Exploring the Association Between Maternal Psychosocial Factors and Empathy Development in Children aged 3-6

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Abstract

Empathy is a multidimensional construct consisting of cognitive, affective, and behavioural components. As a foundation for prosocial and collaborative behaviour, empathy plays a crucial role in facilitating positive relationships and social cohesion. Therefore, understanding the factors that shape its development may provide valuable insight into how these important behaviours can be cultivated within current and future communities. The present study explored the development of empathic responding to a distressed model in N = 29 children aged 3-6, focussing on empathic comforting and concern. Additionally, it examined the relationship between empathic responding and maternal psychosocial factors measured using the WHO-5, Coping with Children's Negative Emotions Scale, and Multidimensional Scale of Perceived Social Support.

The study found that although both children's comforting and concern scores were positively associated with age, this was not statistically significant between discrete age groups. Further, maternal mental health and perceived social support were significantly associated with higher children's concern scores but not comforting. Overall, these findings support the notion that empathic responding increases over the preschool years, and certain maternal psychosocial factors may be associated with children's concern. Due to the small sample in this study (N=29) and correlational nature, these findings should be used as exploratory hypotheses for future research in order to investigate mainstream trends.

Introduction

What is Empathy?

The definition of empathy has been long disputed, revised, and reaffirmed. Still, no one description has been agreed to encompass all that empathy is. Generally, it is thought to be a multidimensional construct consisting of cognitive, affective, and behavioural components which allow an individual to understand and share the emotions of others, then act accordingly. Specifically, cognitive empathy is the ability to recognise another's' emotional state, whereas, affective empathy is the ability to resonate with those emotions [1,2] Behavioural empathy allows individuals to respond appropriately to another's' distress in an attempt to soothe [3, 4].

Why does it matter?

Empathy allows individuals to manage their emotions and therefore, how they respond to others [5]. It can even make us feel happier by strengthening relationships, allowing us to appreciate others' perspectives, and encouraging us to help others (which itself can trigger a dopaminergic response [6]. Similarly, from an evolutionary standpoint, empathy is useful because understanding the needs of others and acting accordingly facilitates the formation of social bonds, moral understanding, and co-operation. Ultimately, by supporting the formation of a cohesive community, empathy may enhance both individual and group survival.

It is clear that empathy is widely considered a desirable trait [7,8]. However, it is important to note that some studies have found individuals with very high levels of empathy may be more likely to experience conditions such as depression, anxiety, and burnout as a result of attuning with the negative emotions of others [9,10]. Therefore, perhaps empathy should be viewed as an important component of social cognition, with a degree of capacity that varies between individuals and their emotional regulation abilities. In other words, for empathy to remain a helper of happiness and survival, it must present alongside appropriate boundaries.

Empathy is considered to form the foundations of society. Whilst modern Western societies no longer rely on protection from predators, cooperative hunting, or collective parenting for survival, sociality remains fundamental to the human experience. In an increasingly interconnected yet polarised world, empathy is important for both supporting individual wellbeing and strengthening interpersonal relationships. Importantly, it also encourages cooperation across social, cultural, and political boundaries by influencing how we respond to humanitarian crises, conflicts, environmental challenges, and racial discrimination - issues becoming increasingly prevalent in modern society [11,12,13]. It could be argued that empathy motivates the desire to co-operate and is essential in driving global initiatives to reduce

poverty, encourage environmental action, boost innovation, and strive for peace, justice, and equality. For this reason, understanding the development of empathy can allow us to cultivate a society better equipped to face the challenges of the modern globe and strengthen multilateral co-operation.

How does empathy develop?

Despite the importance of empathy, its exact origins and developmental mechanisms have not yet been fully established. However, it is understood to have genetic, neurological, and environmental underpinnings [14,15] which are thought to develop rapidly during childhood, and continue to evolve throughout the lifespan [16,17,18]. Ongoing discussion questions whether empathy exists as an integrated or dissociable system, whereby the affective and cognitive components are interconnected and support each other's development, or are distinct systems with independent developmental trajectories. Hierarchal models combining valuable evidence for both systems proposes a dissociable nature at an anatomical level, becoming integrated during higher level cognition [19,20,21]. This presents empathy as a complex and sophisticated capacity and may explain the reasoning behind differing levels of cognitive verses affective empathy in observations of empathic responding.

Recent evidence involving mirror neurones has shown babies as young as 18 hours to respond to other in distress, suggesting an innate predisposition to empathic capacities which are nurtured throughout the child's cognitive development, later facilitating empathetic expression [22,23,24,25]. Further neurological evidence has shown that affective empathy is largely attributed to the anterior cingulate cortex and anterior insula in the brain, involved in automatic, emotion-sharing pathways. Whereas, cognitive empathy involves the activation of the temporo-parietal junction and medial prefrontal cortex, supporting deliberate perspective taking. Interestingly, a small group of studies have found that lesions to these involved areas have shown reduced empathy scores compared to a neurologically healthy control group [26,27,28,29] This suggests these areas are vital in the full expression of empathy and further supports the idea of its independent sub-components. However, it has not been established whether these neural networks influence each other during empathic expression or are entirely distinct.

Whilst empathy may possess a neural basis, its development is modulated by environmental factors. Particularly important in the maturation of these empathic capacities is child-caregiver attachment, which is thought to largely predict empathy later in life [30]. This may be because child-caregiver interactions influence the child's internal working model [31,32] Further, the development of a well-established theory of mind - and subsequently empathetic ability - is associated with

mind-mindedness [32]. This is the caregiver's ability to show empathy toward their child such as by making their child aware they recognise and understand their feelings. These foundations facilitate the development of numerous interacting yet distinct capacities. Affective empathy involves understanding another person's feelings, and sharing those emotions. As development furthers, these affective capacities become increasingly supported by cognitive abilities, including Theory of Mind (ToM) and perspective-taking [33]. Theory of mind is the understanding that others have mental states, beliefs, and desires that may differ from one's own [34]. Whereas, perspective-taking involves considering a situation from another person's point of view [35].

Together, these abilities contribute to cognitive empathy: the capacity to understand another person's feelings without necessarily sharing their emotions [36,37]. For example, a younger child may respond to a caregiver in distress by offering them their own teddy, as that would be their preference. Whereas perspective taking could allow an older child to offer an object based on the caregivers' preferences. Consequently, their empathic and prosocial responses can become more targeted and appropriate to the specific needs of the other person. This highlights the importance of environmental influences in modulating empathy development in children.

Whilst precursors to these abilities begin to emerge around the age 2, they gradually become more sophisticated and consistent by the age of 6 when further executive functioning skills such as inhibitory control and working memory are further developed [38]. Additionally, children at this point can generally recognise the emotions and needs of others. However, their performance buffers when these needs strongly conflict with their own. This requires inhibition of the child's own competing desires which becomes more sophisticated throughout cognitive development. For this reason, younger children may display more self-distress in response to another person in distress e.g. requesting to be hugged or held, even if that person is supposedly injured [39]. Therefore, empathy development may not only reflect an increase in emotional responsiveness, but the further integration of affective and cognitive capacities that allow children to recognise, understand and respond appropriately to others. [40].

How do specific maternal psychosocial factors influence the development of empathy?

A wide literature has explored the impact of maternal psychosocial factors on empathy development. For example, in a longitudinal study, Pratt et al., (2017) found that maternal depression across the first six years of life was associated with altered neural responses to others' pain at age 11 [41]. Additionally, these neural responses were predicted by lower mother-child synchrony and greater

intrusiveness during early childhood, suggesting that the quality of early caregiver-child interactions may contribute to the development of socio-cognitive mechanisms underlying empathy development. Further, Schuijers et al., (2024) found that maternal social support was associated with better infant social-emotional competencies including empathetic abilities [42]. This could be the result of numerous multidirectional mechanisms. One possibility is that better maternal mental health and maternal social support facilitate greater parental sensitivity, therefore contribute positively to the child's internal working model and support empathetic development. Additionally, maternal mental health and social support may influence each other bidirectionally. Similarly, a child's level of empathy may influence maternal mental health.

Current gap in literature

Whilst these findings provide important evidence for the role of maternal psychosocial factors in empathy development, several gaps remain. Much of the existing literature has examined individual maternal factors in isolation, limiting understanding of how multiple influences may interact to shape empathic development. Furthermore, research has frequently relied upon caregiver-reported measures of children's empathy. Whilst these may possess greater ecological validity, they may be susceptible to reporting bias and not fully capture children's behavioural responses to others. The present study uses behavioural observations within a controlled environment in order to capture empathic responding toward an individual in need, rather than relying on informal and unstructured caregiver interpretations.

The uncertainty of whether the subcomponents of empathy are part of an integrated or dissociable system, together with a widely variable definition of empathy has resulted in inconsistent measurements and analyses of empathy as a construct. Subsequently, there is a lack of cohesive and reliable literature surrounding its development. Therefore, the present paper explores the relationship between empathy development and various maternal psychosocial factors using a comforting task in which cognitive, affective, and behavioural responses can be detected individually in order to provide a comprehensive examination of the relationships present.

In the present study we observed behavioural experimental tasks in UK children aged 3-6. Alongside this, we collected questionnaire data from mothers measuring maternal mental health, perceived social support and sensitivity toward their children's negative emotions. The aim of this study was to examine the association between participants observed empathic responses and these maternal psychosocial factors. This study presents the following research questions 1. Does age predict empathic behaviours between 3 and 6 years? 2. Are maternal psychosocial factors

associated with children's empathic behaviours? 3. Do children demonstrate similar levels of comforting and concern in response to others' distress?

Methods

Participants

Participants were recruited from Durham and surrounding areas, UK. Testing took place with a total of 40 (Table 1) (22 male, 18 female) participants aged 3-6 years old (M_{age} = 4.744, SD = 1.019, *n* = 40) producing 29 valid trials (*N* = 29). See appendix for complete dataset prior to exclusions due to experimental errors.

This study involved multiple experimental tasks measuring empathic responding (only the Comforting task is reported in this paper) during one session lasting approximately 1-1.5 hours, or 2 hours if siblings were participating (individually) in one session.

Participants were recruited in one of three ways: participants responded to online and social media advertisements via email or WhatsApp, or participants were recruited from an ongoing longitudinal study database investigating social cognition from the age of 3 months. Subsequent testing took place in the Families Room of the Durham Psychology Department. Thirdly, participants attending a university wide scientific research event consented to take part in this study and were tested in a shared experimental space in Collingwood College, Durham.

This report includes the data of neurotypical children only. However, neurodivergent individuals also took part in this study. See appendix for complete dataset prior to exclusions.

Ethics

Ethical approval for the study was obtained using existing ethical approval from a previous, closely related study with a comparable research design and participant population. Additionally, each participant (parent as participants were under the age of 18) provided written consent prior to testing, and verbal consent immediately before each trial. Participants were also informed of their right to withdraw from the study at any point during or after testing.

Table 1

Sample demographic and Characteristics N = 40

Characteristic	Category	Frequency	Percentage %
Sex	Female	18	45.0
	Male	22	55.0
Age (Y)	3	5	12.5
	4	11	27.5
	5	12	30.0
	6	11	27.5
	Missing	1	2.5

Design

Participants took part in a comforting task originally developed by a previous study [43] in which mothers were trained to falsely trip and fall in front of their child. Additionally, mothers completed the WHO-5 Wellbeing Index [44], Multidimensional Scale of Perceived Social Support (MSPSS) [45], Coping with Children's Negative Emotions Scale (CCNES)[46], and background questionnaires either prior to testing, or whilst the child was engaged in another activity.

Materials

A blue plastic table was used for mothers to trip over. A plastic tray containing a plastic spoon and basket, plastic blocks, a plaster, a teddy bear, and a pen and crayon was used during the trial. The task was filmed using two camcorders filming two different angles. One was handheld in order to focus on the child's behaviours and facial expressions.

Procedure

Children engaged in play with a second experimenter in a separate room whist the mother was trained in her fall by the first experimenter.

Mothers were asked to do a controlled fall over a small plastic table, onto soft mats where the child would be sat. Once on the mat they were asked to rub their leg in

pain for ca. 120 seconds. A demonstration was provided and she was able to practise until she felt confident. The following specific instructions were provided:

- do not look at, touch, or speak to your child

- do not speak, just use pain sounds e.g "ow" or "ouch"

- do not smile or laugh.

The child was then brought back inside by an experimenter and sat down on the soft mats. The experimenter showed the child a series of objects in a plastic tray: a cuddly bear (which the mother was asked to show interest in), plastic spoon and basket, plastic blocks, paper and a crayon, and a plaster. The experimenter said something like “I just need to go do something, wait there for a second”- leaving the child sat alone on the mats. An experimenter then made the trial announcement and indicated for the mother to begin.

The mother called the child’s name whilst walking over to ensure the child looked at her during the fall. The mother tripped over the table, landed next to the child, and began rubbing her leg. At ca. 60s an experimenter placed the plastic tray next to the child and made a previously agreed signal (cough) indicating for the mother to say “[Child's Name] my leg is still hurting!".

Following this, the mother continued rubbing her leg and not engaging with the child. At ca. 120s an experimenter said, 'Are you okay now?' at which point the mother was able to break character and engage with the child.

The child was then asked a series of questions about the experience to test their explicit understanding of the event and their feelings:

1. What happened to mummy?
2. What was mummy thinking?
3. How was mummy feeling?
4. How did watching mummy make you feel?
5. What did you do?

Coding and Data Preparation

Participant behaviours were coded by an individual researcher using an condensed version (appendix) of an established coding ethogram [43]. The following behaviours were coded from trial video recordings.

Comforting. This included physical behaviours such as hugging, stroking, and offering objects to soothe the distressed model, as well as verbal comforting such as “Ouch!” or “Oh no!”. Participants were given a score of 0-3 based on the interpreted duration and urgency of the comforting (coding scheme in appendix see here)

Concern. This was interpreted from the child's facial expressions such as raised eyebrows, wide eyes, and tight lips [43]. Additionally, to avoid confusion between concern for the mother and self-distress, this was coded only if distress behaviours such as fussing and whining did not occur at the same time.

Hypothesis Testing. This is thought to represent the child attempting to further understand the model's distress [43]. Coding of this behaviour was categorised by multiple gaze switches between the mothers' hurt body part and her face and/or the experimenter.

Distress. This reflects the distress of the child in response to the model. Importantly, this is not believed to be distress for the model, but for the child themselves. This includes whining, fussing and crying.

Statistical Analysis

A total of 29 trials were suitable to undergo analysis. The complete set of coded *N*=40 data, and reasons for trial exclusion are available here. Analysis was conducted with JASP 0.96 (Apple Silicon) [47] using an excel spreadsheet of participant data and coding outputs.

Firstly, from a table of descriptive statistics of comforting and concern scores against age, we conducted a Shapiro-Wilk test and established a non-normal distribution of data.

Secondly, we wanted to investigate whether comforting and concern behaviours varied significantly between ages (3,4,5,6y). Due to the non-parametric nature of the data, we conducted a one-way ANOVA alongside a Kruskal-Wallis Test for both comforting scores and concern scores against age.

Following this we performed a linear regression analysis to establish the percentage of variance in both concern scores and comforting that can be explained by age.

We then carried out correlational analyses for comforting score and age, and concern score and age. We used Spearman's rho as suitable for the non-parametric dataset, presented alongside Pearson's r statistic for robustness.

Hypothesis testing data was plotted into a contingency table and a Chi-squared test was carried out in order to determine if there was a significant difference in whether or not children displayed hypothesis testing between ages.

Results

Descriptive statistics for comforting and concern scores by age group are presented in Table 2. Overall, comforting scores (M=1.690, SD=1.285) were higher than concern scores (M=0.586, SD=0.780), and both increased across age groups, from age 3 (Comforting M=1.20, SD=1.304; Concern M=0.20 SD=0.447) to age 6 (Comforting M=2.60, SD=0.548; Concern M=1.20, SD=0.837)

Table 2

Descriptive Statistics showing frequencies of comforting and concern scores

	Comforting score				Concern score			
	3	4	5	6	3	4	5	6
Valid	5	9	10	5	5	9	10	5
Mean	1.200	1.222	1.900	2.600	0.200	0.444	0.600	1.200
Std. Deviation	1.304	1.302	1.370	0.548	0.447	0.726	0.843	0.837
Shapiro-Wilk	0.902	0.816	0.731	0.684	0.552	0.684	0.717	0.881
P-value of Shapiro-Wilk	.421	.031	.002	.006	< .001	< .001	.001	.314

A Kruskal-Wallis test found no statistically significant difference in comforting scores across the four age groups $H(3) = 4.5$, $p = .212$, $\varepsilon^2 = 0.161$. Additionally, One-way ANOVAs produced non-significant results $F(3\ 25) = 1.680$, $p = .197$, $\eta^2 = 0.168$, with a large effect size.

Similarly, no significant difference in concern scores across the four age groups was found by a Kruskal-Wallis test $H(3) = 4.610$, $p = .203$, $\varepsilon^2 = 0.165$. Again, One-way ANOVAs produced non-significant results $F(3\ 25) = 1.648$, $p = .204$, $\eta^2 = 0.165$, with a large effect size.

Given the ordinal, non-normal nature of the comforting and concern scores, Spearman's correlation tested the association between age and score, with Pearson's r reported alongside for comparison. Age was significantly positively correlated with comforting score $r(27) = 0.385$, $p = .039$, $\rho = 0.384$ $p = .040$; and with concern score $r(27) = 0.381$, $p = .041$, $\rho = 0.370$ $p = .048$. The close agreement between the two coefficients suggests the relationship is not being driven by outliers or a non-linear pattern within the data.

To quantify this relationship, simple linear regressions were conducted with age as the predictor. Age significantly predicted comforting score $F(1, 27) = 4.695$, $p = .039$, explaining 14.8% of the variance in the outcome ($R^2 = .148$). Age was a significant positive predictor of comforting score, $\beta = 0.385$, $p = .039$. Each additional year was associated with a 0.50 point increase in comforting score.

Age also significantly predicted concern score $F(1, 27) = 4.584$, $p = .041$, explaining 14.5% of the variance in the outcome ($R^2 = .145$). Age was a significant positive predictor of concern scores, $\beta = 0.381$, $p = .041$. Each additional year was associated with a 0.30 point increase in concern score.

Maternal mental health ($r(27) = 0.479$, $p = .024$) and perceived social support ($r(27) = 0.646$, $p < .001$) were significantly positively correlation with concern. Neither questionnaire measures were significantly associated with comforting scores ($r(27) = 0.271$, $p = .222$; $r(27) = 0.324$, $p = .092$)

Further, no significant relationship was determined between CCNES responses and comforting or concern scores ($r(27) = -0.237$, $p = .377$; $r(27) = -0.091$, $p = .738$) Interestingly, both Pearson's r and Spearman's found a significant positive correlation between WHO-5 and MSPSS responses ($\rho = 0.592$ $p = .004$; $r(27) = 0.569$, $p = .006$)

The majority of children displayed hypothesis testing across all ages (M = 79.31%). A chi-square test showed no significant difference between the frequency of hypothesis testing at each age group $\chi^2(3, N = 29) = 1.85$ $p = .605$.

Discussion

The present study conducted observations of behavioural experimental tasks in children aged 3-6. The following research questions were proposed: 1. Does age predict empathic behaviours between 3 and 6 years? 2. Are maternal psychosocial factors associated with children's empathic behaviours? 3. Do children demonstrate similar levels of comforting and concern in response to others' distress?

Statistical analysis found a significant positive correlation in both comforting scores and age, and concern scores and age. This indicated that as age increased, observed comforting behaviours also increased. This finding is consistent with the notion that empathy becomes more advanced with age, possibly due to increased cognitive functioning abilities such as perspective taking and Theory of Mind. These could allow children to understand the models distress (displayed as facial concern) and decide on an appropriate response (displayed as comforting behaviours). However, due to the correlational nature of the analyses, age cannot be identified as a causal component in higher empathic responding.

Despite this significant correlation, the study detected no statistically significant difference in either comforting or concern scores between ages. This may imply a gradual increase in empathic responding with age, rather than distinct developmental stages at each year. Additionally, the linear regression displayed relatively low R values indicate that age accounts for a moderate proportion of the variability in children's comforting and concern scores, suggesting other factors likely play a large role. Importantly, this finding may be the result of the study's small sample size and varied size of age groups, limiting statistical power and making it harder to establish age-associated differences.

While there was a slight positive association between comforting scores and concern scores, this did not reach significance. This could imply a partially dissociable system of empathy as behavioural, affective, and cognitive empathy did not display congruence - it is apparent that these abilities do not necessarily occur together, or to the same degree. It is possible that a child displays concern but does not act upon this behaviourally, and vice versa. This could be viewed as exploratory evidence into how the dissociable system of empathy manifests behaviourally in children.

Interestingly, both WHO-5 and MSPSS responses were significantly positively correlated with concern scores (but not comforting scores). Namely, as maternal mental health and perceived social support increased, as did concern. This may imply higher maternal mental health and perceived social support foster higher levels of emotional sensitivity which does not necessarily translate into behavioural responding. Taken together with the previous finding in the differing prevalence of comforting and concern, this may provide further support of a dissociable system. On the other hand, it could be argued that the lack of congruence in comforting and concern reflects greater cognitive inhibition abilities rather differing development trajectories. For example, children may be able to inhibit comforting behaviours despite displaying concern, due to uncertainty of what is accepted in the current environment.

Further, WHO-5 and MSPSS responses were significantly positively associated with each other. This implies that some components of maternal mental health and perceived social support are related. Due to the correlational nature of this analysis, it is not possible to determine the direction of this relationship. However, assuming the possibility of a bi-directional relationship, perhaps increased perception of social support positively impacts maternal mental health, which in turn results in more positive social interactions and close support.

Finally, hypothesis testing was displayed in the majority of participants at each age, and its frequency did not differ significantly between ages. This suggests children aged 3-6 tend to display situational questioning behaviours in order to understand

an individual's distress. This aligns with the Theory of Mind and perspective taking abilities children this age group is believed to possess [35**]**.

Limitations

This study presents several limitations to be considered when interpreting these findings.

The small sample size within the study could mean these findings lack statistical power. Therefore, future research should employ analysis of a larger dataset to identify mainstream trends. Child empathy data were coded from recorded observations which – despite utilising an established coding ethogram - may be subject to interpretation bias.

Additionally, coding was only carried out by one researcher. Therefore, inter-observer reliability could not be assessed. Future research should conduct inter-observer reliability to identify coding behaviours consistently and fully.

Finally, empathy scores were based off observational methods alone. Future research should provide a more comprehensive measure of child empathy such as by using caregiver-reported questionnaires of empathy alongside behavioural observations by researchers. This will facilitate the measurement of empathic development from both caregivers' perspectives in a naturalistic environment and direct observation in a controlled setting.

Conclusion

The present study found a significant positive correlation between comforting scores and age, and concern scores and age. Additionally, there was no significant difference between comforting or concern scores between ages. A significant positive correlation between concern scores and maternal mental health and perceived social support was established. Overall, these findings support the notion that empathic responding increases over the preschool years, and certain maternal psychosocial factors may be associated with empathic concern. Future research should focus on integrating behavioural observations and caregiver-reported questionnaires across a larger dataset. These findings contribute to existing literature surrounding empathic responding in pre-school children and provide a valuable exploratory basis for future research.

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47. JASP Team (2026). JASP (Version 0.96) [Apple Silicon]

Appendix

1. *Complete JASP analysis outputs following exclusions N = 29*

Results

Descriptive Statistics

Descriptive Statistics

	Comforting score				Concern score			
	3	4	5	6	3	4	5	6
Valid	5	9	10	5	5	9	10	
Mean (arithmetic)	1.200	1.222	1.900	2.600	0.200	0.444	0.600	1.20
Std. Deviation	1.304	1.302	1.370	0.548	0.447	0.726	0.843	0.83
ShapiroWilk	0.902	0.816	0.731	0.684	0.552	0.684	0.717	0.88
P-value of ShapiroWilk	.421	.031	.002	.006	< .001	< .001	.001	.31

Note. Excluded 22 rows from the analysis that correspond to the missing values of the split-by variable Age

2. *JASP analysis of coding prior to exclusions N = 40*

Results

Descriptive Statistics

Descriptive Statistics

	Age	Sex
Valid	39	40
Missing	1	0
Mean (arithmetic)	4.744	
Std. Deviation	1.019	

Frequency Tables

Frequencies for Age

Age	Frequency	Percent	Valid Percent	Cumulative Percent
3	5	12.5	12.8	12.8
4	11	27.5	28.2	41.0
5	12	30.0	30.8	71.8
6	11	27.5	28.2	100.0
Missing	1	2.5		
Total	40	100.0		

Frequencies for Sex

Sex	Frequency	Percent	Valid Percent	Cumulative Percent
F	18	45.0	45.0	45.0
M	22	55.0	55.0	100.0
Missing	0	0.0		
Total	40	100.0		

3. *Coding scheme adapted from Vreden et al. (2025) [43]*

Ethogram for Video Coding of Comforting Task

Comforting	
Behaviours are only considered comforting if the infant looked at the distressed adult model's face/the hurt body part within the 3s before the behaviour onset.	
Category	*Description*
Pat/Stroke	Gentle movement of the infant's hand on the distressed model's body. NOT hitting, pulling hair, pointing (with finger touching model)
Hug	Extended arms clasping the distressed model while the infant's torso is in contact with the model. NOT pulling self up on model body, leaning sideways against model, lying face down on lap/legs
Kiss	Touch the distressed model's face, hurt body part or other limb with the mouth. NOT falling into the adult head first.
Object	Voluntarily hand the distressed model an object (NOT toy hammer/clipboard). Code regardless of model (not) picking it up.
Verbal	Vocalisations indicating concern such as "You okay?," "Oh oh!", "Ouch!" Note that vocalisations (e.g., "Ouch?") with questioning intonation are coded as verbal hypothesis testing.
None	No observable comforting behaviours

Comforting coding score 0-3

Reflects attempts to help or comfort the distressed victim, rated on a 0–3 scale, with
0 = None,
1 = Brief (e.g. one quick pat, or handing a nearby toy),
2 = Moderate. Single clear comforting behaviour. One identifiable and directed comforting action - tries to help/comfort for a longer time, e.g. a big hug, clear pat, verbal response, or object offering).
3 = Prolonged. Multiple or sustained comforting behaviours. Either multiple distinct types of comforting behaviours or sustained engagement in comforting over time. E.g. assists for a longer duration, and/or with greater effort than for codes 1 and 2.

Ratings based on duration, intensity, and complexity of behaviours, throughout the episode.

4. Complete coding dataset prior to exclusions