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Caring for Sharing
How Attachment Styles Modulate Communal Cues of Physical Warmth

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Abstract. Does physical warmth lead to caring and sharing? Research suggests that it does; physically warm versus cold conditions induce prosocial behaviors and cognitions. Importantly, previous research has not traced the developmental origins of the association between physical warmth and affection. The association between physical warmth and sharing may be captured in specific cognitive models of close social relations, often referred to as attachment styles. In line with this notion, and using a dictator game set-up, the current study demonstrates that children who relate to their friends with a secure attachment style are more generous toward their peers in warm than in cold conditions. This effect was absent for children who relate to friends with an insecure attachment style. Notably, however, these children not just *always* shared less: They allocated more stickers to a friend than to a stranger. These findings provide an important first step to understand how fundamental *embodied relations* develop early in life. We discuss broader implications for grounded cognition and person perception.

Keywords: attachment, grounded cognition, relational models, physical warmth, interpersonal relations

Children's experiences with their caretakers differ substantially. Previous research identified the responsiveness of caretakers as an important variable that determines behavior in social relations by contributing to an attachment style developed by the child. The concepts of caretaker responsiveness and attachment styles suggest a rather abstract and high-level concept. However, what covaries with responsiveness may often be very concrete behavior such as touching, nursing, and feeding that all co-occur with providing bodily warmth. Such concrete dimensions of social interactions recently received increased empirical attention in the literature on adult and infant social cognition (e.g., Häfner & IJzerman, 2011). We argue here that attachment styles also have an embodied dimension that tunes social behavior to embodied cues such as warmth.

Subtle manipulations of physical warmth have been linked to prosocial behaviors and cognitions as compared to physically cold conditions. For instance, adult participants in physically warm compared to cold conditions rated a third party as more sociable and were themselves more generous (Williams & Bargh, 2008; see also Asch, 1946, 1958). Similarly, physically warmer conditions attune adults to focus on communal, affiliate relationships (like those between partners or between caregiver and infant). That is, adults in physically warm conditions use more language associated with relationships, per-

ceive more relationships in their environment, and construe their selves as having greater integration with others (IJzerman & Semin, 2009). Vice versa, the lack of social relationships leads people to perceive their environment literally as being physically colder (Szymkow, Chandler, IJzerman, Parzuchowski, & Wojciszke, 2013; IJzerman & Semin, 2010; Zhong & Leonardelli, 2008), while people's skin literally becomes colder after being excluded (IJzerman et al., 2012).

The theoretical accounts underlying these experiments typically assume that the link between warmth and prosocial cognition is the result of life-long overlearning facilitated by an evolved proclivity (Williams & Bargh, 2008). Yet, little is known about the developmental path of this link – and still less about its generality across individuals. In the current work, we traced the causal role of an early cognitive link in children and found that children who did not develop a secure internal model of relationships toward friends also seemed not to show this link.

General Relations Between Attachment, Touch, and Warmth

Research linking warmth and communal behavior is based on the idea that, from infancy on, physical warmth

and experienced affection covary. This is argued to lead to a learned association of warmth and communion, possibly facilitated by an evolutionary adaptation (Williams, Huang, & Bargh, 2009). These arguments concur with Harlow's (1958) work on touch. He suggested that close, physical contact throughout infancy is necessary for healthy psychological functioning: Young rhesus monkeys preferred a soft surrogate mother made of terrycloth over a surrogate mother made of wire, and those monkeys raised with a wire mother (rather than the terrycloth mother) experienced greater stress, were less playful, and were less likely to explore the environment in new situations. This may suggest that close bodily contact with a caregiver, which is often associated with physical warmth, may indeed be an evolved need (see MacDonald, 1992).

Experiences of infants with their caregivers, however, can vary considerably. One prominent account on how people learn to interact with close and communal others – attachment theory (Bowlby, 1969) – suggests that infants come to learn whether their caregiver is likely to be responsive and available to meet their needs. Early interactions with communal others (like the caregiver) inform infants on specific manners in which they are expected to behave toward self and others. Such early interactions are assumed to be the basis for more generalized cognitive models of relationships and are commonly referred to as attachment styles (see Ainsworth, Blehar, Waters, & Wall, 1978). Those infants who are securely attached expect their caregivers to be available, and when upset, they are more easily comforted. In contrast, insecurely attached infants do not trust their caregiver will be reliably available for their comfort and protection and are not easily comforted (Johnson, Dweck, & Chen, 2007).

The development of attachment styles has been linked to embodied cues experienced early on in infancy, especially bodily contact (Bowlby, 1969). Ainsworth (1979) reported that mothers of avoidant babies showed more frequently signs of an aversion to close bodily contact. Such avoidance of bodily contact frustrates the child's attempts to establish secure bodily contact when motivated to do so, and changes their own approach behavior (Anisfeld, Casper, Nozyce, & Cunningham, 1990; Blehar, Lieberman, & Ainsworth, 1977). This suggests that early embodied cues (in contrast to higher order cognitive cues, like the differentiation between friends and strangers), such as the inherently related touch and physical warmth, may form critical parts of the meaning of cognitive models of attachment. In other words, we argue that an evolutionary adaptation to associate warmth and caring is likely to provide the child with a crucial learning opportunity; however, caregiver behavior such as that leading to an avoidant attachment style may be able to disrupt the acquisition of this link. If so, the effects of physical warmth on behavior should be modulated by attachment styles.

The Present Research: Attachment, Friendship, and Warmth

In the present work, we focus on one specific communal relation, namely, friendship relations. Friendships feature warmth and touch less prominently than the first, crucial parent-infant bond. Nevertheless, anthropological and psychological work alike suggests that friendship relationships may often be considered as communal or even very similar to kinship relations (Ackerman, Kenrick, & Schaller, 2007; Adams & Plaut, 2003). Indeed, friends are often considered "intimate associates." The relationships between friends are characterized by commitment, cooperation, affection, and prosocial support (Hartup & Stevens, 1997). Among adults, secure attachment in general provides a foundation for compassion and care*giving* (Mikulincer & Shaver, 2005). Being insecurely attached, in contrast, hampers compassionate caregiving (e.g., Carnelley, Pietromonaco, & Jaffe, 1996; Collins & Feeney, 2000).

Self-reported attachment styles to friends should thus moderate how young children respond to physical warmth in their behavior toward their peers: Children with different orientations to close and communal friend relations, as measured through an adapted measure of their attachment styles to friends, should differ in the way they respond to physical warmth with caring actions, because their experiences with the implied communal friendships differ.

To test this interaction hypothesis, we assessed children's self-reported attachment styles toward friends, manipulated room temperature, and measured how many stickers the children shared in a dictator-game (e.g., Forsythe, Horowitz, Savin, & Sefton, 1994) with another, not present, child under these conditions. Note that we thereby manipulated physical warmth independently from touch, around comfortable ranges. Furthermore, communal behaviors with respect to friendship relations do not afford close physical warmth to the same degree as parent-child relations. Together, this ensures a strong test of our hypothesis. Whereas securely attached children should respond intuitively to physical warmth by *acting* communally and altruistically to meet other's needs, this should *not* be the case for insecurely attached children who do not share the experience that the needs of self and others are met in (physically) warm, communal relationships. This interaction hypothesis should be absent for known, learned relationships (such as the difference between friends and strangers).

Method

Participants

Sixty (43.3% female, M_{age} = 5.08, SD_{age} = 0.59, all native Dutch) children were recruited from kindergarten classes at two elementary schools in Abcoude, The Netherlands. For all children, we obtained informed consent from their

parents/caregivers to participate. All children received ten stickers and 20 balloons at the end of the day on which they participated. One child was excluded from the final analysis because the task was too difficult for him to complete. All children were randomly allocated to the physically cold (N = 29) or warm (N = 30) conditions.

Procedure and Design

The children were accompanied from their classroom to a room, located in their elementary school, which had been either cooled down (cold condition; 15–19 °C) or heated up (warm condition; 21–26 °C) beforehand (see IJzerman & Semin, 2009). At the beginning of the session, the experimenter, who was blind to the hypotheses, asked them 15 questions from our attachment scale with regard to friendship relations (derived from Bartholomew & Horowitz, 1991). We simplified the original scale for usage with 4–6-year-old children. All children were trained in advance to use simplified Likert scales with intuitive and easy questions (e.g., "Do you like Brussels sprouts?"). The questions were administered orally, and the children could point to a 7-point scale, ranging from *not at all* to *very much* (see Figure 1 and Appendix).

In some cases the children misunderstood the instructions. Here, our experimenter re-explained the questions and the way in which the children could answer. Our scale consisted of four subscales, namely, Dismissive Avoidant (four items, e.g., "Do you feel at ease without having good friends"), Fearful Avoidant (four items, e.g., "Do you find it difficult to be in need of other children's help?"), Securely Attached (five items; "Do you find it easy to become good friends with other children?"), and Anxious Preoccupied (three items; e.g., "How do you feel without good friends?"). One item was used both for Securely Attached and Fearful Avoidant (but reverse-scored; see Appendix).[1]

Subsequently, the children were shown ten equally sized stickers (or 20 balloons) and asked how many they wanted to keep for themselves and how many they wanted to share with an ostensible other child next door. In reality (but unbeknownst to the child), this was a fictitious child, of the same age and sex as the participant, not acquainted, who would not be met in the future. All children believed that the other child truly existed. Our experimenter told the children that the other child would not get the option to receive stickers (or balloons). She then asked the same question with ten new stickers, but children were now asked if they wanted to keep all ten for themselves or if they preferred to share some with their best friend instead (of which we recorded the name in advance). The order stranger–friend was counterbalanced across children. At the end, children were asked not to tell their classmates about the content of the experiment.

Figure 1. Likert-scale used for 4–6-year-old children when answering our attachment scale.

Results

We classified children as securely or insecurely attached on the basis of their highest averaged score on one of the subscales of our attachment scale (62.7% securely attached). Insecurely attached children were those who scored highest on a subscale other than securely attached (37.3% insecurely attached, this was composed of 8.5% Dismissive Avoidant; 6.8% Fearful Avoidant; 20.3% Anxious Preoccupied; 1.7% scored highest on all three insecure styles). In the case of an equal score on the secure subscale and one of the insecure subscales, we averaged the three insecure subscales and recompared. This happened in four cases. Subsequently, we analyzed our results according to a 2 (between: Temperature: cold vs. warm) × 2 (between: Attachment Style: secure vs. insecure) × 2 (within: friend vs. stranger) mixed-models design. There was no reliable effect of order on giving to friend or stranger (p = .551). In addition, we analyzed whether temperature affected the children's answers to the attachment questionnaire. A logistic regression of temperature on attachment styles showed no effect (p = .920).

As expected, like differences between friends and strangers known relationships showed a simple main effect: Children were more willing to share with their friends (M = 2.97, SD = 2.33) than with strangers (M = .98, SD = 1.74), $F(3, 55)$ = 34.38, $p < .001$, Cohen's d = .97. Notably, no interaction effect emerged between attachment style and friend-stranger factors, $F < 1$. Insecurely attached children thus also meaningfully adapted their sharing behavior to the known nature of the relationship. Given that there were no further interaction effects involving differences between friends and strangers (all ps . 250), we focused on the hypothesized between-participants Temperature × Attach-

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[1] Children of the age in our sample can show considerable variance in their ability to use the scale. We controlled for this in two ways. First, our experimenter explained any questions the children might not intuitively understand. Second, we refrained from using the attachment scale to predict responses on physical warmth. Instead, we categorized children on the basis of their highest average score on our attachment scale, reducing the relevance of children's idiosyncratic use of the scale.

ment Style analysis by calculating an average score for stickers given to friends and strangers.

In general, securely attached children gave more stickers than did insecurely attached children, $F(1, 55) = 5.34$, $p = .023$, $\eta_p^2 = .090$, confirming that securely attached children are more care-"giving" than insecurely attached children. There was no main effect of temperature, $F < 1$. Importantly, the main effect of attachment was characterized by a significant interaction of temperature and attachment style, $F(3, 55) = 5.69$, $p = .020$, $\eta_p^2 = .094$. Securely attached children gave significantly more stickers in the warm ($M = 2.89$, $SD = 1.70$) than in the cold ($M = 1.75$, $SD = 1.53$) condition, $t(58) = 3.35$, $p = .001$, Cohen's $d = .71$. There were no significant differences for insecurely attached children, $t(58) = -1.23$, $p = -.214$ (warm, $M = .95$, $SD = 1.08$; cold, $M = 1.77$, $SD = 1.59$; for means and standard deviations split by friend and temperature condition, see Table 1). This confirms our hypothesis that securely attached children should become more prosocial in warm than in cold conditions, but that this effect should be absent for insecurely attached children.

Table 1. Prosocial behavior of children in warm and cold conditions

Temperature condition	Friend		Stranger	
	Secure	Insecure	Secure	Insecure
Cold	1.77 (1.17)	1.64 (1.36)	0.50 (0.77)	0.32 (0.64)
Warm	2.16 (1.07)	1.00 (1.12)	1.21 (1.08)	0.27 (0.47)

Note. Means display prosocial behavior among the 4–6-year-old children in our sample. Analyses in the paper are conducted with the averaged scores between friends and strangers (the analyses yielded no significant interaction effects between temperature and relationship).

Discussion

We examined the altruistic behavior of securely and insecurely attached children in either physically cold or warm ambient conditions. In a dictator game, securely attached children donated more stickers to two other children in physically warm rather than cold conditions. This is remarkable from several perspectives. First, it provides evidence that the link between warmth and prosociality indeed goes back to early childhood, as assumed in earlier work (IJzerman & Semin, 2009, 2010; Williams et al., 2009). Adults may show effects of warmth on prosociality because they have learned the metaphor of kindness and warmth, and that experiencing warmth influences kindness-related behavior because of the representation of this metaphor (Landau, Meier, & Keefer, 2011). However, the fact that we find the same effect with young children supports the notion that the effects found in adults are due to the formation of modal knowledge structures during earlier development (IJzerman & Koole, 2011).

Furthermore, our findings add to the literature on embodied cognition, which so far has mainly been concerned with the main effects of embodied cues. We showed that a higher order concept such as attachment style developed during infancy can moderate the effect of embodied cues (see Meier, Sellbom, & Wygant, 2008; Schubert & Koole, 2009). Going beyond previous work and showing main effects of warmth, we find that *only* securely attached children's giving behavior was positively affected by physical warmth, while insecurely attached children did not show this pattern. Together, our findings indicate that insecurely attached children do not respond to physical warmth with caring actions to the same degree as securely attached children. In other words, one's experiences with and expectations for a given communal relationship determine how one intuitively responds to embodied or physical communal cues. Moreover, because communal behaviors with respect to friendship relations do not afford close physical warmth to the same degree as parent-child relations, the present findings strongly suggest that the warmth-caring association underpins the meaning of communal relations at large, irrespectively of learned associations in the *specific* social relationship.

We developed our argument based on the assumption that different caregiver behaviors lead to different attachment styles and different associations of caring and embodied cues like physical warmth, which are of primary importance during early experiences of being cared for (Ainsworth, 1979). Infants face the formidable task of learning who has what kind of relationship with one another in their social world. To learn this, they must somehow know what basic kinds of social relationships to look for and how to recognize them, that is, their physical or embodied cues. Basic components of communal relations may help infants to construct meaningful internal working models of attachment on the basis of their early life experiences. Strong learning accounts might underestimate the bodily constraints and social coordination devices people are afforded with (Fiske, Thomsen, & Thein, 2009; IJzerman & Cohen, 2011; IJzerman & Koole, 2011; Thomsen & Carey, in press).

Recent evidence suggests that people possess specific systems that link relative size to dominance and physical closeness to communal relations among preverbal and just-linguistic infants (Thomsen, Frankenhuis, Ingold-Smith, & Carey, 2011; Over & Carpenter, 2009). We propose here that physical warmth also forms part of people's core systems affecting behavior in communal friendship relations. Importantly, the fact that children who are insecurely attached to their friends do not respond to physical warmth with communal actions toward friends indicates that the effect of embodied, physical cues is not absolute. Instead, it hinges crucially on the relational meaning a given relation has for the child. This depends on the child's prior experiences with and expectations to the relationship, as indexed by attachment style. In other words, if the child does not experience friendships as secure and successful communal relationships, she/he will not act communally toward friends based on embodied, communal cues.

As far as we know, the present findings are the first to

demonstrate that the relationship between warmth and prosocial behavior is present in early childhood and is moderated by attachment style. As such, the findings provide some initial insight into the origins of the warmth-prosociality link. However, we should acknowledge several limitations and unaddressed issues. First, our findings do not show a simple main effect, as found in other studies (IJzerman & Semin, 2009; Williams & Bargh, 2008). However, these other studies focused on a selected group of college students, whereas our sample included a broader range of children. In both samples used by the other authors, the groups tend to be a relatively selected group of college students. Recent research addresses how these groups of educated students differ substantially from other samples across different tasks (Henrich, Heine, & Norenzayan, 2009). Our research suggests that different samples may differ in attachment styles; that can be the focus of future investigations.

Coming to the issue of differences across groups, one may argue that cross-cultural climatic patterns do not converge with our findings (e.g., Van IJzendoorn & Kroonenberg, 1988). Yet, in our research we were interested in subtle temperature manipulations within comfortable ranges, which seem qualitatively different from climatic differences in temperature. The present research thus does not allow for interpretations of meanings of findings from cross-cultural climatic patterns.

Furthermore, one may argue that mood may have affected our findings. However, studies investigating subtle temperature manipulations consistently fail to find effects on mood – and in fact argue against such a general "halo" effect (IJzerman & Semin, 2009; Williams & Bargh, 2008). Finally, we were interested in a first exploration of attachment style, thereby dividing children into secure and insecure groups. It is an important challenge to discover how different insecure attachment styles may fare toward the experience of physical warmth. Extending these findings to the other attachment styles should directly contribute to the meaning of physical warmth in close relationships.

It is interesting to speculate on the role these findings play in more complex cognitions. Extent research has addressed how people perceive others on an individual and group level, utilizing the metaphor of psychological warmth to describe how one feels about others (Abele & Wojciszke, 2007; Fiske, Cuddy, & Glick, 2007; Wojciszke & Abele, 2008; Wojciszke, Abele, & Baryla, 2009). Williams and Bargh (2008) confirmed Asch's (1958) early suspicions that the metaphor of psychological warmth is firmly grounded in the physical experience of warmth, by showing how experiencing physical warmth increases how sociable people perceive others to be. Other, recent work, shows that this link is bidirectional: Reminding people of their own and other's positive communal traits increases the perception of ambient temperature, independent of self-esteem and higher order cognitions of relationships (Szymkow, Chandler, IJzerman, Parchukowski, & Wojciszke, 2012).

But how do people learn to think of others as warm or cold? Here, too, one may take a strong learning approach (Lakoff & Johnson, 1999; Landau et al., 2010), though as we mentioned above, strong learning accounts overlook the evolved proclivities people become equipped with in order to engage in relationships (Caporael, 1997; Fiske, 1991, 1992; IJzerman et al., in press; Thomsen & Carey, in press). Examining the combinatorial logic of learning accounts scaffolded onto evolved proclivities through physical warmth is vital in understanding *why* psychological warmth has become such an important dimension in perceiving others, and for analyzing *how* the dimension differs across individuals and groups.

To conclude, co-experiencing physical warmth with communal bonds reinforces socially meaningful experiences. The interaction of the body with the social world provides important information for how people learn to engage effectively and adaptively in interpersonal relations. In the current experiment we manipulated room temperature, but in actual situations a temperature cue would be typically instantiated by a warm touch – to which, as we see, securely attached children could adequately respond. Our results therefore deliver important information as to what bodily constraints and social coordination devices are essential in going "beyond the information given" when constructing social relations.

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Appendix

Description of the Scale

The Appendix contains the 15 questions we used in our research, as indexed by attachment style. Each question, except one, is used to calculate only *one* attachment style. [Note that question 3 is used for both "Safely attached" and for "Fearful avoidant". Question 3b is thus not repeated, but added to the present list in order to clarify scoring]

S = Securely attached
FA = Fearful avoidant
AP = Anxious preoccupied
DA = Dismissive avoidant

Research Questions

1. **DA** – Do you feel at ease without having good friends?
2. **FA** – Do you find it difficult to be in need of other children's help?
3. **S** – Do you feel at ease when you can trust other children?
3b. **FA** – Do you feel at ease when you can trust other children?*
4. **S** – Do you feel at ease when other children can trust you?
5. **AP** – Are you, at times, afraid that others don't consider you to be as important as you consider them?
6. **FA** – How does it feel to have good friends?*
7. **DA** – Do you find it important to have the feeling that you do not need other children?
8. **S** – Are you ever afraid to be alone?*
9. **S** – Are you ever afraid that other children don't like you?*
10. **AP** – How do you feel without good friends?*
11. **AP** – Does it happen to you that you want to become good friends with other children, but that the other children don't want to become such good friends with you?
12. **DA** – Do you need the help of other children?*
13. **DA** – Do you find it necessary to help other children?*
14. **FA** – Are you afraid you might get hurt if you become good friends with other children?
15. **S** – Do you find it easy to become good friends with other children?

*Denotes reverse scoring.

Instructions for Using the Scale

The confederate spoke to the children, explained to them how the scale works, and trained them in using the scale. The following is an example of this:

> "I will now ask you some questions about how you feel about, and how you feel with, other children in general. You may answer every question using something called a 'scale.' Let me show you how it works *[show illustration of large scale: see Figure 1]*. When you give an answer you choose between seven answers. 1 means 'not at all,' 2 means 'no,' 3 means 'not really,' 4 means 'I don't know,' 5 means 'a little,' 6 means 'yes' and 7 means 'very much'."

At this point, the confederate pointed at each number and explained what each number meant. Dutch children aged 4–6 are not yet able to read, but the children did remember where the answers were positioned. The confederate then proceeded to train the children with examples, detailed below through an example with one of the children (who would point to the numbers):

> Confederate: "Let's try this with an example: Do you like the color pink?"
> Child: "Yes."
> Confederate: "A little, just 'yes,' or do you like it very much?" *(pointing at scale)*
> Child: "Very much."
> Confederate: "And do you like sprouts?"
> Child: "No."
> Confederate: "Not really, just 'no,' or not at all?"
> Child: "Not really."
> Confederate: "Very good. Now let's start with the questions. Remember, there is no right or wrong answer."

In addition, some questions were more difficult for children to answer. The confederate helped the children by re-explaining and providing additional explanations.

For example, Questions 3 and 4 contained difficult words for the children in our sample: Most of the children do not understand the word "trust" yet. The confederate then helped by giving them some examples:

> "When you can trust someone you know you can rely on this person. You know that he/she will always be there for you. When you tell this person a secret he/she will not tell anybody else."

Finally, Questions 5 and 11 could be difficult for some children. The confederate usually used three markers (or other objects) to point at when she mentioned other children and then she pointed at the child when she mentioned the child in the question. By using the markers it made it easier for the children to understand and visualize the question.