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Developmental Psychology

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Online First Publication, December 5, 2024. https://dx.doi.org/10.1037/dev0001838

AMERICAN PSYCHOLOGICAL ASSOCIATION

Developmental Psychology

ISSN: 0012-1649

https://doi.org/10.1037/dev0001838

Men's Empathy Toward Children's Emotions Across the Transition to Fatherhood

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We investigated whether men's affective and cognitive empathy toward children's emotions changes across the transition to fatherhood. Specifically, we were interested in whether empathy increases with fathering experience. In two preregistered online studies (N = 1,046, primarily from the United Kingdom and the United States), participants' task was to rate their affective responses to emotional pictures of children (affective empathy) and to recognize children's emotions from pictures of the eye area (cognitive empathy). In Study 1 (N = 530), we compared childless men, expecting fathers, and fathers. Expecting fathers displayed greater affective empathy toward children than childless men, but they did not differ significantly from fathers. Unexpectedly, fathers exhibited lower cognitive empathy than expecting fathers. Study 2 (N = 516) extended these findings by investigating the impact of different levels of fathering experience among first-time fathers and those with prior parenting experience. Fathers of infants showed more affective empathy than childless men, regardless of prior parenting experience. Fathers with older children had lower cognitive empathy compared to childless men and fathers with infants. These results suggest that expecting fathers and fathers with a new infant may exhibit increased affective empathy to children's emotions. More experienced fathers and fathers of older children may have become accustomed to childcare, necessitating less intensive engagement to child signals. Future longitudinal studies are needed to determine whether empathy toward children's emotions shows within-person fluctuations during the transition to fatherhood instead of steadily increasing.

Public Significance Statement

We investigated men's empathy toward children at different stages of fatherhood. Unexpectedly, empathy did not uniformly increase with fatherhood experience, but men who were expecting or currently caring for a baby showed heightened empathy toward children's emotions. Empathy is necessary for appropriate responding to children's needs and understanding its development in men across the transition to fatherhood is important for identifying and supporting new fathers who might struggle with empathy.

Keywords: fathers, fatherhood, empathy, emotion recognition, emotions

Supplemental materials: https://doi.org/10.1037/dev0001838.supp

Koraly Pérez-Edgar served as action editor.

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The authors have no known conflicts of interest to disclose. This research was supported by grants from the Suomen Akatemia and Research Council of Finland (Grant 307657 awarded to Mikko J. Peltola and Grant 321424).

Sonja Veistola played a lead role in conceptualization, data curation, formal analysis, investigation, visualization, and writing–original draft and an equal role in project administration. Peter A. Bos played a lead role in resources and an equal role in supervision and writing–review and editing. Rike Pahnke played a lead role in resources and an equal role in methodology and writing–review and editing. Alexander Lischke played a supporting role in supervision and an equal role in methodology, resources, and writing–review and editing. Mikko J. Peltola played a lead role in funding acquisition and supervision and an equal role in data curation, methodology, project administration, and writing–review and editing.

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Research on human paternal caregiving has advanced rather recently, in part propelled by sociocultural and economic adjustments, which encourage fathers' greater involvement in direct childcare (M. J. Bakermans-Kranenburg et al., 2019; Behari, 2021; Employment, Social Affairs and Inclusion, 2018; Lamb, 2013; Lucassen et al., 2011; Pleck & Pleck, 1997). However, paternal caregiving in humans is not a new phenomenon. Human parenting is a complex, malleable, and cooperative process, extending beyond the mother–infant bond and societal changes (L. Gettler et al., 2020; for review, see Sear, 2016). The capacity of human males to assume primary caregiver roles, including single or same-sex parents, underscores their psychological and biological disposition for caregiving. However, there remains a need to understand the biological and psychological mechanisms that prepare men for their new role as a caregiver when they become a parent (Rilling, 2013). This study investigated differences in men's empathy, a crucial aspect of caregiving, throughout the process of becoming fathers. In the first study, we examined affective and cognitive empathy concerning children's emotions in fathers, expecting fathers, and childless men. The subsequent study expanded on these findings by exploring variations in empathy toward children's emotions between first-time fathers and those with prior parenting experience.

Empathy is an essential precursor for sensitive parenting, which includes the caregiver's ability to recognize and respond to the child in a way that matches the child's needs (Ainsworth et al., 1978). While intertwined (Kanske, 2018) empathy can be divided into affective and cognitive components (Smith, 2006). Cognitive empathy encompasses abilities such as perspective taking and emotion recognition (Frith & Frith, 2006), while affective empathy encompasses abilities such as affect sharing and compassionate responding (de Vignemont & Singer, 2006). Both components are important in the context of parental caregiving: Parents need cognitive empathy to infer children's emotions, thoughts, and needs from verbal and nonverbal cues (Braadbaart et al., 2014; Sauter & Eimer, 2010) but without affective empathy the motivation to respond to the child's emotions, thoughts, and needs might not arise (Blair, 2005). Hence, fathers' affective and cognitive empathy is necessary for fathers' engagement in attuned caregiving behavior (Cardenas et al., 2021).

In this article, we compare groups of men in different stages of the transition to fatherhood to see if both affective and cognitive empathy are affected by this developmental stage in a man's life. Previous studies have shown that first-time fathers undergo biological changes that might help them to become more attuned and empathic toward children's emotions (Diaz-Rojas et al., 2021; Paternina-Die et al., 2020). Hormonal (L. T. Gettler et al., 2011) and neural changes (Abraham et al., 2014; Kim et al., 2014) across the transition to fatherhood might relate to fathers' enhanced empathic ability and indicate preparation for caregiving (Feldman & Bakermans-Kranenburg, 2017; Feldman et al., 2012; Fleming et al., 2002; Gordon et al., 2010, 2017; Mascaro, Hackett, & Rilling, 2014).

Regarding neural changes across the transition to fatherhood, men show functional and structural changes in a network of brain regions that are implicated in empathy and caregiving (Abraham et al., 2014; Diaz-Rojas et al., 2021; Horstman et al., 2022; Kim et al., 2014). For instance, compared to childless men, fathers show greater activation in brain regions involved in empathy and emotion when viewing children's emotional expressions (Mascaro, Hackett, & Rilling, 2014). First-time fathers also show similar activation of neural systems involved in empathizing and motivation as first-time mothers when they hear infant cries (Li et al., 2018). These activation patterns suggest changes in brain activity that prime empathetic responding and empathetic behavior in men. Such brain changes might begin already during their partner's pregnancy. Fathers show activity changes in brain regions implicated in empathy and caregiving during their partner's middle-to-late pregnancy that are even more pronounced after the child is born (Diaz-Rojas et al., 2023). These brain changes also continue to take part after the child's birth as indicated by structural brain changes in empathy-related brain regions in the first month after birth (Kim et al., 2014). These brain changes become even more pronounced in fathers who take on more childcare responsibility indicated by greater cohesion between brain regions associated with empathy and caregiving (Abraham et al., 2014; Horstman et al., 2022).

Regarding hormonal changes across the transition to fatherhood, men's testosterone levels decline as they become a father (Edelstein et al., 2017; L. T. Gettler et al., 2011; Gray et al., 2002; Saxbe et al., 2017), a change that is hypothesized to help the new father to shift their focus competition and mating to family and childcare (Archer, 2006; L. T. Gettler et al., 2011). Besides shifting men's focus to parenting, the decline in testosterone levels across the transition to fatherhood was proposed to indicate a change toward more empathic responding to infant's distress by Fleming et al. (2002). They found that, compared to childless men, fathers responded to infant distress with greater sympathy and urge to help the infant and the effect was more pronounced among fathers with lower testosterone levels (Fleming et al., 2002). Furthermore, compared to nonfathers, fathers demonstrate elevated oxytocin levels (Grumi et al., 2021), a hormone linked to parental behavior (Yoshihara et al., 2018) and potentially heightened empathic responses toward children (Li et al., 2017). Oxytocin has been shown to interact with testosterone across the transition to parenthood (Gordon et al., 2017; Weisman et al., 2014), yet further research is needed to fully understand its impact on paternal behavior, independently or in interaction with other hormones (M. Bakermans-Kranenburg et al., 2022).

In sum, previous research suggests that men go through adaptive biological and psychological changes across the transition to parenthood that pertain to empathy toward children. The available body of evidence suggest that empathetic responding and empathetic behavior toward children increases throughout fatherhood, but this has not been systematically investigated in previous studies. To investigate this, we conducted two preregistered cross-sectional studies where we assessed affective and cognitive empathy in men at different stages of fatherhood in both studies. In Study 1, we investigated whether childless men, men expecting their first child (i.e., expecting men), and men with children (i.e., fathers) exhibit differences in affective and cognitive empathy toward children's emotions. In Study 2, we investigated whether childless men, first-time fathers and experienced fathers differ in affective and cognitive empathy toward children. In addition, we investigated in both studies how personality traits, child-related attitudes, and parenting-related experiences are associated with cognitive and affective empathy across fatherhood (see Supplemental Material S1).

Study 1

In our first preregistered study, we investigated whether men's empathy toward children increases across the transition to fatherhood. We hypothesized that fathers would show more and

childless men less affective empathy toward children compared to expecting men (Hypothesis 1). Similarly, we hypothesized that childless men would show less, and fathers more cognitive empathy compared to expecting men (Hypothesis 2). Thereafter, we explored whether personality traits (empathy, alexithymia), depressive and anxiety symptoms, and child-related attitudes (parental care, parental attitudes, parental attachment, parental involvement) associate with empathy across fatherhood (see Supplemental Material S1). The study was in accordance with the Declaration of Helsinki, and the study protocol was discussed with the Ethics Committee of the Tampere Region. The design, hypothesis, and analysis plan of Study 1 was preregistered. The preregistration as well as the data and analysis code can be found online (https://doi.org/10.17605/OSF.IO/9YG5Z).

Method

Participants and Design

We ran a cross-sectional online study with three independent groups: childless men, expecting men, and fathers (Table 1). Participants (N = 530) were recruited between Spring 2021 and Fall 2021 via the online participant pool Prolific (https://www.prolific.com/), except for one participant who heard of the study via social media. We used the "pwr" package for R (Champely, 2020) to calculate required sample size for our planned analyses to be 207 per group to reliably detect an effect size of f^2 = .02 with significance level α = .05 and 85% statistical power. As we could not reach the desired number of expecting men via Prolific due to outdated information on some participants' profiles within our time window, we decided to proceed with the achieved sample size at the end of Fall 2021.

We prescreened participants with Prolific's filters. For all groups, we recruited people who were assigned male at birth, spoke English as their first language, and lived together with a partner in a relationship. Childless men were selected from a population that had no children and whose partner was not expecting at the moment of the study. In addition to the participants included in the analyses, four childless men were rejected due to indicating they had a child, they were not male, or they were not living with a partner. Expecting men were not allowed to have previous children, and their partner was pregnant at the time of the study. Fathers had had a child between 2020 and 2021 and their partner was not currently expecting. Of the total fathers, 126 had their first infant (i.e., first-time fathers) and 72 also had older children in addition to an infant (i.e., experienced fathers). In addition to the fathers included in the analyses, nine fathers were rejected because they indicated contradictory information about the age of their youngest child in their Prolific profile and demographic survey in the study; hence, it was unclear when their baby was born and whether they fit the inclusion criteria.

Little over half of the participants were from the United Kingdom (54.2%) and a third from the United States (30.9%). The rest of the participants (14.9%) were from elsewhere in Northern America, Europe, Africa, or Oceania. Of all participants, 42.6% had an undergraduate degree (BA/BSc/other), 27.39% had a Graduate degree (MA/MSc/MPhil/other) or a Doctorate degree (PhD/other), and 23.12% had completed either a high school diploma/A-levels or Technical/community college. The remaining participants (6.89%) had completed Secondary education (e.g., General Educational Development/General Certificate of Secondary Education), did not have formal education, or indicated that they could not respond.

Procedure and Measures

The study was run via the online experiment interface Gorilla (https://gorilla.sc/) on the participants' personal computer or tablet. After providing informed consent, participants completed a demographic questionnaire. They were prevented from participating in the study at this stage if their answers to the demographic questionnaire did not match their answers to the prescreening questions.

Participants completed empathy tasks (Bos et al., 2021; RME-C-T; Pahnke & Lischke, 2020; Pahnke et al., 2020) and five questionnaires (reported in Supplemental Material S1). The study lasted approximately 25 min. After the questionnaires, the experiment finished and participants were debriefed, compensated (£3.75), and thanked for participation.

Affective Empathy Task. To measure affective empathy, we used a task (Bos et al., 2021) in which participants viewed grayscale images of children in naturalistic situations. The images depicted children (aged approximately 3–6 years) in negative (e.g., a child surrounded by destroyed buildings), positive (e.g., a child playing with a parent), or neutral (e.g., a child sitting at a dining table) situations. There were 10 images of each valence, that were presented in a random order (2 s). Each image was preceded by a fixation cross (1 s) and followed by two questions (self-paced). In total, the participants viewed 30 images during the task and answered two questions per picture, resulting in 60 responses. Participants gave their answers with a slider measure on a continuous numerical scale (range 1–9, in .01 increments). The first question measured positive affect: "How positive do you feel about the picture?" (1 = *not at all positive*, 9 = *very positive*). The second question measured compassion: "How much compassion do you feel for the child?" (1 = *not at all*, 9 = *very much*). The mean rating on each scale was used as an outcome measure, one reflecting positive affect and one reflecting compassion.

Cognitive Empathy Task. The cognitive empathy task was a modified version of the Reading the Mind in the Eyes Task (RME-T, Baron-Cohen et al., 2001), called the Reading the Mind in the Eyes of Children Task (RME-C-T; Pahnke & Lischke, 2020; Pahnke et al., 2020). In this task, participants viewed color images

Table 1
Descriptive Statistics of the Three Participant Groups

	Group		
Characteristic	Childless men (n = 203)	Expecting men (n = 129)	Father (n = 198)
Children	No children	Expecting first child	An infant (<1 year old)
Age (years)	35.8 (12.0, range = 18–65)	30.3 (6.11, range = 18–49)	32.0 (5.33, range = 18–47)

of the eye region of children's faces (aged approximately 8–10 years) expressing distinct emotional expressions. Participants had to identify the expressed emotion by selecting one out of four labels describing different emotions. One label (target) described the expressed emotion, whereas three labels (distractors) described other emotions. Participants completed two versions of the RME-C-T: one version (RME-C-T-C) with 34 trial images depicting complex emotions (e.g., jealous, worried), and one version (RME-C-T-B) with 28 trial images depicting basic emotions (e.g., happy, sad). We used the mean of correctly identified expressions, separately for basic and complex emotions, as the task outcomes.

Data Analysis

All analyses were done with R Version 4.2.1 (R Core Team, 2022). The significance value for all analyses was set at $\alpha = .05$, uncorrected for multiple comparisons. We ran preregistered categorical regression analyses with the "stats" package (R Core Team, 2022) to investigate group differences in the empathy tasks. Because of nonnormality in some of the regression models, we used nonparametric bootstrapping ($n = 1{,}000$ simulations) to obtain confidence intervals of regression coefficients using the "boot" package (Canty & Ripley, 2021). We decided to diverge from our preregistration with regard to the treatment of outliers. Instead of removing, as preregistered, we winsorized outliers to improve the nonnormal distributions. Values below 5%-quantile and above 95%-quantile were replaced by the value at 5%-quantile or 95%-quantile, respectively. We inspected normality visually before and after winsorizing to determine its effect on the distributions.

Affective Empathy Task. As an initial validity check, we confirmed that participants reported significantly more compassion toward negative than neutral images, $t(529) = 36.48$, $p < .001$, and greater positive affect toward positive images than neutral images, $t(529) = 48.57$, $p < .001$.

We tested whether childless men, expecting men and fathers differed in affective empathy. Specifically, we tested whether childless men reported less empathy toward children compared to expecting men, and whether fathers reported more affective empathy compared to expecting men (Hypothesis 1) against the null hypothesis that there are no differences between the groups. To this aim, we predicted compassion scores toward negative images and positive affect toward positive images by group. We fitted a categorical regression model using group as a predictor and expecting men as the reference group to predict the compassion and positive affect mean scores.

Cognitive Empathy Task. As an initial validity check, we confirmed that participants were significantly more accurate in recognizing basic than complex emotions, $t(529) = 30.28$, $p < .001$. In line with the preregistered criteria, we excluded participants from the analyses if their task performance was equal or below guessing level (25%). Whereas all participants performed above guessing level on the complex task version, three participants (two fathers, one childless man) performed below guessing level on the basis task version. Consequently, we considered 527 participants in the analyses of the basic task version. All participants scored above guessing level on the complex version of the task and were included in the analyses.

We investigated whether childless men, expecting men and fathers differed in cognitive empathy toward children. Specifically, we tested whether childless men were less accurate in recognizing children's emotions compared to expecting men, and whether fathers were more accurate compared to expecting men (Hypothesis 2) against the null hypothesis that there are no differences between the groups. To test whether the groups differed in cognitive empathy, we fitted a categorical regression model to predict basic and complex emotion recognition accuracy scores with group as a predictor and expecting men as the reference group.

Results

Participant Characteristics

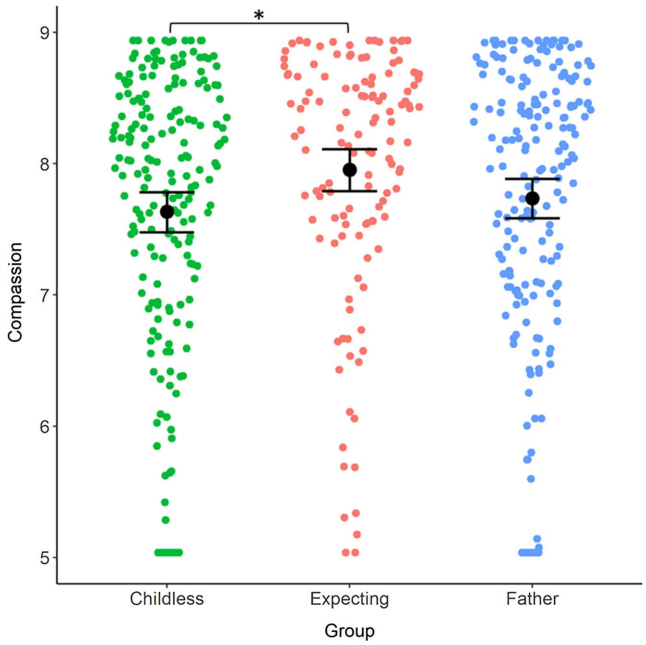
We checked whether participants differed in age, country of residence, or education level. The three groups did not differ in education level, but country of residence, $\chi^2(30) = 52.18$, $p = .007$, and age differed between the groups significantly. Childless men, $t(329) = 5.01$, $p < .001$, and fathers, $t(325) = 2.57$, $p = .011$, were significantly older than expecting men, and childless men were significantly older than fathers, $t(316) = 3.43$, $p = .001$. Age had a small, negative correlation with compassion in the affective empathy task, $r = -10$, $t(528) = -2.36$, $p = .018$. For this reason, we added age as a covariate to our regression model with compassion as the outcome. Age did not correlate with other test scores. Country was not related to any task scores.

Affective Empathy

Group explained a statistically significant portion of the variance in compassion (Figure 1), $R^2_{adj} = .02$, CI [.001, .04], $F(3, 526) = 3.83$, $p = .010$, with age added as a covariate. Group also explained a significant portion of positive affect (Figure 2), $R^2_{adj} = .01$, CI [.001, .03], $F(2, 527) = 3.57$, $p = .036$. Childless men (7.63, $SD = 1.10$)

Figure 1

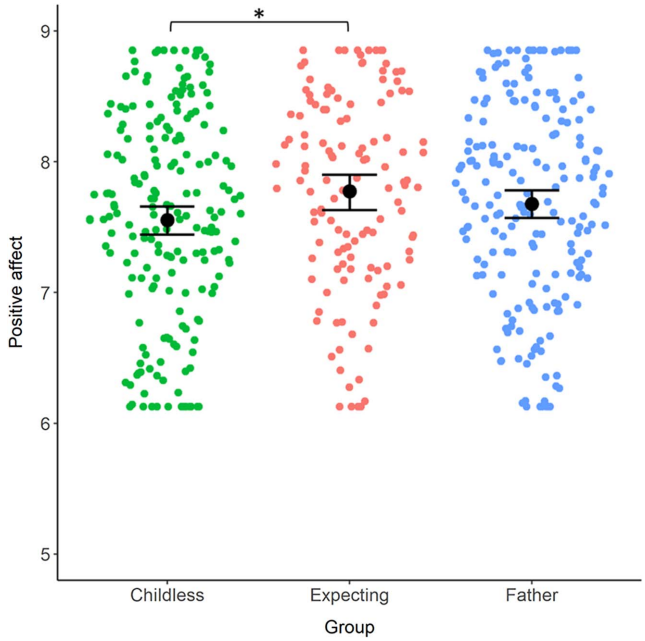
Men's Compassion Toward Children's Emotions by Group



Note. See the online article for the color version of this figure.
* $p < .05$.

Figure 2

Men's Positive Affect Toward Children's Emotions by Group



Note. See the online article for the color version of this figure.
* $p < .05$.

had lower compassion scores compared to expecting men (7.95, $SD = 0.96$), $b = -0.27$, CI [−0.53, −0.05], $t(526) = -2.21$, $p = .026$. There was no significant difference between expecting men and fathers (7.74, $SD = 1.09$) in compassion, $b = -0.22$, CI [−0.43, 0.004], $t(526) = -1.83$, $p = .068$. Age had a very small negative relationship with compassion, $b = -0.011$, CI [−0.02, 0.01], $t(526) = -2.08$, $p = .038$. Similar to compassion, childless men (7.55, $SD = 0.81$) had lower positive affect scores compared to expecting men (7.78, $SD = 0.75$), $b = -0.22$, CI [−0.39, −0.03], $t(527) = -2.52$, $p = .012$, but again there was no difference in positive affect between expecting men and fathers (7.68, $SD = 0.77$), $b = -0.10$, CI [−0.26, 0.07], $t(527) = -1.08$, $p = .279$.

Exploratory Analyses. The father's group contained men who had had their first infant (i.e., first-time fathers) and fathers who had an infant and older children (i.e., experienced fathers). We ran an exploratory analysis where we separated the fathers group into experienced and first-time fathers. We first ran the same regression model as in the main analyses, but without first-time fathers, and found lower compassion in childless men compared to expecting men, $b = -0.32$, CI [−0.51, −0.05], $t(401) = -2.61$, $p = .010$, and lower compassion in experienced fathers compared to expecting men, $b = -0.42$, CI [−0.75, −0.10], $t(401) = -2.65$, $p = .008$. Alternatively, when we excluded experienced fathers from the fathers' group, childless men again had lower compassion compared to expecting men, $b = -0.32$, CI [−0.53, −0.08], $t(455) = -2.75$, $p = .006$, but there was no difference between expecting men and first-time fathers in compassion, $b = -0.10$, CI [−0.33, 0.11], $t(455) = -0.77$, $p = .441$.

Experienced fathers did not differ from expecting men in positive affect, $b = -0.19$, CI [−0.44, 0.04], $t(401) = -1.60$, $p = .111$, while childless men again had a lower positive affect compared to expecting men, $b = -0.22$, CI [−0.39, −0.04], $t(401) = -2.48$, $p = .014$. First-time fathers and expecting men did not differ in positive affect either, $b = -0.04$, CI [−0.22, 0.13], $t(455) = -0.45$, $p = .651$, and, as in all models above, childless men displayed lower positive affect than expecting men, $b = -0.22$, CI [−0.38, −0.05], $t(455) = -2.55$, $p = .011$.

Hence, expecting men showed similar positive affect and compassion as first-time fathers, and there was no difference between expecting men and experienced fathers in positive affect. However, experienced fathers showed less compassion than expecting men.

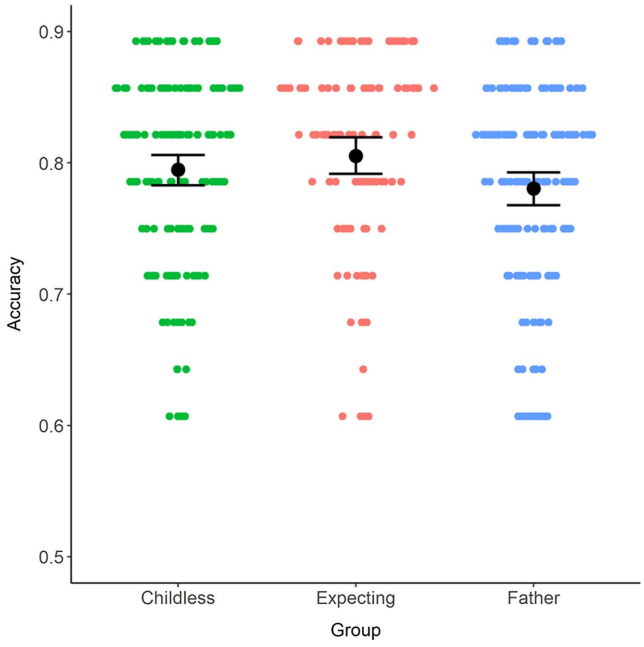
Cognitive Empathy

Group explained a small, but significant proportion of the variance in emotion recognition accuracy on the basic version of the task, $R^2_{adj} = .01$, CI [.001, .04], $F(2, 524) = 3.17$, $p = .043$ (Figure 3). Unlike we hypothesized, neither childless men (.82, $SD = .09$), $b = .002$, CI [−.02, .02], $t(524) = 0.20$, $p = .846$, nor fathers (.80, $SD = .09$), $b = -.02$ CI [−.04, .00], $t(524) = -1.88$, $p = .061$, differed from expecting men (.82, $SD = .09$) in basic emotion recognition.

Group also explained a small, but significant portion of the variance in emotion recognition accuracy on the complex task version, $R^2_{adj} = .01$, CI [.002, .04], $F(2, 527) = 4.03$, $p = .012$ (Figure 4). As in the basic version of the task, there was no difference between expecting men (.67, $SD = 0.11$) and childless men (.67, $SD = 0.10$) in complex emotion recognition, $b = .01$, CI [−.02, .03], $t(527) = 0.48$, $p = .630$, but fathers (.64, $SD = 0.10$) were slightly less accurate in complex emotion recognition than expecting men, $b = -.02$, CI [−.05, −.00], $t(527) = -2.05$, $p = .041$.

Figure 3

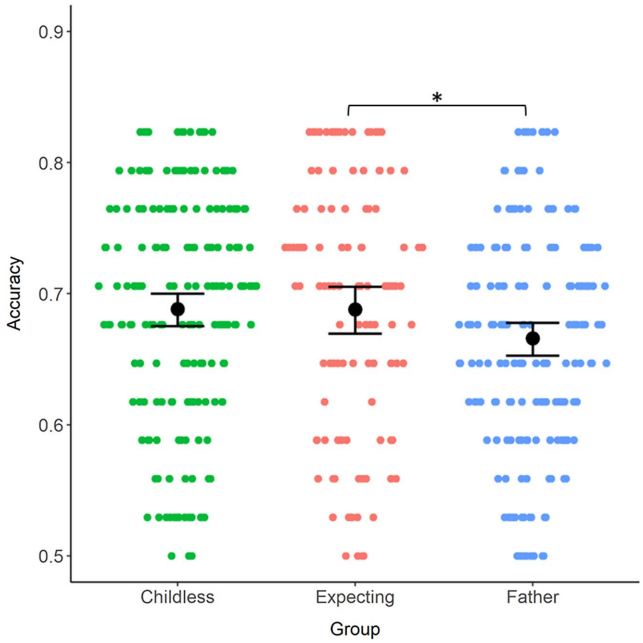
Men's Emotion Recognition Accuracy of Children's Emotions in the Basic Version of the Reading the Mind in the Eyes of Children Task (RME-C-T-B) by Group



Note. See the online article for the color version of this figure.

Figure 4

Men's Emotion Recognition Accuracy of Children's Emotions in the Complex Version of the Reading the Mind in the Eyes of Children Task (RME-C-T-C) by Group



Note. See the online article for the color version of this figure.
* $p < .05$.

Exploratory Analyses. As for affective empathy, we explored separately whether fathers of multiple children (i.e., experienced fathers) and first-time fathers differed from expecting men in cognitive empathy. Expecting men did not differ from childless men in basic, $b = .002$, CI [−.02, .02], $t(452) = 0.20$, $p = 842$, nor complex emotion recognition, $b = .006$, CI [−.02, .03], $t(455) = 0.49$, $p = .626$, when only first-time fathers were included. Further, there was no difference between expecting men and first-time fathers in basic, $b = -.005$, CI [−.03, .02], $t(452) = -0.41$, $p = .684$, nor complex emotion recognition, $b = -.02$, CI [−.04, .01], $t(455) = -1.19$, $p = .237$. Expecting men also did not differ from childless men in basic, $b = .002$, CI [−.017, .023], $t(400) = 0.20$, $p = .845$, nor complex emotion recognition, $b = .01$, CI [−.02, .03], $t(401) = 0.47$, $p = .640$, when only experienced fathers were included. However, experienced fathers were less accurate in basic, $b = -.05$, CI [−.07, −.02], $t(400) = -3.36$, $p = .001$, and complex emotion recognition, $b = -.04$, CI [−.07, −.01], $t(401) = -2.54$, $p = .011$, than expecting men.

Interim Discussion

In our first preregistered study, we ran hypothesis-driven analyses to test whether empathy differs in men at different phases of fatherhood. We hypothesized that fathers would show more and childless men less affective (Hypothesis 1) and cognitive (Hypothesis 2) empathy toward children compared to expecting men. Our hypothesis regarding affective empathy (Hypothesis 1) was partially confirmed. We found that expecting men exhibited more affective empathy compared to childless men, while they did not differ from fathers. Contrary to our hypothesis regarding cognitive empathy (Hypothesis 2), we found that expecting men were as accurate in complex emotion recognition as childless men and more accurate in recognizing complex emotions in children than fathers. Basic emotion recognition accuracy did not differ between expecting men, childless men, and fathers.

Motivated by the partly unexpected findings of our preregistered analyses, we ran exploratory follow-up analyses where we looked at first-time (i.e., fathers with one infant) and experienced (i.e., with at least one older child and an infant) fathers separately. We found that first-time fathers and expecting men did not differ in affective and cognitive empathy. However, experienced fathers showed lower affective empathy in terms of compassion and poorer complex emotion recognition accuracy than expecting men. These findings are in contrast to our initial hypothesis that empathy toward children increases in linear fashion throughout fatherhood. The findings rather suggest a nonlinear increase in empathy toward children throughout fatherhood.

These somewhat unexpected findings led us to investigate the influence of fathering experience on empathy toward child signals more comprehensively. Consequently, in our second preregistered study, we compared affective and cognitive empathy between five distinct groups of men: childless men, first-time fathers of an infant, fathers of one older child, experienced fathers of an infant and at least one older child, and fathers with multiple older children. Varying both the number and age of children between the groups allowed us to identify the primary driver for the observed differences in empathy between first-time and experienced fathers in Study 1.

Study 2

Drawing insights from our Study 1 findings, we investigated whether empathy toward children changes in a nonlinear fashion across men's transition to and at different stages of fatherhood. As outlined in our preregistered hypotheses, we hypothesized that first-time fathers would display more affective and cognitive empathy than experienced fathers and childless men (Hypothesis 1). In addition, we hypothesized that first-time fathers with an infant would display more affective and cognitive empathy than fathers with an older child (Hypothesis 2). We posited a two-sided hypothesis regarding differences in cognitive and affective empathy between fathers with one older child and fathers with multiple older children (Hypothesis 3). However, we hypothesized that fathers with multiple children, including an infant, would demonstrate more affective and cognitive empathy than fathers with multiple older children, who do not have an infant (Hypothesis 4). Beyond these father-status oriented hypotheses, we tested whether parent-related experiences, such as stress exposure, sleep disturbance or study distractions would associate with fathers' cognitive and affective empathy (see Supplemental Material S1).

The design, hypothesis, and analysis plan of Study 2 was preregistered. The preregistration and data-analysis script are available online (https://doi.org/10.17605/OSF.IO/9YG5Z). The study was conducted in accordance with Declaration of Helsinki and the study protocol was discussed with the Ethics Committee of the Tampere Region.

Method

Participants and Design

We collected an independent, cross-sectional online study (N = 516) consisting of five groups (Figure 5 and Table 2): first-time fathers with an infant, fathers with only one older child, fathers with older children *and* an infant, fathers with multiple older children, and childless men. We recruited the sample in Winter 2023 via the online participant pool Prolific (https://www.prolific.com). We used "pwr" package for R (Champely, 2020) to calculate the required sample size for our planned analyses to be 110 per group to reliably detect an effect size of f^2 = .02 with significance level α = .05 and 80% statistical power. However, we could not reach the desired number of men with an infant via Prolific within our time window. We decided to proceed with the sample size we achieved by the end of Winter 2023.

All participants were prescreened with Prolific's filters to determine eligibility for recruitment. We only recruited participants who were assigned male at birth, spoke English as their first language, lived together with a nonexpecting partner in a relationship, and had not participated in our first study. Inclusion criteria for fathers was that they were currently living in the same household as their biological child(ren). Childless men were included only if they did not have or cohabit with children.

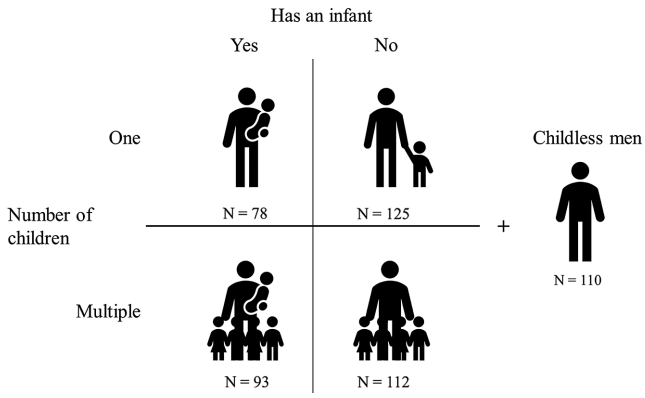
Most participants were from United Kingdom (72.4%) and 21.4% were from the United States. The rest (6.2%) were from elsewhere in Europe, North America, Oceania, and South Africa. Of all participants, 44.5% had completed an undergraduate degree, 17.7% had a master's degree, 15.7% had high school/A-levels education, and 11.5% had completed technical/community college. The remaining participants (10.6%) had a doctorate degree, secondary education, or no formal qualifications.

Procedure and Measures

The study was run via the online experiment interface Gorilla (https://gorilla.sc) on participants' personal computer or tablet. After providing informed consent, participants completed a demographic questionnaire. Participants whose answers to the demographic questions did not match their answers to the prescreening questions were prevented from further participation. Included participants completed the same empathy tasks (Bos et al., 2021), RME-C-T-C (Pahnke & Lischke, 2020), RME-C-T-B (Pahnke et al., 2020) as in Study 1. In addition, participants completed a series of questionnaires for the assessment of personality traits, child-related attitudes, parenting-related experiences, and stress indicators (see Supplemental Material S1). Following the completion of questionnaires, participants were debriefed, compensated (£3.75), and thanked for participation. The whole study lasted approximately 25 min.

Figure 5

Participants Were Divided Into Four Groups Depending on Whether They Had an Infant and How Many Children They Had



Note. The fathers' groups from top left to bottom right: first-time fathers with an infant, fathers with one older child, fathers with older children and an infant, and fathers with multiple older children. In addition, we had a group of childless men.

Data Analysis

All analyses were done with R Version 4.2.1 (R Core Team, 2022). The significance value for all analyses was set at α = .05, uncorrected for multiple comparisons. We ran preregistered categorical regression analyses with the "stats" package (R Core Team, 2022) to investigate group differences in participants' performance on the empathy tasks. Because of nonnormality in some of the regression models, we used nonparametric bootstrapping (n = 1,000 simulations) to obtain confidence intervals of regression coefficients using the "boot" package (Canty & Ripley, 2021). To improve the normality distribution in the regression models, outliers were winsorized by replacing values below the 5%-quantile and above the 95%-quantile with the value at 5%-quantile or 95%-quantile, respectively.

Affective Empathy Task. We used the mean ratings of positive affect toward positive images and compassion toward negative images as the outcomes of the affective empathy task, similarly as in Study 1. As an initial validity check, we confirmed that participants reported significantly more compassion toward negative than neutral images, $t(517) = 33.43$, $p < .001$, and greater positive affect toward positive than neutral images, $t(517) = 51.08$, $p < .001$.

We first compared affective empathy between childless men, first-time fathers (i.e., fathers of an infant) and experienced fathers (i.e., fathers of one older child and no infant, experienced fathers of multiple older children and no infant, and fathers of multiple older children and an infant). First, we investigated whether childless men would show less positive affect and compassion than first-time and experienced fathers (Hypothesis 1a). To this aim, we ran categorical regression analyses with group as the predictor and childless men as the reference group for the prediction of men's positive affect and compassion.

Then, we used t tests to investigate differences between the fathers' groups more closely. We first tested whether compassion and positive affect are higher in first-time fathers (i.e., those with one infant) compared to fathers with an older child (i.e., those with one older child and no infant; Hypothesis 2a). Next, we investigated whether experienced fathers without an infant (i.e., fathers of one older child and fathers of multiple older children) differ from each other in compassion and positive affect (Hypothesis 3a). Finally, we tested whether compassion and positive affect are higher in experienced fathers of multiple children and an infant compared to experienced fathers of multiple older children without an infant (Hypothesis 4a).

Cognitive Empathy Task. As in Study1, we used mean emotion recognition accuracy, in terms of correctly recognized basic

Table 2
Descriptive Statistics of the Five Participant Groups

Characteristic	Childless men (n = 110)	First-time father (n = 78)	Fathers with one older child (n = 125)	Fathers with older child(ren) and an infant (n = 93)	Fathers with older children (n = 112)
Number of children	0	One infant	One child	At least two children	At least two children
Has an infant	No	Yes	No	Yes	No
Age	35.3 (11.1, range = 18–78)	32.1 (3.59, range = 23–41)	40.5 (10.5, range = 18–72)	34.1 (5.4, range = 18–46)	45.0 (9.8, range = 18–72)

and complex expressions as outcomes of the cognitive empathy task. For an initial validity check, we confirmed that participants were significantly more accurate in recognizing basic than complex emotions, $t(517) = 35.51$, $p < .00$. Participants performed the basic and complex task version above guessing level (25%), indicating no need to exclude any participant from the analyses.

We first compared basic and complex emotion recognition accuracy between childless men, first-time fathers (i.e., fathers of an infant), and experienced fathers (i.e., fathers of one older child and no infant, experienced fathers of multiple older children and no infant, and fathers of multiple older children and an infant). First, we investigated whether childless men would show lower basic and complex emotion recognition accuracy compared to first-time and experienced fathers (Hypothesis 1b). To this aim, we ran categorical regression analyses with group as the predictor and childless men as the reference group for the prediction of men's basic and complex emotion recognition accuracy.

Then, we used t tests to investigate differences between the fathers' groups. We first tested whether basic and complex emotion recognition accuracy are higher in first-time fathers (i.e., those with one infant) compared to fathers with an older child (i.e., those with one older child and no infant; Hypothesis 2b). Next, we investigated whether experienced fathers without an infant (i.e., fathers of one older child and fathers of multiple older children) differ from each other in basic and complex emotion recognition accuracy (Hypothesis 3b). Finally, we tested whether basic and complex emotion recognition accuracy are higher in experienced fathers of multiple children and an infant compared to experienced fathers of multiple older children without an infant (Hypothesis 4b).

Results

Participant Characteristics

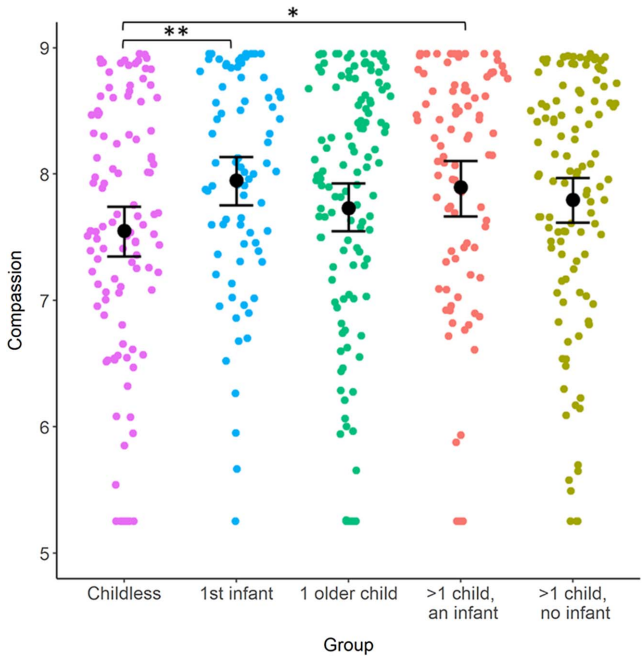
We checked whether participants differed in age, country of residence, or education level. The groups differed in age, $F(4, 513) = 33.59$, $p < .001$. However, age was not correlated with compassion, $r = .06$, $t(516) = 1.48$, $p = .139$; positive affect, $r = -.01$, $t(516) = -0.17$, $p = .862$; recognition of basic emotions, $r = .03$, $t(516) = 0.61$, $p = .544$; nor recognition of complex emotions, $r = -.03$, $t(516) = -0.64$, $p = .524$. Education level did not differ between the groups, $\chi^2(24) = 32.19$, $p = .122$. Groups differed in Country of residence, $\chi^2(32) = 102.9$, $p < .001$. However, Country of residence was not related to compassion, $H(8) = 8.00$, $p = .434$; positive affect, $H(8) = 5.73$, $p = .678$; recognition of basic emotions, $H(8) = 4.11$, $p = .847$; nor recognition of complex emotions, $H(8) = 6.390$, $p = .604$. Correlations between the task scores and additional questionnaires can be found in the Supplemental Tables S3 and S4.

Affective Empathy

Our first categorical regression analysis with group predicting men's compassion and childless men as the reference group (Figure 6) showed that group explained only .01% of the variance in compassion scores, $R^2_{adj} = .01$, CI [.002, .04], $F(4, 513) = 2.33$, $p = .055$, which was not significant. However, compared to childless men (7.47, $SD = 1.29$), both experienced fathers with an infant and older children (7.83, $SD = 1.24$), $b = .34$, CI [.06, .64], $t(513) = 2.41$, $p = .016$, and first-time fathers of an infant (7.94, $SD = 1.12$), $b = .40$, CI [.13, .69], $t(513) = 2.67$, $p = .008$, showed more compassion. Childless men did not differ from fathers of one older child (7.58, $SD = 1.37$), $b = .19$, CI [−.09, .46], $t(513) = 1.35$, $p = .178$, nor fathers with multiple older children (7.77, $SD = 1.09$), $b = .25$, CI [−.02, .51], $t(513) = 1.81$, $p = .070$.

Our second categorical regression analysis with group predicting men's positive affect and childless men as the reference group (Figure 7) showed that group explained a small but significant proportion of positive affect, $R^2_{adj} = .01$, CI [.01, .05], $F(4, 513) = 3.84$,

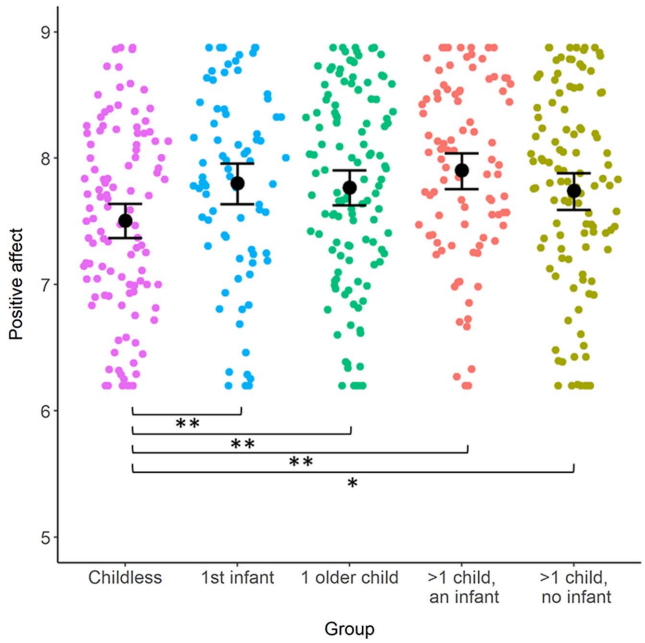
Figure 6
Men's Compassion Toward Children's Emotions by Group



Note. See the online article for the color version of this figure.
* $p < .05$. ** $p < .01$.

Figure 7

Men's Positive Affect Toward Children's Emotions by Group



Note. See the online article for the color version of this figure.
* $p < .05$. ** $p < .01$.

$p = .004$. All groups of fathers showed higher positive affect than childless men (7.51, $SD = 0.74$): first-time fathers with an infant (7.72, $SD = 0.80$), $b = .30$, CI [.09, .51], $t(513) = 2.62$, $p = .009$; fathers with one older child (7.90, $SD = 0.73$), $b = .26$, CI [.06, .47], $t(513) = 2.61$, $p = .009$; fathers of an infant and older children (7.90, $SD = 0.73$), $b = .40$, CI [.21, .61], $t(513) = 3.72$, $p < .001$; and fathers of multiple older children (7.74, $SD = 0.79$), $b = .24$, CI [.04, .44], $t(513) = 2.31$, $p = .022$.

Closer comparison of the fathers' groups showed that there were no significant differences between the fathers' groups. First-time fathers of an infant did not show higher compassion, $t(201) = 1.53$, $p = .127$, nor positive affect, $t(201) = 0.31$, $p = .756$, when compared directly to fathers of one older child. Further, fathers without an infant did not differ from each other depending on whether they had one child or multiple children in compassion, $t(235) = 0.50$, $p = .615$, nor in positive affect, $t(235) = -0.24$, $p = .811$. Finally, fathers of multiple children, that is, fathers of older children with an infant and fathers of older children without an infant, did not differ in compassion, $t(203) = 0.69$, $p = .491$, nor in positive affect, $t(203) = 1.53$, $p = .129$.

Cognitive Empathy

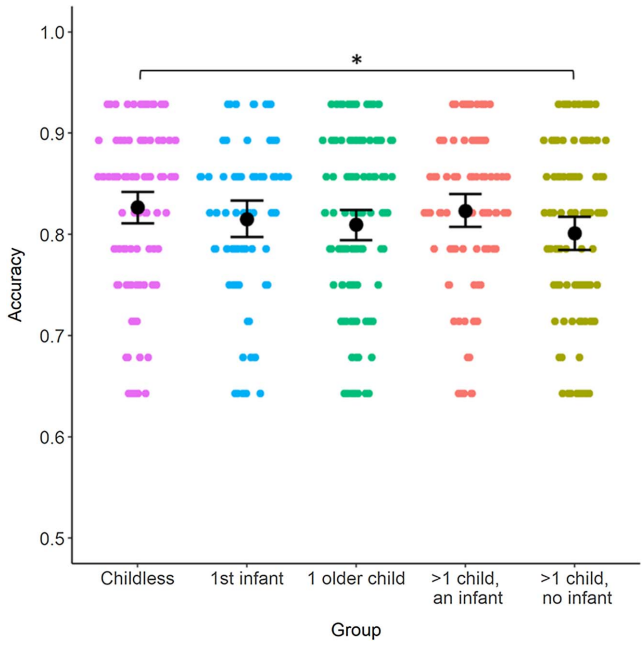
Our first categorical regression analysis with group predicting men's basic emotion recognition accuracy and childless men as the reference group (Figure 8) showed that group did not explain a significant proportion of basic emotion recognition, $R^2_{adj} = .01$, CI [.001, .03], $F(4, 513) = 1.59$, $p = .176$. Childless men (.83, $SD = .10$) did not differ in basic emotion recognition accuracy from first-time fathers (.81, $SD = 0.12$), $b = -.01$, CI [−.04, .01], $t(513) = -0.83$, $p = .361$; fathers of one older child (.80 $SD = 0.12$), $b = -.02$, CI [−.04, .00], $t(513) = -1.51$, $p = .132$; nor from fathers with older child(ren) and an infant (.82, $SD = 0.10$), $b = -.003$, CI [−.03, .02], $t(513) = -0.27$, $p = .786$. However, fathers with multiple older children and no infant had lower basic emotion recognition accuracy (.79, $SD = 0.12$) than childless men, $b = -.03$, CI [−.05, −.002], $t(513) = -2.23$, $p = .027$.

Our second categorical regression analysis with group predicting men's complex emotion recognition accuracy and childless men as the reference group (Figure 9) showed that group did not explain a significant proportion of variance in complex emotion recognition, $R^2_{adj} = .005$, CI [.001, .03], $F(4, 513) = 1.62$, $p = .169$. There were no group differences: Childless men (0.67, $SD = 0.11$) did not differ in emotion recognition accuracy from first-time fathers (0.66, $SD = 0.12$), $b = -.00$, CI [−.03, .02], $t(513) = -0.29$, $p = .771$; fathers of one older child (.66, $SD = .11$), $b = -.01$, CI [−.03, .02], $t(513) = -.43$, $p = .669$; fathers with older child(ren) and an infant (.68, $SD = 0.10$), $b = .07$, CI [−.01, .04], $t(513) = 1.21$, $p = .227$; or fathers with multiple older children (.64, $SD = 0.12$), $b = .07$, CI [−.04, .01], $t(513) = 1.21$, $p = 227$.

Closer comparison of the fathers' groups showed that the only significant group difference was that fathers of multiple children with an infant were more accurate in complex emotion recognition compared to fathers of multiple children with no infant, $t(203) = 2.52$, $p = .012$. However, fathers of multiple children did not differ from each other in basic emotion recognition depending on whether they had an infant, $t(203) = 1.85$, $p = .066$. First-time fathers did not show higher basic emotion recognition, $t(201) = 0.43$, $p = .668$,

Figure 8

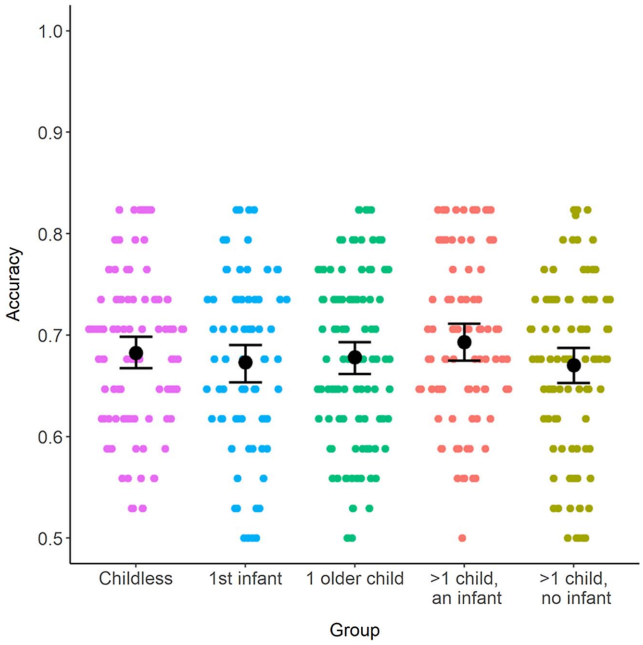
Men's Emotion Recognition Accuracy of Children's Emotions in the Basic Version of the Reading the Mind in the Eyes of Children Task (RME-C-T-B)



Note. See the online article for the color version of this figure.
* $p < .05$.

Figure 9

Men's Emotion Recognition Accuracy of Children's Emotions in the Complex Version of the Reading the Mind in the Eyes of Children Task (RME-C-T-C)



Note. See the online article for the color version of this figure.

nor complex emotion recognition, $t(201) = 0.09$, $p = .930$, when compared directly to fathers of one older child. Further, fathers without an infant did not differ from each other depending on whether they had one child or multiple children in basic, $t(235) = -0.75$, $p = .454$, nor in complex emotion recognition, $t(235) = -0.97$, $p = .333$.

General Discussion

In two preregistered studies, we investigated whether men's empathy toward children's emotions differs at different stages of fatherhood. In the first study, we compared empathy toward children between childless men, expecting men and fathers of infants. We first ran preregistered analyses to test our hypotheses that affective and cognitive empathy toward children's emotions increase in a linear fashion throughout the transition to fatherhood, that is, empathy is lowest in childless men and highest in fathers of infants. In contrast to our hypothesis regarding affective empathy, expecting men showed more compassion and positive affect than childless men but similar compassion and positive affect as fathers. Contrary to our hypothesis concerning cognitive empathy, expecting men were slightly more accurate in emotion recognition than fathers. To elucidate possible explanations for these findings, we separated first-time fathers and more experienced fathers (i.e., those with more than one child) and compared them to childless and expecting men. These exploratory analyses revealed lower affective and cognitive empathy in experienced fathers than expecting men but similar affective and cognitive empathy between first-time fathers and expecting men.

Prompted by the results of Study 1, our second preregistered study investigated whether the extent of fathers' exposure to a care-requiring infant and experience of childcare are associated with affective and cognitive empathy. We compared affective and cognitive empathy between childless men and fathers, varying both the number and age of children the fathers had. This allowed us to investigate the primary driver for the observed differences in empathy between first-time and experienced fathers in Study 1 more closely. Based on the results from our first study, we expected affective and cognitive empathy to be higher in first-time fathers compared to experienced fathers and childless men. However, we found that fathers with an infant, regardless of previous parenting experience, showed more compassion than childless men. Moreover, compared to childless men, all fathers showed more positive affect, irrespective of the age or number of children they had. Further, closer comparisons between the fathers' groups revealed no significant group differences in affective empathy. Regarding cognitive empathy, fathers with multiple older children showed lower basic emotion recognition accuracy than childless men. They also had lower complex emotion recognition accuracy when compared to fathers with multiple children and an infant.

Together the findings suggest that especially fathers who are expecting or caring for an infant might show increased affective empathy toward children. In other words, instead of steadily increasing with parenting experience, affective empathy might follow a curvilinear trajectory throughout the transition to fatherhood and across its various stages. However, confirming individual trajectories across the transition to fatherhood require further investigation with longitudinal analyses. In addition, our results indicate that cognitive empathy may be less susceptible to change across the transition to parenthood compared to affective empathy. This disparity may stem from the implicit, motivational, and innate nature of affective empathy (Singer & Lamm, 2009), contrasting with the partly learned and more controlled aspects of cognitive empathy (Bull et al., 2008; Heyes & Frith, 2014; Kanske, 2018). Affective empathy can further be influenced by top-down functions such as attention (Singer & Lamm, 2009), and changes in attention toward child signals can be seen throughout the transition to parenthood (Ferrey et al., 2016), which could elucidate shifts in affective empathy.

For fathers, the period of expecting and caring for a preverbal infant for the first time might represent a particularly sensitive phase during which their responsiveness to child signals is heightened (L. T. Gettler et al., 2021; Li et al., 2018; Storey et al., 2000). This heightened sensitivity could be seen as a beneficial mechanism that guides fathers to respond to infant distress. Meanwhile, an older child has a broader range of ways to communicate their needs and emotions and the parent's sensitivity to nonverbal signals might taper off with the child's age as it becomes less paramount. In fact, instead of a linear increase, a gradual decrease in empathy toward children in fathers may even be adaptive, as excessively high empathy could lead to aversive reactions (Li et al., 2018), such as personal distress, potentially resulting in an avoidance of interacting with the child (Mascaro, Hackett, Gouzoules, et al., 2014).

The second study results suggest that even fathers with prior childcare experience may return to their former level of empathy when exposed to a preverbal infant, necessitating the interpretation and response to the infant's nonverbal signals. Being responsible for a care-requiring infant might give rise to a sensitive period during which fathers are more compassionate and affectionate toward children (Stallings et al., 2001), regardless of previous parenting

experience. However, this finding is only partially consistent with the exploratory findings of our first study that suggested experienced fathers with infants to show lower empathy compared to first-time fathers. These findings emerged in exploratory analyses, rendering them more susceptible to false discovery than the findings of our second study that were obtained from preregistered analyses. Although we believe that the findings of our second study were more robust, we recommend further research in this area to clarify how the presence of an infant modulate affective empathy toward children at different stages of the transition to fatherhood, preferably with a longitudinal design.

Linkages between men's neural changes across the transition to fatherhood, fathering experience, and responses to child signals need further research. Research on mothers suggests that neural responses to infant affective cues are modulated by parity (Maupin et al., 2019) and that primiparous mothers, as compared to multiparous mothers, show heightened alertness toward such cues (Bunderson et al., 2020; Maupin et al., 2016) and rate them as higher in arousal (Parsons et al., 2021). Similar studies on fathers could help us shed light on potential differences between first-time and experienced fathers' reactions toward child signals.

Previous studies point to potential links between fathering experience and men's hormonal systems that are implicated in empathy and caregiving, while the results are somewhat inconclusive. For example, after an initial decrease in testosterone following childbirth, fathers can go through a testosterone rebound as their child grows (Corpuz et al., 2021; Rosenbaum et al., 2018). The decrease in testosterone can also be maintained for a longer period in fathers who cohabit with their children (Mascaro, Hackett, & Rilling, 2014), although it is uncertain whether cohabitation is the driving force for suppressing the testosterone rebound (L. Gettler et al., 2015). Parenting experience can also influence fathers' immediate physiological reactions to child signals (Fleming et al., 2002; L. T. Gettler et al., 2021). For example, first-time fathers were found to show an increase in oxytocin when holding their first-born, whereas experienced fathers' oxytocin levels did not differ between pre- and postholding (L. T. Gettler et al., 2021). More studies are needed to confirm potential linkages between fathers' caregiving experience, physiology, and empathy toward children's emotional signals.

Future studies could also further disentangle whether men's neural and hormonal changes brought on by the transition to fatherhood are related to both affective and cognitive empathy. Although the exploratory results from Study 1 suggested that experienced fathers might display less cognitive empathy toward children than first-time fathers, we found no differences in emotion recognition between experienced fathers of multiple children and first-time fathers in our second study. However, experienced fathers of multiple children with an infant were more accurate in recognizing complex emotions than fathers of multiple older children without an infant. Notwithstanding the need of further research on the impact of infant exposure on cognitive empathy, we think that the findings of the second study are more robust given that they come from preregistered analyses. These findings suggest that infant exposure modulates fathers' cognitive empathy toward children similarly as affective empathy. The findings of the second preregistered study, thus, support our assumption that exposure to care-requiring infants makes fathers more sensitive to children across fatherhood, thereby increasing cognitive as well as affective empathy throughout fatherhood in a curvilinear fashion.

Limitations

Despite running two preregistered studies in large samples with established empathy tasks and questionnaires, there are some study characteristics that limit the interpretation and generalizability of our findings. First, although our sample was large and international, most participants were well educated and from Western countries. Furthermore, our native-level English requirement narrowed the sample mostly to the United States and United Kingdom. The language limitation was crucial, though, as it evened out differences between participants' vocabulary and understanding of the tasks. Nevertheless, care should be taken when generalizing our results to more diverse samples.

Online data collection offered us the benefit of collecting large samples, however, it lent us less control over the situation in which a participant completed the study—a common challenge for online research. The large sample offers some buffer against potential noise introduced by variability in the setting, nevertheless further research is necessary to determine whether the current findings can be replicated in laboratory studies that allow a better control of extraneous factors than online studies.

Given that large sample sizes such as the ones in the present studies easily reach statistical significance, it is important to consider the practical significance of our results. We did not predict large effects in empathy as a function of parenthood, and as we expected, all effect sizes were small. Finding small effect sizes is important information as it suggests caution when hypothesizing about, for example, associations between physiological responses and fathers' behavior or perception of child signals. Since our large study only found small effect sizes, it might not be justified to presume robust connections between men's physiological changes and their parenting behavior in smaller samples. Further, the small differences between groups suggest that other, individual variables play a role in explaining differences between individuals within the groups. For example, fathers' reactions to their own infant's distress have been linked to the infant's characteristics, fathers' testosterone reactivity, trait empathy, and marital quality (Kuo et al., 2016). Future studies are needed to elucidate individual variation in fathers' empathic responses toward children's emotional signals.

Further, we should consider some features of the stimuli we used. Both tasks depict pictures of unfamiliar children. Our results might differ if the pictures were taken of the father's own children since fathers might display higher attention and empathy to their own children and lower empathy toward unfamiliar children (cf. Vuoriainen et al., 2022). To address the issue of child familiarity, future studies should employ images of familiar and unfamiliar children in empathy tasks. Besides the children being unfamiliar, they were approximately at preschool or school age in both empathy tasks. Children at this age show more refined and, therefore, easier to interpret, emotions than children at younger ages. To address the issue of child age, future studies should employ images of children at different ages, such as infancy, kindergarten, preschool, and school-age.

Final issue is specific to the affective empathy task, and the observed differences between affective empathy toward positive and negative emotions. Differences in arousal might have specifically affected fathers' empathetic responses to positive and negative images in the affective empathy task. Negative images (e.g., an image of child among collapsed buildings) likely elicit more arousal than

positive images (e.g., an image of a child playing with their parent), leading to stronger emotional reactions and corresponding empathetic feelings. This contrast might be further heightened by random presentation of the stimuli. We can see from the distributions that compassion toward negative pictures had a stronger left skew than positive affect toward positive images, which indicates that more participants gave higher ratings toward the negative images than the positive images. Although this task has been shown to associate with relevant hormonal factors in the previous studies (Bos et al., 2021; Spencer et al., 2022), and in Study 2, compassion scores were correlated with participants' self-reported empathy (see Supplemental Material), which gives confidence in using this task, future studies should use arousal-matched negative and positive images for the empathy tasks.

Conclusions and Future Directions

Studies on empathy in fatherhood are crucial to understand differences in sensitive caregiving among fathers. Whereas the present studies provided insights into fatherhood-related empathy changes from a cross-sectional point of view, future longitudinal studies are needed to provide more in-depth insights into individual-level changes across the transition to fatherhood. Longitudinal studies are also necessary to unravel potential curvilinear trajectories in empathy throughout fatherhood that we can only suggest based on the present cross-sectional studies. Importantly, associating changes in empathy with actual caregiving behavior is an important next step in illuminating important factors in men's transition to fatherhood. Studies that combine empathy with caregiving tasks in longitudinal designs may be particularly useful to understand the interplay between empathy and caregiving changes throughout fatherhood. These types of studies might help to identify men who have difficulties in empathy at early stages of fatherhood experience disruptions in empathy at later stages of fatherhood, which could lend important information for interventions and health care providers for supporting new fathers.

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Received December 21, 2023
Revision received July 13, 2024
Accepted July 15, 2024 ■