it would be highly unfortunate if attachment theory was pressed into misleading diagnostic service against society’s more vulnerable populations.

2.2 | Attachment theory as framework science and diagnostic science

The above discussion results in different conclusions for the framework and the diagnostic level, respectively. First, attachment theory and research should be admissible for framework evidence and testimony. In particular, research on attachment networks is valid, has relevance to pertinent questions, and can be helpful in educating courts about important matters. At the same time, framework testimony is restricted by a scarcity of research within the child custody context. Second, assessments of particular individuals’ attachment quality should currently not be admissible as diagnostic evidence and testimony. In particular, research calls for great caution in inferring individual caregivers’ caregiving skills, and individual children’s development, from observations of child-caregiver attachment quality.

The application of the admissibility framework proposed by Faigman et al. (2014, 2016) results in conclusions that are similar to those of the recent consensus statements (Forslund et al., 2021; Granqvist et al., 2017). Most notably, the statements also emphasized the applicability of general principles of attachment (i.e., framework science), and cautioned as regards attachment observations in high-stakes situations concerning individuals (i.e., diagnostic science). There are certainly many forms of validity, and they go beyond psychometric properties (internal validity) and include broader considerations concerning the adequacy of conclusions (e.g., external validity; see Boorsboom et al., 2004). Indeed, it

may be argued that the criteria suggested by Faigman et al. (2014, 2016) were, to an extent, implicitly addressed in those statements. Yet, illuminating an issue from different angles is important whether it results in different conclusions or not. Our application of Faigman et al. (2014, 2016) admissibility framework consequently corroborate the conclusions drawn in these consensus statements.

It is important to note that framework science can be important to decision-making, such as in in policy work, even in the absence of valid diagnostic instruments (Faigman et al., 2014, 2016). In fact, theory and research about attachment seem to have permeated important policies and guidelines for decision-making in many countries. Perhaps most notably, the CRC (2013), which is generally devoid of references to particular psychological theories, references the importance of children's attachment relationships, and their vulnerability to separations, and emphasizes that joint custody is often best for children. Bowlby (1969/1982, 1973) and Ainsworth ([1978] 2015) certainly described phenomena of great relevance for child-caregiver interactions/relationships and child development. Subsequent research and theory development, including on attachment networks (Bacro et al., 2021; Dagan et al., 2021; this issue; Lamb, 2018), have corroborated and extended their claims and showed that each attachment relationship is important. Attachment theory clearly constitutes a sophisticated developmental theory, with great applicability to work focused on supporting children's development.

2.3 | What to do and ways forward?

We are aware that professionals conducting child custody evaluations face very complex cases and that courts must make difficult decisions, with or without the potential help of psychological assessments (Ackerman et al., 2021). We are also aware that there is a scarcity of valid psychological measures for diagnostic science (e.g., Neal et al., 2019) and that the limitations of attachment measures may well pertain to many, if not most, other constructs and their associated measures; however, validated for group-level research they may be. We also acknowledge that perfect scientific rigour is unrealistic in the family courts. Thus, we realize that our critical discussion of the use of attachment measures for diagnostic evidence may result in questions of "what to do instead?" and that we risk coming across as "the brain police" (Zappa, 1966).

There are of course ways forward and we believe that a fruitful avenue is to focus on measures more closely related to the particular questions that courts face. As discussed above, such questions typically concern parents' current and probable future caregiving skills (Ackerman et al., 2021; Bow & Quinnell, 2001). In fact, attachment theory rests in large part on the importance of caregiver behavior (Ainsworth & Bowlby, 1991). Rather than inferring caregiver sensitivity from observations of child-caregiver attachment quality, we advise professionals to seek training in validated measures of sensitivity (for a review, see Mesman & Emmen, 2013). One such measure, closely grounded in Ainsworth's conceptualization of sensitivity, and developed for use in ecologically valid situations, is the Maternal Behavior Q-Sort (MBQS; Pederson & Moran, 1995; Pederson et al., 1990). While there is a scarcity of research using the MBQS in child custody cases, the MBQS has been used with fathers and parents from non-Western cultures, and can be used with parents of infants, toddlers and pre-schoolers (Mesman & Emmen, 2013).

Beyond caregiver sensitivity, which is primarily linked to secure versus insecure attachment, there are also validated measures of caregiver behaviour linked to disorganized attachment that are showing promise for use in applied settings. One such measure is the Atypical Maternal Behavior Instrument for Assessment and Classification (AMBIANCE;

Bronfman et al., 2009). Since the AMBIANCE is time consuming to learn and administer—as is true for most validated measures grounded in attachment theory—a brief version has been developed to bridge the research-to-practice gap (Madigan et al., 2018). Initial studies of the AMBIANCE-brief have reported convergent validity with the full AMBIANCE and construct validity in predicting disorganized attachment, and a recent study also found that it was feasible to train service providers in it (Madigan et al., 2021). Yet, further research is needed to validate the instrument for use by practitioners in applied settings such as child custody contexts.

Another example is evidence-based protocols for assessment and promotion of parental capacity (e.g., Cyr et al., 2012, 2020). Through multiple assessments in the family's home, professionals can observe parent-child interaction and discuss important questions concerning caregiving practices, child development, and family context. At the same time, professionals can give an attachment-based intervention focused on pertinent caregiving behaviour (e.g., insensitivity, frightening behavior). Such approaches, aimed at key parental competencies, offer parents a fair chance of developing their caregiving. At the same time, it allows the evaluator to assess parents' capacity for doing so in a standardized manner. While such protocols have been developed for child protection, probable future caregiving skills are also important in child custody cases. Thus, such protocols may be useful in child custody contexts and may prevent diminished access to caregivers.

3 | CONCLUSIONS

We have analysed the application of attachment theory, research and assessments in a child custody context in relation to a framework for admissibility of scientific evidence in court proposed by Faigman et al. (2014, 2016). We conclude that theory and research on attachment in general, and attachment networks in particular, should be admissible as framework evidence in child custody settings. Specifically, the principle that children benefit from attachment networks is valid, relevant, and helpful. Yet, there is a need for research in child custody settings for more certain generalizability. We also conclude that insufficient qualifications can compromise framework as well as diagnostic testimony, and that experts reach too far when they proffer diagnostic evidence and testimony about attachment quality. Not only do such assessments lack sufficient validity, but considerations of relevance, qualifications, helpfulness, and prejudice also render their usage dubious. Moving forward, we argue that child custody evaluations should focus on actual caregiving behavior. Not only does attachment theory rest on the importance of caregiving behavior for child development, but caregiving behavior is also closer to the legal issues in dispute and thereby more relevant and helpful.

ACKNOWLEDGMENT

This work was supported by grants from the Swedish Research Council (Grant 2017-03315) and the Swedish research Council for Health, Working Life, and Welfare (Grant 2017-01182) awarded to Pehr Granqvist and Tommie Forslund.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

ORCID

Tommie Forslund  <https://orcid.org/0000-0002-5519-9956>

Mårten Hammarlund  <https://orcid.org/0000-0002-2527-9357>

Pehr Granqvist  <https://orcid.org/0000-0003-0747-5028>

NOTES

- ¹ We acknowledge that these criteria do not lend themselves to uniform application, because countries vary with regard to rules for admissibility and division of responsibilities between lawyers and laymen (cf. accusatorial vs. inquisitorial legal traditions; Champod & Vuille, 2011). Nevertheless, the structure of a legal system is not in itself an important factor in the context of evaluating scientific evidence, and we therefore believe that these criteria could be of use regardless of tradition.
- ² Faigman et al. (2014) discussion of validity, using these criteria, is somewhat idiosyncratic. We will adhere to this somewhat overextended use of the concept in our discussion of validity, although it deviates from the conventional, narrower, measurement sense (i.e., convergent and discriminant validity).

REFERENCES

- Ackerman, M. J., Bow, J. N., & Mathy, N. (2021). Child custody evaluation practices: Where we were, where we are, and where we are going. *Professional Psychology: Research and Practice*, 52(4), 406–417.
- Ainsworth, M. D. S., Blehar, M. C., Waters, E., & Wall, S. N. ([1978] 2015). *Patterns of attachment: A psychological study of the strange situation*. Psychology Press.
- Ainsworth, M. S., & Bowlby, J. (1991). An ethological approach to personality development. *American Psychologist*, 46(4), 333.
- Alexius, K., & Hollander, A. (2014). Care assessments concerning involuntary removal of children from intellectually disabled parents. *Journal of Social Welfare and Family Law*, 36(3), 295–310.
- Bacro, F., Forslund, T., & Granqvist, P. (2021). Children's multiple attachment relationships and representations in different family contexts. In (T. Forslund & R. Duschinsky Eds.). *Attachment theory and research: A reader*. Wiley.
- Bakermans-Kranenburg, M. J. (2021). The limits of the attachment network. *New Directions for Child and Adolescent Development*, 1–8.
- Bjerre, L. S., Madsen, O. J., & Petersen, A. (2021). 'But what are we doing to that baby?' Attachment, psy-Speak and designed order in social work. *European Journal of Social Work*, 1–13.
- Borsboom, D., Mellenbergh, G. J., & Van Heerden, J. (2004). The concept of validity. *Psychological Review*, 111(4), 1061–1071.
- Bow, J. N., & Quinnell, F. A. (2001). Psychologists' current practices and procedures in child custody evaluations: Five years after American Psychological Association guidelines. *Professional Psychology: Research and Practice*, 32(3), 261–268.
- Bowlby, J. (1969/1982). *Attachment and loss: Attachment*. Pimlico.
- Bowlby, J. (1973). *Attachment and loss: Separation*. Pimlico.
- Bowlby, J. (1980). *Attachment and loss: Loss*. Pimlico.
- Bronfman, E., Madigan, S., & Lyons-Ruth, K. (2009). *The atypical behavior instrument for assessment and classification*. Harvard Medical School.
- Cadman, T., Diamond, P. R., & Fearon, P. (2018). Reassessing the validity of the attachment Q-sort: An updated meta-analysis. *Infant and Child Development*, 27(1), e2034.
- Champod, C., & Vuille, J. (2011). Scientific evidence in Europe—Admissibility, evaluation and equality of arms. *International Commentary on Evidence*, 9(1), i-68.
- Cheadle, J. E., Amato, P. R., & King, V. (2010). Patterns of nonresident father contact. *Demography*, 47(1), 205–225.
- Cyr, C., Dubois-Comtois, K., Paquette, D., Lopez, L., & Bigras, M. (2020). An attachment-based parental capacity assessment to orient decision-making in child protection cases: A randomized control trial. *Child Maltreatment*, 1–12.
- Cyr, C., Dubois-Comtois, M. G., Poulin, C., Pascuzzo, K., Losier, V., Dumais, M., St-Laurent, D., & Moss, E. (2012). Attachment theory in the assessment and promotion of parental competency in child protection cases. In (A. Muela Ed.), *Child abuse and neglect: A multidimensional approach* (pp. 63–86). InTech Open.
- Cyr, C., Euser, E. M., Bakermans-Kranenburg, M., & van IJzendoorn, M. (2010). Attachment security and disorganization in maltreating and high-risk families: A series of meta-analyses. *Development and Psychopathology*, 22(1), 87–108.
- Dagan, O., & Sagi-Schwartz, A. (2018). Early attachment network, to mother and father: An unsettled issue. *Child Development Perspectives*, 12(2), 115–121.
- Dagan, O., Schuengel, C., Verhage, M. L., Van IJzendoorn, M. H., Sagi-Schwartz, A., Madigan, S., ... Cummings, E. M. & The Collaboration on Attachment to Multiple Parents and Outcomes Synthesis (2021). Configurations of mother-child and father-child attachment as predictors of internalizing and externalizing behavioral problems: An individual participant data (IPD) meta-analysis. *New Directions for Child and Adolescent Development*, 2021(180), 67–94. <https://doi.org/10.1002/cad.20450>
- De Wolff, M. S., & van IJzendoorn, M. H. (1997). Sensitivity and attachment: A meta-analysis on parental antecedents of infant attachment. *Child Development*, 68(4), 571–591.

- Duschinsky, R. (2015). The emergence of the disorganized/disoriented (D) attachment classification, 1979–1982. *History of Psychology, 18*(1), 32.
- Duschinsky, R., & Solomon, J. (2017). Infant disorganized attachment: Clarifying levels of analysis. *Clinical Child Psychology and Psychiatry, 22*(4), 524–538.
- Emery, R. E., Otto, R. K., & O'donohue, W. T. (2005). A critical assessment of child custody evaluations: Limited science and a flawed system. *Psychological Science in the Public Interest, 6*(1), 1–29.
- Faigman, D. L., Monahan, J., & Slobogin, C. (2014). *Group to individual (G2i) inference in scientific expert testimony. The University of Chicago Law Review, SSRN Electronic Journal* 81(2), pp. 417–480.
- Faigman, D. L., Slobogin, C., & Monahan, J. (2016). Gatekeeping science: Using the structure of scientific research to distinguish between admissibility and weight in expert testimony. *Northwestern University Law Review, 110*(4), 859–904.
- Forslund, T., & Duschinsky, R. In (T., Forslund & R., Duschinsky Eds.). (2021). *Attachment theory and research: A reader*. Wiley.
- Forslund, T., Granqvist, P., van IJzendoorn, M. H., Sagi-Schwartz, A., Glaser, D., Steele, M., Hammarlund, M., Schuengel, C., Bakermans-Kranenburg, M. J., Steele, H., Shaver, P. R., Lux, U., Simmonds, J., Jacobvitz, D., Groh, A. M., Bernard, K., Cyr, C., Hazen, N. L., Foster, S., & R. D. (2021). Attachment goes to court: Child protection and custody issues. *Attachment & Human Development*.
- Fox, N. A., Kimmerly, N. L., & Schafer, W. D. (1991). Attachment to mother/attachment to father: A meta-analysis. *Child Development, 62*, 210–225.
- Fraleigh, R. (2002). Attachment stability from infancy to adulthood: Meta-analysis and dynamic modeling of developmental mechanisms. *Personality and Social Psychology Review, 6*(2), 123–151.
- George, C., Isaacs, M. B., & Marvin, R. S. (2011). Incorporating attachment assessment into custody evaluations: The case of a 2-year-old and her parents. *Family Court Review, 49*(3), 483–500.
- George, C., & Solomon, J. (2008). The caregiving system: A behavioral systems approach to parenting. In (J. Cassidy & P. R. Shaver Eds.), *Handbook of attachment: Theory, research, and clinical applications* (pp. 833–856). The Guilford Press.
- Goldberg, S. (2000). *Attachment and development*, Routledge.
- Granqvist, P. (2016). Observations of disorganized behaviour yield no magic wand: Response to shemmings. *Attachment & Human Development, 18*(6), 529–533.
- Granqvist, P., Hesse, E., Fransson, M., Main, M., Hagekull, B., & Bohlin, G. (2016). Prior participation in the strange situation and overstress jointly facilitate disorganized behaviours: Implications for theory, research and practice. *Attachment & Human Development, 18*(3), 235–249.
- Granqvist, P., Sroufe, L. A., Dozier, M., Hesse, E., Steele, M., van IJzendoorn, M., Solomon, J., Schuengel, C., Fearon, P., Bakermans-Kranenburg, M., Steele, H., Cassidy, J., Carlson, E., Madigan, S., Jacobvitz, D., Foster, S., Behrens, K., Rifkin-Graboi, A., Gribneau, N., & Duschinsky, R. (2017). Disorganized attachment in infancy: A review of the phenomenon and its implications for clinicians and policy-makers. *Attachment & Human Development, 19*(6), 534–558.
- Groh, A. M., Fearon, R. P., van IJzendoorn, M. H., Bakermans-Kranenburg, M. J., & Roisman, G. I. (2017). Attachment in the early life course: Meta-analytic evidence for its role in socio emotional development. *Child Development Perspectives, 11*(1), 70–76.
- Gur, A., & Stein, M. A. (2020). Social worker attitudes towards parents with intellectual disabilities in Israel. *Disability and Rehabilitation, 42*(13), 1803–1813.
- Hacker, D., & Halperin Kaddari, R. (2013). The ruling rules in custody disputes—On the dangers of the parental sameness illusion in a gendered reality. *Mishpat and Mimshal, 15*, 91–170. ([Hebrew]).
- Hammarlund, M., Andram, C., Elfvik, S., Forslund, T., & Granqvist, P. (2021). Concepts Travel Faster than Thought: An Empirical Study of the Use of Attachment Classifications in Child-Protection Investigations. Manuscript in preparation.
- Hazen, N. L., Allen, S. D., Christopher, C. H., Umemura, T., & Jacobvitz, D. B. (2015). Very extensive nonmaternal care predicts mother-infant attachment disorganization: Convergent evidence from two samples. *Development and Psychopathology, 27*(3), 649–661.
- Keddell, E. (2017). Interpreting children's best interests: Needs, attachment and decision-making. *Journal of Social Work, 17*(3), 324–342.
- Kelly, J. B., & Lamb, M. E. (2000). Using child development research to make appropriate custody and access decisions for young children. *Family and Conciliation Court Review, 38*(3), 297–311.
- Lamb, M. (2018). Does shared parenting by separated parents affect the adjustment of young children? *Journal of Child Custody, 15*(1), 16–25.
- Lucassen, N., Tharner, A., van IJzendoorn, M. H., Bakermans-Kranenburg, M. J., Volling, B. L., Verhulst, F. C., & Tiemeier, H. (2011). The association between paternal sensitivity and infant-father attachment security: A meta-analysis of three decades of research. *Journal of Family Psychology, 25*(6), 986–992.
- Madigan, S., Bronfman, E., Halitgan, J. D., & Lyons-Ruth, K. (2018). *The atypical behavior instrument for assessment and classification-brief (AMBIANCE-Brief)*. University of Calgary.

- Madigan, S., Eirich, R., Racine, N., Borland-Kerr, C., Cooke, J. E., Devereux, C., & Lyons-Ruth, K. (2021). Feasibility of training service providers on the AMBIANCE-Brief measure for use in community settings. *Infant Mental Health Journal*, 42(3), 438–451.
- McIntosh, J. (2011). Guest editor's introduction to special issue on attachment theory, separation and divorce: Forging coherent understandings for family law. *Family Court Review*, 49(3), 418–425.
- McIntosh, J. E., Smyth, B. M., & Kelaher, M. (2013). Overnight care patterns following parental separation: Associations with emotion regulation in infants and young children. *Journal of Family Studies*, 19(3), 224–239.
- Mesman, J., & Emmen, R. A. (2013). Mary Ainsworth's legacy: A systematic review of observational instruments measuring parental sensitivity. *Attachment & Human Development*, 15(5-6), 485–506.
- Mnookin, R. (2014). Child custody revisited. *Law and Contemporary Problems*, 77(1), 249–274.
- Neal, T. M., Slobogin, C., Saks, M. J., Faigman, D. L., & Geisinger, K. F. (2019). Psychological assessments in legal contexts: Are courts keeping “junk science” out of the courtroom? *Psychological Science in the Public Interest*, 20(3), 135–164.
- Nielsen, L. (2014). Woozles: Their role in custody law reform, parenting plans, and family court. *Psychology, Public Policy, and Law*, 20(2), 164–180.
- Otto, R. K., Edens, J. F., & Barcus, E. H. (2000). The use of psychological testing in child custody evaluations. *Family Court Review*, 38(3), 312–340.
- Padrón, E., Carlson, E. A., & Sroufe, L. A. (2014). Frightened versus not frightened disorganized infant attachment: Newborn characteristics and maternal caregiving. *American Journal of Orthopsychiatry*, 84(2), 201–208.
- Pederson, D. R., & Moran, G. (1995). A categorical description of infant-mother relationships in the home and its relation to Q-sort measures of infant-mother interaction. *Monographs of the Society for Research in Child Development*, 60(2-3), 111–132.
- Pederson, D. R., Moran, G., Sitko, C., Campbell, K., Ghesquire, K., & Acton, H. (1990). Maternal sensitivity and the security of infant-mother attachment: AQ-sort study. *Child Development*, 61(6), 1974–1983.
- Reijman, S., Foster, S., & Duschinsky, R. (2018). The infant disorganised attachment classification: “Patterning within the disturbance of coherence.” *Social Science & Medicine*, 200, 52–58.
- Reisz, S., Duschinsky, R., & Siegel, D. J. (2018). Disorganized attachment and defense: Exploring John Bowlby's unpublished reflections. *Attachment & Human Development*, 20(2), 107–134.
- Skivenes, M., & Sørsdal, L. M. (2018). The child's best interest principle across child protection jurisdictions. In (A. Falch-Eriksen & E. Backe-Hansen Eds.), *Human rights in child protection* (pp. 59–88). Palgrave Macmillan.
- Scott, E. S., & Emery, R. E. (2014). Gender politics and child custody: The puzzling persistence of the best-interest standard. *Law and Contemporary Problems*, 77(1), 69–108.
- Smith, M., Cameron, C., & Reimer, D. (2017). From attachment to recognition for children in care. *British Journal of Social Work*, 47(6), 1606–1623.
- Solomon, J., Duschinsky, R., Bakkum, L., & Schuengel, C. (2017). Toward an architecture of attachment disorganization: John Bowlby's published and unpublished reflections. *Clinical Child Psychology and Psychiatry*, 22(4), 539–560.
- Solomon, J., & George, C. (2011). Disorganization of maternal caregiving across two generations. In (J., Solomon & C., George Eds.), *Disorganized attachment and caregiving* (pp. 25–51). Guilford Press.
- Sroufe, A., & McIntosh, J. (2011). Divorce and attachment relationships: The longitudinal journey. *Family Court Review*, 49(3), 464–473.
- Steinbach, A. (2019). Children's and parents' well-being in joint physical custody: A literature review. *Family Process*, 58(2), 353–369.
- Tornello, S. L., Emery, R., Rowen, J., Potter, D., Ocker, B., & Xu, Y. (2013). Overnight custody arrangements, attachment, and adjustment among very young children. *Journal of Marriage and Family*, 75(4), 871–885.
- True, M. (2021). New correlates of disorganization from a West-African dataset, and shared rhythmic and shared touch as a hidden pathway to infant attachment security. In (T. Forslund & R. Duschinsky Eds.), *Attachment theory and research: A reader*. Wiley.
- Umemura, T., & Jacobvitz, D. B. (2014). Nonmaternal care hours and temperament predict infants' proximity-seeking behavior and attachment subgroups. *Infant Behavior & Development*, 37(3), 352–365.
- Umemura, T., Jacobvitz, D., Messina, S., & Hazen, N. (2013). Do toddlers prefer the primary caregiver or the parent with whom they feel more secure? The role of toddler emotion. *Infant Behavior & Development*, 36(1), 102–114.
- UN General Assembly, *Convention on the rights of the child*, 20 November 1989, United Nations, Treaty Series, vol. p. 1577.
- van IJzendoorn, M. H., Bakermans-Kranenburg, M. J., Duschinsky, R., & Skinner, G. C. M. (2019). Legislation in search of “good-enough” care arrangements for the child: A quest for continuity of care. In (J. G. Dwyer Ed.), *The Oxford handbook of children and the law* (pp. 1–29). Oxford University Press.
- van IJzendoorn, M. H., Bakermans, J. J., Steele, M., & Granqvist, P. (2018a). Diagnostic use of Crittenden's attachment measures in family court is not beyond a reasonable doubt. *Infant Mental Health Journal*, 39(6), 642–646.
- van IJzendoorn, M. H., & De Wolff, M. S. (1997). In search of absent father-Meta-analyses of infant-father attachment: A rejoinder to our discussants. *Child Development*, 68, 604–609.

- van IJzendoorn, M. H., Sagi, A., & Lambermon, M. W. E. (1992). The multiple caretaker paradox: Data from Holland and Israel. *New Directions for Child and Adolescent Development*, 1992(57), 5–24.
- van IJzendoorn, M. H., Schuengel, C., & Bakermans-Kranenburg, M. J. (1999). Disorganized attachment in early childhood: Meta-analysis of precursors, concomitants, and sequelae. *Development and Psychopathology*, 11(2), 225–250.
- van IJzendoorn, M. H., Steele, M., & Granqvist, P. (2018b). On exactitude in science: A map of the empire the size of the empire. *Infant Mental Health Journal*, 39(6), 652–655.
- Verhage, M. L., Schuengel, C., Madigan, S., Fearon, R. M., Oosterman, M., Cassibba, R., & van IJzendoorn, M. H. (2016). Narrowing the transmission gap: A synthesis of three decades of research on intergenerational transmission of attachment. *Psychological Bulletin*, 142(4), 337–366.
- Warshak, R. A. (2014). Social science and parenting plans for young children: A consensus report. *Psychology, Public Policy, and Law*, 20(1), 46–67.
- Zappa, F. (1966). Who are the brain police? [Song recorded by the Mothers of invention]. *On Freak Out! Hip-O/Zappa Records*.
- Zimmermann, P. (2017). Bindung an den Vater: Eine andere bindung? [Attachment to father: A different attachment?]. In P. Zimmermann & G. Spangler (Eds.), *Feinfühliges Herausforderung: Bindung in Familie, Kita, Kinderheim und Jugendhilfe* (pp. 191–206). Psychosozial-Verlag.

How to cite this article: Forslund, T., Hammarlund, M., & Granqvist, P. (2021). Admissibility of Attachment Theory, Research and Assessments in Child Custody Decision-Making? Yes, and No!. *New Directions for Child and Adolescent Development*, 2021, 125–140. <https://doi.org/10.1002/cad.20447>

A society that values its children should cherish their parents: A move to considering the attachment network

Miriam Steele | Howard Steele

The New School for Social Research,
Department of Psychology, New York, USA

Correspondence

Miriam Steele, The New School for Social
Research, Department of Psychology, NY,
USA.

Email: SteeleM@newschool.edu

Author Note: The title of this paper, as many readers will recognize, is a paraphrasing of words that John Bowlby frequently included in his talks and publications. The words imply that it is easier to love children than children's parents, yet children's well-being depends in large part on their parents' well-being.

Abstract

This comment on the Special Issue contributions regarding the attachment network addresses the clinical implications of the findings from three perspectives: (1) the need to look beyond maternal influences on child developmental outcomes; (2) to be open to every seemingly peripheral influence on the child as this may have a central impact on the child, for example, grandmothers, the parental couple relationship, and others not living in the child's home but nonetheless influential; and (3) identify and cultivate security spreading effects that help change not only the child, but the child's relationships with others in and outside the family—to the benefit of all. Some evidence-based attachment-based interventions are highlighted.

KEYWORDS

attachment-based interventions, child-father attachment, child-mother attachment, grandmothers, John Bowlby

The papers making up this Special Issue on the attachment network move beyond the longstanding largely myopic focus on the mother-child attachment in the child development literature to a broader viewpoint, that is, that of examining how children are influenced in the near- and long-term by their relationship-specific attachments not only to mother, but also to father and other important caregiving influences on the child (e.g., grandmothers). There is an inherent and obvious complexity in this move from the original units of analyses of dyadic mother-child relationships to father-child, and to the extended network of grandparents, aunts, uncles, daycare providers. Each of these constellations of relationships represent diverse facets of childhood experiences and the interconnecting web of attachment relationships have made it a daunting prospect to

consider them all individually (e.g., father-child attachment) as well as the relationships between them. These start in infancy and develop further in early childhood, adapt, and potentially change in middle-childhood and then become more-or-less integrated in the mind of the adolescent, with repeated opportunities for reworking and updating these attachment representations in adulthood. This response to the papers focuses on three related areas of importance for clinicians considering the attachment network that should guide interventions aimed at enhancing the mental health of the child:

1. Expand the notion of “attachment” beyond mother, to include father and other significant individuals in the child’s caregiving environment and to consider the quality (insecure vs. secure, organized vs. disorganized) of those relationships;
 2. Focus on relatively minor or seemingly peripheral influences on the child that may have a great impact on the child, for example, grandmothers, the parental couple relationship, and others not living in the child’s home but nonetheless influential; and
 3. Consider the potential for security in a corner of the child’s life (in one relationship but not others) to have a spreading effect that helps change not only the child, but the child’s relationships with others in and outside the family.
-
1. Expand the notion of “attachment” beyond mother, to include father and other significant individuals in the child’s caregiving environment and to consider the quality (insecure vs. secure, organized vs. disorganized) of those relationships.

Relationship-specific interactions with parents, grandparents, teachers, and others receive much attention in Bakermans–Kranenburg’s review (2021; this issue), which delineates what is required for the development of an attachment relationship between a child and a caregiver. Specifically, Bakermans–Kranenburg cites Ainsworth’s six criteria needed to establish an attachment relationship, and accordingly states that many hundreds if not thousands of interactions between caregiver and child, where contingency (and shared positive affect) are sustained, as the building blocks for an attachment relationship. Bakermans–Kranenburg suggests that infants thrive best in the context of having attachment figures who show a special dedication to caring for the infant, which can include fathers, grandparents and others who spend time with child in a consistent and ongoing way as opposed to large numbers of caregivers in an institution where very likely no one caregiver has a special dedication to the infant. In the words of Bakermans–Kranenburg: “a child needs to spend time with a caregiver to build up a library of shared experiences to create (feelings of) contingency with that specific caregiver” (p.7) and out of this the child may come to regard the caregiver as a reliable source of safety (when distressed) and security/support (when needing to be helped to do something new and challenging). Bakermans–Kranenburg highlights the gap in research answering the question of how much time is needed for a child to form an attachment relationship and whether this depends on the age of the child and/or the context. As children mature and attend school, spending more time away from their family of origin, then the attachment network broadens and (hopefully) deepens.

An attachment perspective has much to offer individual clinicians who provide support and interventions to children. The move to the level of the attachment network demands that the clinician include all those directly involved in the child’s life including informants other than the usual maternal suspect. Ideally, one would want to collect information about all the significant relationships in a child’s life, from mother to all others, from insecure to secure, in order to map out the network of influences acting on the child. Dagan and Sagi-Schwartz (2021; this issue) provide a coherent restatement of their arguments in their influential *Child Perspectives* (Dagan & Sagi-Schwartz, 2018) paper laying out

different testable models for considering multiple caregiving influences on a child. There is an elegant model, including hierarchical and horizontal models, but the complexity of any modeling becomes dense when one considers families with multiple siblings, and also, blended families with half-siblings or children living with a new mother or new father who is married to the child's birth mother/father. There are also considerations that follow from taking account of children born of new reproductive technologies, where only one parent has a genetic link to the child, for example, gay or lesbian parents: Findings to date underscore how these children typically fare well on account of the fact that these children are frequently deeply wanted (Imrie & Golombok, 2020). This is the real world of clinical work, where each relationship within the family is ever being influenced by each other relationship in the family. Mapping these influences is essential so that a detailed consideration of these many discrete and overlapping influences is accounted for, including teacher and school contexts which are vital to get an idea of how the child functions beyond the intimate home environment. Evidence-based attachment-oriented interventions, however, have a long way to go if they are going to incorporate the important messages of this Special Issue. For example, the Handbook of Attachment-Based Interventions includes 21 chapters, yet only two of the 21 chapters explicitly focus on fathers as well as mothers, and 16/21 (76%) that are aimed at early childhood or infancy, are about interventions that focus primarily on the mother-child relationship. The two that include fathers explicitly are aimed at parents of troubled adolescents (Moretti et al., 2018) and another aimed at couples with father-involvement being critical to the intervention (Cowan et al., 2018). So clinicians have much to learn from the contents of this 2022 Special Issue.

Dagan and Sagi-Schwartz's perspective is operationalized in Dagan et al.'s individual participant data meta-analysis that provides support for the early attachment relationship to mother being similar to the early attachment relationship to father as insecurity in either one of these primary relationships may make internalizing or externalizing behavior problems more likely, especially if there is a classification of attachment disorganization in both of these early relationships. As in previous developmental research, children with the poorest prognosis for healthy development are those who have no primary attachment relationship that can be identified as secure. In a longitudinal study of children who experienced severe maltreatment in the first years of their lives and were then adopted between 4 and 7 years, and the AAI was administered after the adoptive placement had been made, the children showed less indicators of disorganized attachment 2-years into the adoptive placement if both adoptive parents were secure in response to the AAI, *or only one parent*, mother or father was securely attached. This finding is echoed in the current meta-analytic report from Dagan et al.: "children who were disorganized with both parents had more externalizing behavioral problems compared with children who were organized with either two parents or a single parent, regardless of which parent." (p. 27). This ought to give clinicians hope if they sense security in only one parent and not the other when working with children and their families. With the paucity across the globe of adults coming forward to take on a parental role with such children by expanding the focus beyond only considering whether mothers might be suitable to fathers too would greatly expand the possibilities for familial placements. There still exists a longstanding bias in favor of mothers (over fathers) and these findings argue for paying close attention to the potential adoptive father, because if he is organized and secure, and his partner is not, that may be enough to turn things around for the adopted child (and family). A change to government policies regarding suitability for fostering and adoption would serve those children who cannot remain in the care of maltreating adults.

There is another important clinical application of this first point of this commentary, that is, identify each child's attachment figure and the quality of that attachment. The gold

standard measure of attachment quality is the Strange Situation Procedure (Ainsworth et al., 1978), relied on in the Dagan et al.'s report, where the focus is on reunion behavior *following* a separation. It is not advisable to infer the quality of a child's attachment from the child's separation response, every-day reunion behavior (e.g., at preschool or nursery school) may be highly informative as to the child's probable attachment to the caregiver collecting them (Bick et al., 2012). One often hears from well-intentioned but not so well-informed clinicians that they have evidence that a child is "securely" attached because they cried when the caregiver left the room. From an attachment research perspective, equal if not more attention needs to be paid to the child's behavior upon reunion.

Dagan et al.'s paper importantly answers a question that was previously posed regarding the contributing role of father-child attachment to internalizing behavioral problems relative to that of the mother-child's: the available data from their meta-analytic report suggests that there is no significant difference in importance between the two. Children can be made to feel sad by having had an early insecure attachment to mother, or father. So there are limits on the capacity of one parent to over-ride the adverse influences of the other. But this question deserves much further investigation longitudinally, and with respect to disturbances beyond internalizing (e.g., depression) and externalizing (e.g., aggressive) behavioral problems. As adolescence brings the advent of other problems including eating disorders and personality disorders, that are linked to earlier insecure (and ongoing) attachments, including experiences of loss and abuse.

2. Consider secondary or other influences on the child that may have a great impact on the child, for example, grandmothers, the parental couple relationship, and others not living in the child's home but are nonetheless influential.

The Karaskiewicz et al. (2021) reporting on sustained observations of coppery titi monkeys (*Plecturocebus cupreus*): small-bodied, socially monogamous neotropical primates that form socially monogamous pair bonds and provide biparental care to their offspring offers up fascinating findings on the likely importance of the parents' couple relationship for the success of the child rearing effort. Affiliative behavior between monkey parents declines, as it does in humans, after the birth of the first child, but to the extent that the parenting couple have had more time affiliating prior to becoming parents, there is greater coparenting success after the child is born. This work echoes the decades of scientific and clinical contributions made by the Cowans devoted to including fathers and couples in developmental clinical research (e.g., Cowan & Cowan, 2019). Clearly, the field needs more evidence-based interventions aimed at enhancing the couple relationship in the service of both mother-child and father-child attachment relationships, including guidance to couples on the impact of the birth of a child on their affiliative relationship.

Bakermans-Kranenburg (pp. 3–4, 2021; this issue) summarizes the perspective that diverse relationships in the child's life may all play a role influencing character development: "the sociobiological perspective leads to the expectation that not only mothers take responsibility for childcare." Fathers would take such responsibility as well, especially if their paternity is reasonably certain, but also other close relatives such as grandparents, aunts and uncles, and older siblings would increase their inclusive fitness by investing the care of a specific child. Allomothering is observed in most group-living primates. The benefits of alloparenting are manifold: it provides inexperienced mothers with the opportunity to practice mothering skills, allows some freedom for the mother, and increases the child's chances of survival if the mother dies (Hrdy, 1976, 2009). At the same time, children with multiple attachments may still prefer their principal attachment figure in times of stress (Bowlby, 1969), which suggests a hierarchy of attachment relationships. And multiple

attachments may not always be ideal, as there is increasing agreement with the advocacy of Bakermans–Kranenburg and van IJzendoorn against institutionalized care (van IJzendoorn & Bakermans-Kranenburg, 2021) on account of the fact that the caregiving net institutional settings are spread too wide. High numbers of caregivers of very young children are likely to be confusing to the child and make stability and feelings of safety out of reach. As children mature and enter school, some teachers may assume the role of secondary attachment figures capable of helping to stabilize a child's social-emotional and cognitive direction (Verschuere & Koomen, 2012).

3. Consider the potential for security in a corner of the child's life (in one relationship but not others) to have a spreading effect that helps change not only the child, but the child's relationships with others in and outside the family.

The import for the researcher or the clinician to take into the account the cultural context in which an individual child is being cared for and raise is echoed in many of the papers in this Special Issue. And perhaps this is most evident in the contribution from Liang et al. (2021; this issue) who highlight the Chinese caregiving system that often directly involves grandmothers, as well as mothers (their daughters) who need to cooperate closely on the task of being attachment figures to the developing infant/young child. Liang et al. highlight the enormous value of what they call, and measure as “neutral/watching coparenting behaviors”—linked in their longitudinal study to parenting sensitivity later and optimal child outcomes. A close look at what they mean by “neutral/watching coparenting behaviors” suggests that they are observing “joint attention” and “shared positive affect”—two salient experiences vital to healthy development in the period when attachment relationships are first consolidating (i.e., 9–12 months of age). And, in terms of clinical interventions, advising caregivers to engage in these activities that fit under the heading of “neutral/watching coparenting behaviors” is likely to be very helpful. Neutral/watching often leads to the adult using descriptive language that helps structure the infants' experiences and enables them to feel “seen” and “valued.” Interestingly, the “neutral/watching” cluster of behaviors appears low down the list of behaviors Liang et al. describe in their Method section: “Neutral/watching behaviors meant one caregiver being engaged in the task, but not performing any coparenting initiatives (for example, one caregiver is quietly watching the interaction between infant and the other caregiver).” “Fools rush in where angels dare to tread” is another way of stating this parenting and grandparenting strategy. In other words, support of the child and fellow caregivers can also be provided by providing support via nonverbal behavior. Clearly more was being captured with this code than just quietly watching the other caregiving figure (mother watching grandmother or grandmother watching mother)—a lack of interference, a lack of criticism, a respect for the other. All vital messages to underscore in a clinical intervention aiming to support mothers and other caregivers (fathers, grandmothers, grandfathers). Clinically, it is often the case that a parent expresses resentment of the other caregiver who is not doing what the first caregiver thinks they ought to be doing. Conflict may be averted or resolved by encouraging “neutral/watching behaviors.”

It is interesting to consider the important research findings and conceptual expansions of attachment theory that are presented in this special issue on attachment networks in the context of revisiting John Bowlby's penultimate book, *Clinical Applications of Attachment: A secure base* (1988). Bowlby articulated a 5-point model of therapy that has wide relevance in terms of individual therapy, couple therapy, and family therapy. The five goals of therapy to be pursued jointly are: (1) establish a secure base, trust or therapeutic alliance; (2) explore current relationships, sources of satisfaction and concern; (3) explore

past relationships, sources of satisfaction and concern; (4) link current relationships to learning in past relationships; and (5) update and revise one's assumptions or internal working models so that they are more accurate and flexible and accepting of love, while one becomes better able to provide love. Arguably, mapping the influence of the past on the present is best arrived at by interviewing a parent about their childhood history (Bowlby, 1949). This 1949 paper of Bowlby's is considered the first paper on family therapy ever published. Some 40 years later the AAI (George et al., 1996) was developed with a companion rating and classification system (Main et al., 2003, 2008), and the AAI has been usefully applied in clinical research and clinical practice to shed light on dimly remembered but important security-promoting relationships, for example, to a grandmother during childhood, that can be reawakened in the adult to harness and grow parenting skills that contribute to a parent being an attachment figure capable of providing sensitive and responsive care (Jones, 2008).

In conclusion, new directions in child development research and clinical work will likely follow from the creative and interesting mix of papers that comprise the present Special Issue, with the relevant focus provided on the Attachment Network. Such a focus demands that clinical interventions aiming to help children also aim to help siblings, parents, grandparents, and the parental couple, as children's well-being will be linked to how well each of these influential family members is managing with the challenges in their lives, arising from, and interacting with, forces in and outside the family home.

REFERENCES

- Ainsworth, M. D. S., Blehar, M. C., Waters, E., & Wall, S. (1978). *Patterns of attachment: A psychological study of the strange situation*. Erlbaum.
- Bakermans-Kranenburg, M. J. (2021). The limits of the attachment network. *New Directions for Child and Adolescent Development*, 2021, 117–124. <https://doi.org/10.1002/cad.20432>
- Bick, J., Dozier, M., & Perkins, E. (2012). Convergence between attachment classifications and natural reunion behavior among children and parents in a child care setting. *Attachment & Human Development*, 14, (1), 1–10, <https://doi.org/10.1080/14616734.2012.636645>
- Bowlby, J. (1949). The study and reduction of group tensions in the family. *Human Relations*, 2, 123–128. <https://doi.org/10.1177/001872674900200203>
- Bowlby, J. (1969). *Attachment and loss*, Vol. 1: Attachment. Basic Books.
- Bowlby, J. (1988). *A secure base: Clinical applications of attachment*. London: Routledge.
- Cowan, P. A., & Cowan, C. P. (2019). Introduction: Bringing dads back into the family. *Attachment & human development*, 21(5), 419–425.
- Cowan, P. A., & Cowan, C. P., Pruett, M. K., & Pruett, K. (2018). Supporting father involvement: A father-inclusive couples group approach to parenting interventions. In Steele, H. & Steele, M. (Eds). *Clinical applications of the Adult Attachment Interview*, pp. 466–492. Guilford Press.
- Dagan, O., & Sagi-Schwartz, A. (2018). Early attachment network with mother and father: An unsettled issue. *Child Development Perspectives*, 12(2), 115–121. <https://doi.org/10.1111/cdep.12272>
- Dagan, O., & Sagi-Schwartz, A. (2021). Early attachment networks to multiple caregivers: History, assessment models, and future research recommendations. *New Directions for Child and Adolescent Development*, 2021, 9–19. <https://doi.org/10.1002/cad.20446>
- George, C., Kaplan, N., & Main, M. (1996). *Adult attachment interview protocol* (3rd edn.). Unpublished manuscript, University of California, Berkeley.
- Hrdy, S. B. (1976). Care and exploitation of nonhuman primate infants by conspecifics other than the mother. In *Advances in the study of behavior* (Vol., 6, pp. 101–158). Academic Press.
- Hrdy, S. B. (2009). *The woman that never evolved*. Harvard University Press.
- Imrie, S., & Golombok, S. (2020). Impact of new family forms on parenting and child development. *Annual Review of Developmental Psychology*, 2, 295–316. <https://doi.org/10.1146/annurev-devpsych-070220-122704>
- Jones, A. The AAI as a clinical tool. In Steele, H. & Steele, M. (Eds). (2008). *Clinical applications of the adult attachment interview*, pp. 175–194. Guilford Press.
- Karaskiewicz, C. L., Witzack, L. R., Lau, A. R., Dufek, M. E., & Bales, K. L. (2021). Parenting costs time: Changes in pair bond maintenance across pregnancy and infant rearing in a monogamous primate (*Plecturocebus cupreus*). *New Directions for Child and Adolescent Development*, 2021, 21–42. <https://doi.org/10.1002/cad.20438>

- Liang, X., Lin, Y., Van IJzendoorn, M. H., & Wang, Z. (2021). Grandmothers are part of the parenting network, too! A longitudinal study on coparenting, maternal sensitivity, child attachment and behavior problems in a Chinese sample. *New Directions for Child and Adolescent Development*, 2021, 95–116. <https://doi.org/10.1002/cad.20442>
- Main, M., Goldwyn, R., & Hesse, E. (2003). *Adult attachment classification system Version 7.2. Unpublished manuscript*. University of California.
- Main, M., Hesse, E., & Goldwyn, R. (2008). Studying differences in language use in recounting attachment history. In (H. Steele, & M. Steele Eds.), *Clinical applications of the adult attachment interview* (pp. 31–68). Guilford Press.
- Moretti, M. M., Pasalich, D. S., & O'Donnell, K. A. (2018). Connect: An attachment-based program for parents of teens. In (H. Steele, & M. Steele Eds.), *Handbook of attachment-based interventions* (pp. 375–400). Guilford Press.
- Steele, H., & Steele, M. (Eds). (2018). *Handbook of attachment-based interventions*. New York: Guilford Press.
- van IJzendoorn, M. H., & Bakermans-Kranenburg, M. J. (2021). 'Tear down your institutions'. Empirical and evolutionary perspectives on institutional care in SOS Children's Villages. *American Psychologist*, 76.
- Verschueren, K., & Koomen, H. M. (2012). Teacher–child relationships from an attachment perspective. *Attachment & Human Development*, 14(3), 205–211.

How to cite this article: Steele, M., & Steele, H. (2021). A society that values its children should cherish their parents: A move to considering the attachment network. *New Directions for Child and Adolescent Development*, 2021, 141–147. <https://doi.org/10.1002/cad.20454>

Attachment networks and the future of attachment theory

Ross A. Thompson

Department of Psychology, University of California, Davis, California, USA

Correspondence

Ross A. Thompson, Department of Psychology, University of California, Davis, Davis, CA USA.

Email: rathompson@ucdavis.edu

Abstract

Attachment theorists have long recognized that multiple attachments characterize the typical experience of most children. But an appreciation of attachment networks is new, and this commentary draws on some of the most theoretically provocative themes of the contributions to this special issue. These include: how the quality of attachment relationships and the contexts of their development colors the security derived from them and the developmental outcomes they influence; the impact of relationships on other relationships in the attachment network; and the multiple ways attachment theory can influence public policy for children and families.

KEYWORDS

attachment networks, internal working models, multiple attachments, public policy, security

INTRODUCTION

Historians of science often describe how theories are derivative of the times and culture of their creation. In psychology, familiar examples are the influence of the Victorian sensibility of 19th-century Vienna on psychoanalytic theory, and behaviorism as a reflection of the practical, can-do spirit of its early 20th century American origins. In a similar manner, attachment theory reflects the influence of post-WWII British society, especially as it was experienced by John Bowlby, in its concern with the importance of early relationships for the socioemotional well-being of young children. In the aftermath of a war in which traumatized young children had lost their parents, temporarily or permanently, this was a natural concern. And although Bowlby's personal childhood experience of nanny care might have led him otherwise, the theory he created is focused predominantly on care provided by a mothering-figure, and it is an orientation that has continued to this day. There is

no doubt that attachment theory would be much different if it were a 21-century product, or if it were informed by observations of early care in different cultures, and one of the ways it would be different would be its greater attention to attachment networks as part of the typical experience of young children.

The contributors to this special issue invite us to consider what attachment theory might look like if it had incorporated attention to attachment networks from the beginning, and that is also the task of this commentary. In some respects, this does not envision a radically different theory because attachment theory has gradually included attention to multiple attachments as children's experience of care has increasingly included fathers as well as mothers, extended family members, out-of-home caregivers, and others in the child's environment of relationships. Moreover, the expansion of attachment theory to adult attachments has familiarized researchers with the multiple close relationships of various kinds that characterize adult life. But it is impossible to deny that in some respects, attachment theory would look very differently if Bowlby (or Ainsworth) had devoted greater attention to young children's normative experience of care from diverse people and the relational networks in which this occurs. In this brief essay, I focus on three differences that are theoretically most provocative: the qualitative richness of relationships with multiple figures, the impact of relationships on other relationships within the attachment network, and the implications of attachment networks for social policies that have been informed by attachment research.

EARLY RELATIONSHIPS DIFFER QUALITATIVELY

The view that early relationships differ in their quality almost goes without saying, but the recognition that these qualitative differences have developmental impact would significantly broaden the scope of attachment thinking about early relationships. It would cause attachment researchers to broaden their attention from a narrow emphasis on the security conferred by relationships to how that security is contextualized by the characteristics of the attachment figure, the contexts of their interaction, and the nature of their relationship.

Given how predominantly (and justifiably) researchers have studied attachment through the lens of security, it is natural that initial efforts to portray the developmental influence of attachment networks would proceed in terms of the number of relationships that confer security to the child. As summarized by Dagan and Sagi-Schwartz (2021; this issue), this work has focused on the independence or nonindependence of the security established by a child in multiple relationships, the joint effects of multiple secure (or insecure) relationships, the relative influence of the security of different attachments on developmental outcomes, and related concerns. Exemplary of this approach is their own formulation that distinguishes the additive, buffering, hierarchical, and horizontal hypotheses to account for the intersection of multiple attachments on developmental outcomes, all based on the security of these attachments. Because of the data-intensive research required to evaluate these hypotheses, the study by Dagan et al. (2022; this issue) is a fascinating empirical inquiry into the attachment network using individual participant data meta-analysis to examine the developmental impact of maternal and paternal attachments on internalizing and externalizing problems in children, and constitutes a model for future research on attachment networks. Their findings were complex because the influence of attachment relationships varied according to whether they were assessed as secure/insecure or organized/disorganized—suggesting that more than security is relevant to the effects of attachment networks on different developmental domains. But the findings confirm and extend current understanding by demonstrating the additive effects of multiple

attachments, providing some evidence of buffering associations between these relationships, and rejecting the view that there is (at least with respect to the prediction of behavioral problems) a hierarchy of influence between maternal and paternal attachments, and thus supporting the horizontal hypothesis.

As these (and all) researchers recognize, of course, fathers are more to a child than another source of security compared to mothers. It took researchers years of effort to move beyond studying fathers using the conceptual lens of maternal care, and now researchers are increasingly unfolding the unique contributions of fathers to young children's development. Deneault et al. (2021; this issue) provide an important contribution by establishing, through another large-sample meta-analysis, that father-child attachments contribute to the prediction of child internalizing and externalizing problems at a level comparable to mother-child attachments. Their conclusions are consistent with those of Dagan et al. (2021; this issue), but they extend them by considering the reasons why paternal attachments have these influences and the follow-on research that is necessary to explore these issues further. The question at the heart of their discussion is how security to father buffers the emergence of early behavior problems in a manner comparable to, but different from, the effects of maternal attachments. Their portrayal of fathers' influence through engaging play activity and fathers' emotional regulatory influence is consistent with other portrayals in the fatherhood literature, such as Cowan and Cowan's (2019) view that while mothers provide a safe haven when their young children are upset, fathers more characteristically offer a secure base for exploration and discovery. Together, these papers underscore that the context in which security is experienced is important to the developmental influence of multiple attachment relationships.

The view that security is colored by qualitative differences between relationships is even clearer when attachments to child care providers are considered. Secure attachments to child care providers are similar to child-parent attachments in the safety they provide young children and comfort when distressed, but children do not respond comparably to separation from their parents and child care providers. Drawing on her own research, Ahnert (2021) has underscored the functional differences between these relationships, such as how security develops from a care provider's sensitivity to the group (not just the individual child), how young children's security is influenced by their observations of sensitive care provided to other children, and how security in these relationships affects core features of adaptation in child care, including differences in cognitive performance, behavioral adjustment, and stress management. Security is important, and its origins and developmental influence depend on the relationship in its context.

This is not news to those who study adult attachment relationships because of the diversity of adult attachment figures. These can include marital partners, close friends or relatives, and siblings, and relationships with each have different defining features, origins, functions, and significance to the individual (Aviles & Zeifman, 2021). Although one can find in the adult literature references to the additive, buffering, and hierarchical effects of security to multiple partners, more often adult attachment researchers portray these attachments in terms of their functional characteristics for the individual (e.g., Girme & Overall, 2021). The meaning and significance of a secure attachment to a romantic partner is different from the meaning and significance of a secure attachment with an adult sibling, for example, even though each partner provides, in different ways, a psychological secure base and a safe haven in difficulty.

Viewing attachment networks with regard to the qualitative characteristics of different attachments and the contexts in which they function would not only add depth to theoretical portrayals of relational security, but also afford greater specificity in the prediction of different developmental outcomes. If the security of child-father attachment is colored

by the father's sensitivity while managing emotionally arousing play, but security to a child care provider is shaped by the child's experience of group sensitivity received in the midst of other children's demands, this has important implications for thinking about the prediction of these attachments to peer relationships, emotion understanding, self-regulation, and other outcomes. Stated differently, within the attachment network different attachments may be preeminent influences for different developmental outcomes.

Attachment networks are also important to understanding the development of attachment-related representations or, in Bowlby's term, internal working models. The idea that experiences with attachment figures lead to the development of affectively colored, dynamic mental representations that influence subsequent relationships is one of the most generative aspects of Bowlby's theory, but also one of the most problematic. It is problematic because attachment researchers conceptualize internal working models in many different ways, leading to considerable ambiguity in the defining features of one of the core theoretical concepts of attachment theory (see Thompson et al., 2021). An important unaddressed but crucial theoretical question is whether the working models associated with different attachment relationships become developmentally integrated or harmonized, and if so, how. Given the importance of the internal working models construct to attachment thinking, research on attachment networks would contribute immeasurably to attachment theory by shedding light on this issue.

Once again, adult attachment researchers have already devoted some thought to this problem (see Thompson et al., 2021, for a review). To some, individuals develop and maintain multiple partner-specific working models that are evoked in different circumstances based on the relationship from which they have derived (another reason why attention to the functional characteristics of attachment relationships is useful). To others, earlier working models become revised with subsequent relational experience over time, while other researchers portray multiple working models becoming hierarchically integrated to constitute global working models summarized across relational experience. None of these formulations from the adult literature is developmentally graded, but they constitute useful working hypotheses for considering the development and refinement of mental working models of relationships within attachment networks.

One way that developmental processes may affect the growth of working models within attachment networks, however, is described by Bakermans-Kranenburg (2021; this issue). She thoughtfully argues, based on data from multiple sources, that there is a limit to the size of the attachment network of which children are capable if these attachments are to be secure, and that cognitive developmental changes permit a gradual increase in the size of the network (within limits) in childhood. This argument builds on the view that not all caregiving relationships are attachments, and that some attachments may be temporary or transitory in nature (that is, attachment figures within a network may not be comparably important or salient to the child).

This is a valuable contribution, and it might be expanded with consideration of developmental changes in the nature of internal working models themselves as the child matures. It seems likely that the earliest mental representations of relationships in infancy are intuitive, largely nonconscious responses to regular interactive contingencies that elicit quick and automatic behavioral and affective reactions in the infant. These are not yet the "expectations about behavioral do's and don'ts in each of the specific relationships" described by Bakermans-Kranenburg—those will emerge later. But they do permit the young infant to respond adaptively to early relational experience in ways that can foster human connections and survival. With increasing age, children become more consciously aware of specific characteristics of their attachment figures and of their interactions with them and, even later, begin to develop the broader relational "rules" that affect other relationships as

well. Stated differently, and with reference to current dual-process models of cognition (see Kahneman, 2011, for a recent account), internal working models begin with the intuitive, automatic, nonconscious processing of relational experience before it becomes integrated with the reflective, slower, and more conscious thinking that enables the refinement, revision, and integration of working models envisioned by adult attachment theorists. By combining understanding of internal working models as developing mental constructs with Bakermans-Kranenburg's respect for developmental changes in capacity limitations, the beginnings of a genuinely developmental portrayal of Bowlby's concept can begin to be envisioned.

RELATIONSHIPS INFLUENCE OTHER RELATIONSHIPS

An attachment network is more than the security derived by a child from multiple attachment relationships. It also incorporates the relationships between different attachment figures, and the impact of those relationships on each attachment. Attachment researchers have long recognized this, such as in studies showing that the quality of the parents' marital relationship shapes a child's emotional security with family members (Cummings & Davies, 2010). This special issue includes two more thought-provoking contributions to understanding the impact of relationships on other relationships.

In a study of Chinese families, Liang et al. (2021; this issue) show that a mother's sensitivity to her infant is influenced by the quality of coparenting afforded by the grandmother, observed in a culture with well-defined coparenting roles for the grandparenting generation. Although the findings of this study were not entirely consistent with expectations, particularly in the failure of the grandmother's supportive coparenting to predict maternal sensitivity or infant secure attachment, the benefits to maternal sensitivity and attachment of the grandmother's more neutral coparenting demeanor—and the capacity of the grandmother's undermining coparenting to reduce maternal sensitivity—attest to the significant impact of the mother–grandmother relationship on the mother's relationship with her own child. An interesting question deriving from these findings is a culturally comparative one: would such impact ensue in an alternative cultural context (such as the United States) in which the role of the grandmother is not so well-defined?

The contribution by Karaskiewicz et al. (2021; this issue) focuses on how the relationship between parents is affected by the birth of a newborn through a study of titi monkeys (it also invites the question of how differently attachment theory might have developed if Bowlby had studied research on titi monkeys rather than rhesus monkeys). Beginning with the observation that it is challenging to maintain relationships, their investigation focused on how pair-bond maintenance became progressively balanced with the demands of infant care over time. Perhaps predictably, the findings showed a decline in behaviors indexing relational maintenance once offspring are born, followed by its slow recovery, but this simple story was complicated by several influences, including the duration of the parental relationship before birth, the infant's growing independence, and—importantly—the infant's preferential behavior toward the father. Few human attachment studies are designed to so incisively inquire into the developing dynamics of the attachment network when it expands to include a newborn.

Taken together, these studies attest to how children's relational experience is affected directly by the quality of adult care and indirectly by the impact of other relationships on an adult's care. They challenge students of attachment networks to move beyond studies of the impact of marital quality on children's emotional security to consider a broader range of relationships impacting attachment, including how parental care is affected by

parents' relationships with child care providers, grandparents, neighbors, coaches, media influencers, and others in the relational environment of the attachment network. Not surprisingly, these relationships are often shaped by practices and policies governing how families interact with outside individuals and agencies that are often not well-informed by attachment theory. This leads to the final topic.

ATTACHMENT NETWORKS AND SOCIAL POLICY

Kurt Lewin's oft-quoted maxim, "there is nothing so practical as a good theory," is certainly true of attachment theory. For more than 50 years since Bowlby's formulations, attachment theory has been applied to a range of issues in child and family policy, including child custody determinations when parents divorce, child placement decisions in child protection, foster care, child care practices, and more recently home visitation and early education. As Forslund et al. (2021; this issue) insightfully argue, attachment theory and research constitute "framework evidence" to provide general principles guiding judicial and public policy, but measures of attachment quality are not sufficiently validated for diagnostic contexts to provide individual-level or case-specific evaluations. These conclusions confirm and extend those of a recent consensus statement by attachment experts (Forslund et al., 2021) as well as an earlier consensus statement by developmental experts (Lamb et al., 1997).

Bridging developmental science and public policy is attractive in abstract but difficult in practice, as Forslund and colleagues' discussion of the variety of historical and current misapplications of attachment to child custody issues aptly illustrates. In a sense, one needs to be either an expert in both fields, as familiar with the thicket of issues in case law and judicial procedure as with psychological theory and methodology, or ally with experts in these fields to create well-crafted policy recommendations informed by attachment thinking. In this light, one of the recommended "ways forward" offered by the authors was a bit surprising: enlisting professional training in validated measures of sensitivity for assessing caregiver behavior in custody determinations. Such a recommendation would seem to be subject to some of the same reservations as using Strange Situation observations for offering case-specific recommendations to the court, and is also prone to the criticisms of culture researchers that, without further validation in non-Western contexts, such measures incorporate Western and middle-class standards of desirable parental care that may disadvantage families who are from a different cultural context (Keller et al., 2021). It does not appear, therefore, that there are good avenues for attachment theory to offer more than framework evidence to the court for child custody determinations.

However, there is another way forward. Child custody determinations are not only retrospective (i.e., determinations of past parental roles and competence) but also prospective, as divorcing parents negotiate over the future care of their children. One of the major avenues of legal reform of child custody determinations in the United States has been to create strong incentives for parents to negotiate detailed parenting plans for the postdivorce care of offspring, helping parents to recognize that although they may divorce a former spouse, they cannot stop being parents to their children (American Legal Institute, 2002). Parenting plans, often created with the assistance of divorce mediators, give parents responsibility for creating arrangements for issues such as parenting time for each former spouse, educational and health care decisions, child support, sharing of higher education expenses, and they also identify how changes to the plan will be negotiated in response to future needs. These plans must pass muster with the court before they can be approved and implemented. If attachment theory cannot have a stronger influence in courtroom determinations of child custody, it can have a significant influence on the considerations parents

enlist in negotiating meaningful roles for each of them in the future lives of their offspring, especially through the influence of divorce mediators, counselors, attorneys, and the court itself, and thus preserve a child's essential attachment network in postdivorce family life (Thompson & Amato, 1999).

FINAL COMMENTS

These remarkable papers take us a long way forward in unpacking the concept of attachment networks and its implications for the future of attachment theory. Envisioning what attachment theory might look like if it had incorporated attention to attachment networks from the beginning inspires a vision for what the future of attachment theory and research might become. It is a vision well worth pursuing.

CONFLICT OF INTEREST

No conflicts of interest to declare.

REFERENCES

- Ahnert, L. (2021). Attachment to child care providers. In R. A. Thompson, J. A. Simpson, & L. J. Berlin (Eds.), *Attachment: The fundamental questions* (pp. 31–38). Guilford.
- American Legal Institute (2002). *Principles of the law of family dissolution: Analysis and recommendations*. St. Paul, MN: American Law Institute.
- Aviles, A. I., & Zeifman, D. M. (2021). Casting a wider net: Parents, pair bonds, and other attachment partners in adulthood. In R. A. Thompson, J. A. Simpson, & L. J. Berlin (Eds.), *Attachment: The fundamental questions* (pp. 53–59). Guilford.
- Bakermans-Kranenburg, M. J. (2021). The limits of the attachment network. *New Directions for Child and Adolescent Development, 2021*, 117–124. <https://doi.org/10.1002/cad.20432>
- Cowan, P. A., & Cowan, C. P. (2019). Introduction: Bringing dads back into the family. *Attachment & Human Development, 21*, 419–425. <https://doi.org/10.1080/14616734.2019.1582594>
- Cummings, E. M., & Davies, P. T. (2010). *Marital conflict and children: An emotional security perspective*. Guilford.
- Dagan, O., & Sagi-Schwartz, A. (2021). Early attachment networks to multiple caregivers: History, assessment models, and future research recommendations. *New Directions for Child and Adolescent Development, 2021*, 9–19. <https://doi.org/10.1002/cad.20446>
- Dagan, O., Schuengel, C., Verhage, M. L., van IJzendoorn, M. H., Sagi-Schwartz, A., Madigan, S., Duschinsky, R., Roisman, G. I., Bernard, K., Bakermans-Kranenburg, M., Bureau, J.-E., Volling, B. L., Wong, M. S., Colonnese, C., Brown, G. L., Eiden, R. D., Fearon, R. M. P., Oosterman, M., Aviezer, O., ... Cummings, E. M.; Collaboration on Attachment to Multiple Parents and Outcomes Synthesis. (2022). Configurations of mother-child and father-child attachment as predictors of internalizing and externalizing behavioral problems: An individual participant data (IPD) meta-analysis. *New Directions for Child and Adolescent Development, 2021*, 67–94. <https://doi.org/10.1002/cad.20450>
- Deneault, A.-A., Bakermans-Kranenburg, M. J., Groh, A. M., Fearon, P. R. M., & Madigan, S. (2021). Child-father attachment in early childhood and behavior problems: A meta-analysis. *New Directions for Child and Adolescent Development, 2021*, 43–66. <https://doi.org/10.1002/cad.20434>
- Forslund, T., Granqvist, P., van IJzendoorn, M. H., et al. (2021). Attachment goes to court: Child protection and custody issues. *Attachment & Human Development*. Advance online publication. <https://doi.org/10.1080/14616734.2020.1840762>
- Girme, Y. U., & Overall, N. C. (2021). A functional account of multiple internal working models: Flexibility in ranking, structure, and content across contents and time. In R. A. Thompson, J. A. Simpson, & L. J. Berlin Eds., *Attachment: The fundamental questions* (pp. 136–143). New York, NY: Guilford.
- Kahneman, D. (2011). Thinking, fast and slow. *Farrar, Straus and Giroux*.
- Karaskiewicz, C. L., Witzak, L. R., Lau, A. R., Dufek, M. E., & Bales, K. L. (2021). Parenting costs time: Changes in pair bond maintenance across pregnancy and infant rearing in a monogamous primate (*Plecturocebus cupreus*). *New Directions for Child and Adolescent Development, 2021*, 21–42. <https://doi.org/10.1002/cad.20438>
- Keller, H. (2021). Attachment theory: Fact or fancy? In R. A. Thompson, J. A. Simpson, & L. J. Berlin (Eds.), *Attachment: The fundamental questions* (pp. 229–236). New York, NY: Guilford.

- Lamb, M. E., Sternberg, K., & Thompson, R. A. (1997). The effects of divorce and custody arrangements on children's behavior, development, and adjustment. *Family & Conciliation Courts Review*, 35(4), 393–404 <https://doi.org/10.1111/j.174-1617.1997.tb00482.x>
- Liang, X., Lin, Y., Van IJzendoorn, M. H., & Wang, Z. (2021). Grandmothers are part of the parenting network, too! A longitudinal study on coparenting, maternal sensitivity, child attachment and behavior problems in a Chinese sample. *New Directions for Child and Adolescent Development*, 2021, 95–116. <https://doi.org/10.1002/cad.20442>
- Thompson, R. A., & Amato, P. E. Eds. (1999). *The postdivorce family: Children, parenting, and society*. Thousand Oaks, CA: Sage.
- Thompson, R. A., Berlin, L. J., & Simpson, J. A. (2021). Assembling the puzzle: Interlocking pieces, missing pieces, and the emerging picture. In R. A. Thompson, J. A. Simpson, & L. J. Berlin (Eds.), *Attachment: The fundamental questions* (pp. 391–425). Guilford.

How to cite this article: Thompson, R. A. (2021). Attachment networks and the future of attachment theory. *New Directions for Child and Adolescent Development*, 2021, 149–156. <https://doi.org/10.1002/cad.20455>