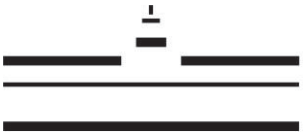

Cognitive and Motivational Underpinnings of Early Helping Behavior

Inaugural-Dissertation

zur Erlangung des Doktorgrades (Doctor rerum naturalium)

im Fachbereich Psychologie und Sportwissenschaft

der Westfälischen Wilhelms-Universität Münster

Vorgelegt von

Moritz Köster

aus Köln

2016

Promotionskomitee:

1. Prof. Dr. Joscha Kärtner (Westfälischen Wilhelms-Universität Münster)

2. Prof. Dr. Shoji Itakura (Kyoto Universität)

3. Dr. Patricia Kanngießer (Freie Universität Berlin)

Dekan:	Prof. Dr. Elmar Souvignier
Erster Gutachter:	Prof. Dr. Joscha Kärtner
Zweite Gutachterin:	Dr. Patricia Kanngießer

Tag der mündlichen Prüfung:	07.11.2016

Tag der Promotion:	07.11.2016

Acknowledgements

Life is a journey. At this point, I would like to thank all the people who accompanied and supported me so greatly along the way throughout the last years. Without them, I would not have been able to accomplish this dissertation.

First of all, I want to thank my wife and my family. My wife was always there for me when I needed her, she made the research projects in Brazil and Japan unforgettable experiences and she was always understanding, when I spent nights at the desk to work on my thesis. My family always gave me the warms, support and freedom that a family can give.

I am especially grateful to my supervisor Prof. Dr. Joscha Kärtner. He was a great mentor, not only giving me the opportunity to work on fascinating research topics together with him, but also the support, trust and confidence to complete the research projects of this dissertation. His advices and his constructive criticism were highly valuable for my development as a researcher.

My great appreciation goes to all the collaborators and the students for their friendly and reliable collaboration in the research projects of this thesis. They are acknowledged in detail in the Manuscripts. In particular, I would like to thank Prof. Dr. Shoji Itakura (Kyoto University) and Prof. Dr. Lilia Cavalcante (Federal University of Pará, Belém, Brazil) for sharing the enthusiasm for the joint research projects and for the excellent support of the data collections in Japan and rural Brazil.

Last, but not least, I want to say thank you to Prof. Dr. Joscha Kärtner, Dr. Jens Hellmann (University of Münster), Prof. Dr. Audun Dahl (University of California, Santa Cruz) and Niklas Dworazik for useful corrections and comments on former versions of the synopsis.

Table of Contents

Part 1:

Synopsis

Cognitive and Motivational Underpinnings of Early Helping Behavior

Moritz Köster

University of Münster

Table of Contents

Abstract

Infants' helping behavior appears to be a simple action, but it is a complex phenomenon. Why do infants spontaneously start to help others at the beginning of their second year of life, for example, when another individual is reaching for an object that she cannot reach? Put differently, how do infants perceive situations and their own role in situations in which another individual is in need for help (cognitive underpinnings) and what motivates them to engage helpfully in these situations (motivational underpinnings)? In this synopsis, I embed the empirical works of my dissertation in a broader empirical and theoretical context. In particular, I will organize recent topics and research about infants' helping behavior along four general factors that influence infants helping behavior in a certain situation. These comprise socio-cognitive functions (e.g., understanding others' needs and the own competencies to engage helpfully), the socialization within the cultural context (e.g., maternal scaffolding of chores), influences of the social situation (e.g., recent social interactions with the recipient), and expected consequences of helpful behavior (e.g., praise and thanking by the parents). I will then discuss the biological foundations of infants' early motivation to help. That is, why helping behavior may have evolved and how early helping behavior may be grounded in proximate biological mechanisms. I will conclude that, although the debate about infants' altruistic tendencies remains unresolved, early helping behavior is certainly deeply grounded in our social human nature.

Cognitive and Motivational Underpinnings of Early Helping Behavior

Imagine yourself walking on the sidewalk of a noisy street. A person is walking in front of you, when she suddenly loses her key but keeps on walking. Even if this person is a stranger, most likely you would walk over, pick up the key and bring it after her. This situation would leave you with the good feeling for having helped and the other person with a relief for all the trouble you saved her from and possibly a smile on her face. Helping feels very natural for human adults. But when and how do infants begin and learn to help, and what motivates them to firstly engage helpfully when another person is in need?

Even after some years of research, it remains fascinating to observe how infants in their second year of life readily begin to help others. Rheingold (1982) firstly described how infants at 18 months of age spontaneously engaged in a variety of household chores, such as sweeping paper bits or setting a table, when their parents or another adult performed these actions in a laboratory setting. Thereafter, empirical research on infants' helping behavior was only revitalized about 10 years ago by the seminal works of Warneken and Tomasello (2006, 2007).

Warneken and Tomasello (2007) found that infants as young as 14 months pass objects to other individuals who reach out for these objects unsuccessfully (out-of-reach task; see Figure 1). For example, when another person reached out for a clothespin that dropped on the ground while she was hanging clothes, infants reliably toddled over to pass the clothespin to the experimenter. They passed over the clothespin at a much lower rate in a control condition, where the experimenter threw an object on the ground intentionally and did not reach out for it, showing that helping in these tasks is not simply explained by infants' tendency to pick up an object that fell on the ground. Indicating that infants start to help even earlier, Liszkowski and colleagues (2008) found that 12-month-old infants already used pointing gestures to indicate the location of an object that another individual was looking for when this object dropped on the ground out of her sight (informative pointing; see Figure 1,

left picture). Infants did not inform the experimenter in a control condition where the experimenter saw the object falling on the ground. In one of our studies (Köster, Ohmer, Nguyen, & Kärtner, 2016) we found a very low rate of helping behavior in out-of-reach tasks in the first year (9- to 11-month-olds: 10.7%), and stepwise increases in helping rates in the months thereafter (12- to 14-month-olds: 39.2%; 15- to 18-month-olds: 69.8%). From around 18 months, infants start to help in more complex tasks (Warneken & Tomasello, 2006). For example, they open the door of a cabinet, when the experimenter tries to put books into the cabinet, but her hands are occupied with the books she is holding. Taken together, infants' helping behavior emerges gradually from around the first birthday, before infants help in increasingly complex situations throughout their second year. This age range is in the focus of the present work.

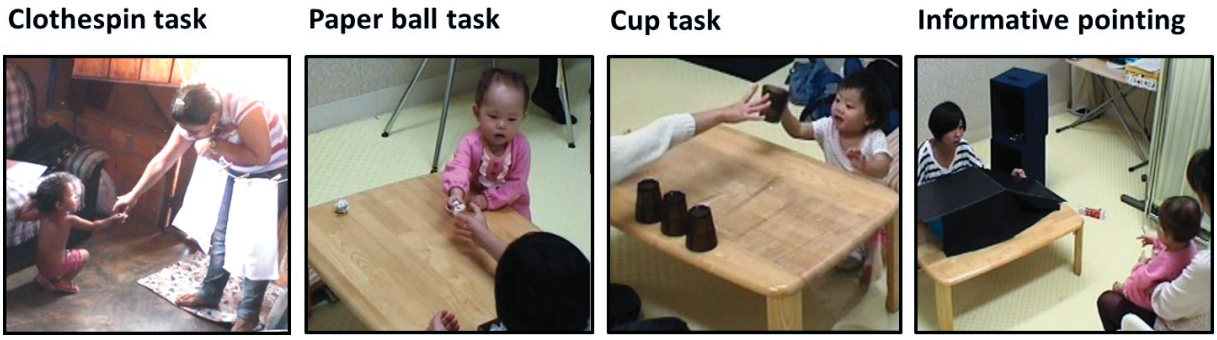

Figure 1. Photographs display infants' helping behavior in three out-of-reach tasks (clothespin, paper ball, and cup task) and an informative pointing task. In the clothespin task, the experimenter reaches out for a clothespin she dropped on the ground while hanging clothes and that she cannot reach (e.g., Warneken & Tomasello, 2006), here assessed in a home setting in the Brazilian Amazon region (Köster et al., in press). In the paper ball task, the experimenter collects paper balls on her side of the table, before she reaches out for paper balls on the side of the infant unsuccessfully (e.g., Warneken & Tomasello, 2006). In the cup task, the experimenter stacks cups on the table and accidently drops some of the cups at the infants' side of the table (e.g., Kärtner et al., 2014). In the informative pointing task, an object falls on the ground out of sight of the experimenter. The experimenter looks for the object but does not see it (e.g., Liszkowski et al., 2008). To code infants' helping behavior, it is then observed whether or not the infant displays helping behavior by passing over or pointing at the object in these tasks. The latter three pictures stem from laboratory sessions at the Kyoto University (Köster et al., submitted).

Although infants' helping appears to be a simple act, it is a complex phenomenon, which may even hold implications for the social nature of the human species. For example, Warneken and Tomasello (2007, 2009a) initially proposed that, in order to help, infants must "understand the other's unachieved goal and possess the altruistic motivation to act on behalf of the other" (2007, p. 271) and that "reciprocity, reputation, and social norms - do not seem to kick in until after children have been practicing their natural altruism […] for a few years" (2009a, p. 455). These rather strong assumptions about early helping were not shared by all researchers (e.g., Hay, 2009; Wynn, 2009) and led to a vivid debate and research in the field.

Outline of the synopsis

In this synopsis, I will outline how the empirical research in the last 10 years, including the empirical studies, which are part of my dissertation, advanced our understanding of the cognitive and motivational underpinnings of early helping behavior. I will start by defining and characterizing the phenomenon of early helping behavior as one specific domain of prosocial behavior. In the main part of this synopsis, inspired by Eisenberg's model on prosocial behavior (e.g., Eisenberg, Fabes, & Spinrad, 2006), I will organize recent empirical and theoretical works on infants early helping behavior along four general factors underlying the early ontogeny of helping behavior. These are socio-cognitive abilities, socialization experiences, the social situation, and anticipated consequences of early helping behavior. For each factor, I will review and discuss recent empirical findings and theoretical considerations on the contribution of these factors in the early ontogeny of helping behavior. This will include summaries of the empirical articles, which are part of this dissertation. I will further discuss the biological foundations of early helping behavior. That is, how helping others may be grounded in the human evolutionary history and which proximate biological mechanisms may form the basis for early helping behavior, laying the ground for the factors that influence early helping behavior. Finally, I will point out possible directions for future research.

A central debate that revolves around the study of early helping tendencies is the question if infants' early helping behavior is motivated altruistically or even an indicator for a human altruistic predisposition. I will discuss these possibilities in the light of the factors that influence early helping behavior and when indicating the evolutionary processes that lay the ground for our social human nature.

Characterizing early helping behavior

Helping as one domain of prosocial behavior

Helping behavior may be defined as any behavior that directly aims to support the goal achievement of another individual. Here, helping behavior is conceptualized as one domain of prosocial behavior, which further comprises the domains of sharing, comforting, and cooperation.

Prosocial behavior, in general, may be defined as any form of voluntary behavior that aims to benefit another individual and was traditionally viewed as a group of related behaviors, possibly motivated by a general prosocial disposition (Eisenberg et al., 2006). However, recent evidence suggests that the behaviors of the different domains are not correlated in infancy (as found for helping, sharing, and comforting; Dunfield & Kuhlmeier, 2013; Dunfield, Kuhlmeier, O'Connell, & Kelley, 2011) and that the behaviors of the different domains follow different developmental trajectories. Namely, helping develops before comforting behavior in the second year (Svetlova, Nichols, & Brownell, 2010). Furthermore, there are first hints that different domains of prosocial behavior may have different neuronal correlates (Paulus, Kühn-Popp, Licata, Sodian, & Meinhardt, 2013). Based on these differences, it was suggested that the domains may differ in the socio-cognitive abilities required to identify the need of the other individual (Dunfield et al., 2013) and that different types of motivations may guide prosocial behaviors in these domains (Paulus, 2014). However, it is noteworthy that it may likewise be that similar helping behaviors are motivated

differently, for example, in children from different cultural contexts (Köster, Cavalcante, Carvalho, Resende, & Kärtner, in press).

As indicated above, helping behavior may be specified as any behavior that aims to fulfill the instrumental need of another individual. As substantiated by the results of the studies that comprise my dissertation, infants are able to understand others' instrumental needs (Köster et al., 2016) and orient their helping behavior at others' needs (Köster, Itakura, & Kärtner, submitted). The motivational processes that may underlie early helping behavior will be discussed throughout this synopsis.

Another often studied domain of early prosocial behavior is comforting, that is, any behavior that aims to fulfill an emotional need, for example, to alleviate a negative emotional state (Hoffman, 1982). In a classical task (Bischof-Köhler, 2012), an experimenter simulates distress after breaking her toy accidentally. From about 18 months on, infants toddle over to comfort her or help instrumentally, for example, by caressing the experimenter or passing over an alternative toy. One central motivation thought to underlie early comforting behavior is empathy, the vicariously felt emotional state of another person with the ability to locate the emotional state in the other person (Bischof-Köhler, 2012; Hoffman, 1982), possibly due to an emerging self-concept, measured by mirror self-recognition (Bischof-Köhler, 2012: but see Kärtner, Keller, Chaudhary, & Yovsi, 2010). In contrast to situations affording comforting, in tasks assessing instrumental help, there is no expression of an emotional state. Therefore, empathy is not further discussed in this synopsis.

Sharing resources with others is putatively driven by the identification of a material need or desire of the other (Dunfield & Kuhlmeier, 2013). It is assumed that normativity may play a critical role in the ontogeny of sharing behavior, such as a sense of fairness (see for example, House et al., 2013). This idea is supported by findings that, throughout childhood, sharing behavior follows very different developmental trajectories across cultures (House et

al., 2013; Rochat et al., 2009; Schäfer, Haun, & Tomasello, 2015), presumably due to culture-specific fairness norms.

Collaboration differs somewhat from other forms of prosocial behavior. It is characterized by a joint engagement towards a shared goal (Tomasello, Carpenter, Call, Behne, & Moll, 2005). Here, the need of the other is not necessarily distinct from one's own need[1]. In particular, Tomasello and colleagues (2005) proposed that collaborative activity is characterized by a shared goal, a joint intention, and a commitment to the complementary roles in a collaborative engagement. The authors assume that collaboration is based on a species unique motivation to share psychological states with another individual.

Measurements of early helping behavior

As outlined above, in the laboratory, helping can be measured by providing infants with the opportunity to engage in simulated chores (Rheingold, 1982), in out-of-reach situations (Warneken & Tomasello, 2006, 2007) or in an informative pointing task (Liszkowski et al., 2008). Warneken and Tomasello (2006) further developed more complex scenarios, in which the experimenter makes unsuccessful attempts to complete an action goal, for example, a book slipping away when putting it on a stack (wrong result), or a wrong action plan, for example, grasping in a small opening to retrieve an object out of a box, ignorant of a large flap at the side of the box (wrong means). In these examples, it is then observed, if the infant completes the action for the experimenter (wrong result) or whether the infant directs attention of the experimenter to the flap (wrong means). Buttelmann and colleagues (2009) even used a task in which infants had to take into consideration another individual's false belief, to help appropriately, which they did from 18 months of age.

Developmental psychologists do often not consider anthropological studies that observe and quantify the helpful engagement of young children in subsistence-based

[1] Note that collaboration may thus not be considered a type of prosocial behavior, as defined above, namely a behavior that aims to benefit another individual.

communities, and their counterparts in urban industrialized contexts (e.g., Whiting & Edwards, 1992; Ochs & Izquierdo, 2009). However, recently psychologists rediscovered the value of naturalistic observations to understand the ontogeny of early helping behavior (e.g., Dahl, 2015). These studies will be outlined in the section on socialization. Here, it should be noted that it is important to complement laboratory studies with ethological approaches. First, this enables psychologists to test their ecological commitments, the implicit assumptions that researchers make about the world out of the laboratory, such as situations in which infants usually help others (Dahl, submitted). Second, ethological approaches allow researchers to identify the behaviors to look at in the laboratory, when designing experimental studies (Dahl, submitted; Köster, Schuhmacher, & Kärtner, 2015).

Out-of-reach tasks may be particularly well suited to investigate the contribution and interplay of different factors that motivate early helping behavior (as outlined in the next section). This is, because infants' helping in out-of-reach tasks is a very robust phenomenon (e.g., Warneken & Tomasello, 2013) that was tested and found in the first year in a series of different cultural contexts (Callaghan et al., 2011; Giner Torréns, Kärtner, & Chaudhary, under review; Köster et al., in press), and also out of the laboratory in a home setting (Köster et al., in press). Furthermore, socio-cognitively, infants are able to understand the unachieved goal structure of out-of-reach situations in their first year already, before they start to help (outlined below; Köster et al., 2016). Thus, helping in these situations may not be confounded with problem-solving abilities, which are necessary to identify the need of the other in a certain situation in more complex tasks (e.g., Warneken & Tomasello, 2006). Therefore, out-of-reach tasks are a good candidate for a litmus test of early helping.

Factors that influence helping behavior

I will now get back to the initial question of how infants perceive[2] situations in which other individuals are in need for help, including their own role as a helper (cognitive underpinnings), and what motivates them to act helpfully in these situations (motivational underpinnings). Here, infants' motivation to engage helpfully in a certain situation is inseparably linked to how they perceive a situation affording help and their own role in this situation. For example, when a person reaches out for an object unsuccessfully, infants may identify the need of the other individual and furthermore be aware of their own ability to help. In addition, they may even be aware that helping in this situation is a praiseworthy act. In this way, the perception of a situation affording help critically contributes to infants' motivation to help in a certain situation. Note that this basic idea and the factors outlined below are inspired by Eisenberg's model of prosocial behavior (e.g., Eisenberg et al., 2006).

I will now review the research on influences on early helping behavior of the last years and organize the factors that influence infants' early helping behavior along four more general factors, with good evidence that each of these factors contributes to infants' early motivation to help. These four factors are infants' socio-cognitive functions (e.g., understanding others' needs and the own role as a helper), the socialization within the cultural context (e.g., culture-specific socialization experiences), the social situation (e.g., characteristics of and former experiences with the recipient), and anticipated consequences of helping (e.g., being praised or thanked). It is assumed that early helping behavior emerges from the developmental changes in these factors with infants' age, such as the maturation of socio-cognitive functions or qualitative changes in parental behavior.

---

[2] Here I use the term *perception*, and not *interpretation*, to refer to infants' cognitive processes, because I conceptualize infants understanding of a situation affording help (and their own role in the situations) as a constructive process, to which the factors outlined in this synopsis (see below) contribute mainly implicitly, this means, without an explicit awareness of these factors or an explicit deliberation process, in particular in infancy. This concept of perception also includes that infants attend to a certain situation and can assess all relevant information with their senses, which will be presumed throughout this synopsis.

The organization of influences on early helping behavior along four general factors aims to emphasize the complexity of the phenomenon of early helping and to highlight, which main aspects have to be considered when trying to understand the cognitive and motivational underpinnings of early helping behavior. In this way, these factors should be understood as a heuristic to better understand infants' motivation to help in a certain situation. However, there are certainly strong interdependencies between the factors, some influences on early helping cut across more than one key factor, and there may be additional factors that influence early helping tendencies. Furthermore, the socialization within the cultural context may mainly operate via the other factors but are here discussed separately because there was a general debate whether socialization influences early helping tendencies, or not.

Socio-cognitive functions

Do infants understand that other individuals are in need when they are unable to achieve a certain goal and when do infants become aware of their own competencies to help in a certain situation? As outlined in this section, the empirical works, which are part of my dissertation, suggest that infants understand the instrumental needs of other individuals already some months before their first birthday (Köster et al., 2016) and that they orient their helping behavior at others' needs, shortly after the emergence of the required motor abilities and their social interaction skills (Köster et al., submitted). Finally, it will be discussed how infants' novel motor abilities, that emerge around the first birthday, may support their perception of their own potential role as a helper, or at least an awareness of their own motor abilities to help. Because infants' motor abilities are considered with respect to their psychological consequences, they are not further discussed as a (rather trivial) biological factor.

As outlined previously, a critical precondition for early helping behavior to be prosocial is that infants orient their helping behavior at others' needs. That is, helping is aimed to fulfill another individual's unachieved goal. Paulus (2015) summarized two

alternative interpretations about infants' early helping behavior in out-of-reach situations, namely goal-alignment models and social interaction models.

First, according to goal-alignment models, early helping may be motivated by an "urge" to complete an unfulfilled action goal, when confronted with an ostensive grasping cue. In particular, Kenward and Gredebäck (2013) argued, on the basis of low rates of helping for non-human agents, that direct-matching processes between the individual in need and the infant may be critical for early helping because they allow infants to align the own goal with the goal of the other (see the discussion in Kenward & Gredebäck, 2013). A similar proposal was made by Kärtner and colleagues (2010) as an alternative mechanism underlying comforting behavior, because there was no correlation between mirror-self recognition and comforting behavior in infants from New Delhi, India. In situations affording the reparation or replacement of a broken toy, infants may form an intentional relation with the other person, that is, matching their mental state with the mental state of another individual when engaging in the same situation (Barresi & Moore, 1996; cf. Kärtner et al., 2010). In this sense, the contagion with the goal of the other could lead to an urge to complete an initiated action.

Second, according to social interaction models, infants' helping behavior could mainly be driven by an interest in the other's activity and the opportunity to socially interact with the other person (Carpendale, Kettner, & Audet, 2014). This idea is, for example, supported by the finding that priming infants with affiliative pictures increases subsequent helping rates (Over & Carpenter, 2009).

Importantly, both models would not require that infants understand and orient their behavior at another individual's need. Here, the critical question is, when do the socio-cognitive prerequisites for an understanding of others' needs develop? Furthermore, are infants aware of others' needs, that is, their unachieved goals, when they begin to help others? Infants first understand the goal-directedness of animate actions from six months on (Woodward, 1998): They expect that human hands (but not inanimate objects, such as garden

tools) reach towards a toy they just reached before, instead of reaching towards a location they reached for previously. From early on, infants use their understanding of goal-directed actions to evaluate other individuals (Hamlin, Wynn, & Bloom, 2007): Already 6-month-olds prefer individuals that support goal-directed actions of others (helpers), for example, helping another individual to get up a hill, over those that prevent others' goal-directed actions (hinderers), for example, preventing another individual from getting up a hill. Furthermore, infants understand the intentions underlying goal-directed behaviors around their ninth month (Behne, Carpenter, Call, & Tomasello, 2005; Woodward, 1999). For example, 9- to 18-month-olds, but not 6-month-olds, show more impatience if an individual is unwilling to pass over a desired object, compared to a condition in which an individual is unable to pass over a desired object due to an obstacle (Behne et al., 2005). Thus, around their ninth month infants understand that other individuals pursue goals and the structure of intentional actions (also see Tomasello et al., 2005). However, do infants also understand that other individuals are in need, when they are not able to achieve an intended action goal on their own, for example, due to an obstacle in out-of-reach situations?

Study 1: Infants understand others' needs. Based on these considerations, the first study of this dissertation (Köster et al., 2016) investigated at what age infants begin to understand that other individuals are in need. Furthermore, we tested how their understanding of others' needs would be related to the emergence of early helping behavior.

To disentangle the alternative interpretations outlined above, we used an eye-tracking paradigm to test infants' understanding of others' needs (see Figure 3). Participants were 71 infants between 9 and 18 months, divided into three age groups. A character being unable to reach a ball due to an obstacle (character in need) was presented along with a character being able to reach a ball on its own (character not in need). When a helper leaned forward, we tested whether infants would first look at the needy character (i.e., anticipatory looking), indicating the anticipated action of the helper. Thereafter, the helper gave the ball either to the

character in need or the other character, not requiring help (i.e., violation of expectation), to further test whether infants would expect help towards the needy character. This design controls for common alternative interpretations of behavioral studies, because in the experimentally relevant phases, both characters did not complete an action (goal-alignment model) and provided the helper with the opportunity to interact socially (social interaction model). Infants' gaze behavior was also assessed in a non-social control trial, which was identical to the experimental trials, except for the variation that we used geometric shapes without arms and legs and that the shapes did not enter into the scene like the characters. This was to avoid an intentional interpretation (see Figure 3). Furthermore, infants' helping behavior was tested in two out-of-reach tasks, namely a paper ball task (but with cups instead of paper balls) and a cup task (for examples see Figure 1).

Interestingly, we found that infants understood others' needs, across all age groups. Namely, infants expected that the helper would pass the ball to the character in need and they were surprised when the helper gave the ball to the other character instead. This was indicated by main effects in the anticipatory looking phase (i.e., higher number of anticipatory gazes to the character in need) and the violation of expectation phases (i.e., longer looking times when the helper helped the other character, not in need), and no interaction of these effects with age. No significant effects were found in the control trials. Infants showed an increase in helping behavior in the out-of-reach tasks from about 11% in 9- to 11-month-olds to about 70% in 15- to 18-month-olds. However, infants' understanding of others' needs did not correlate with their actual helping behavior. Thus, infants understood others' needs already in their first year, before they started to reliably help the experimenter themselves.

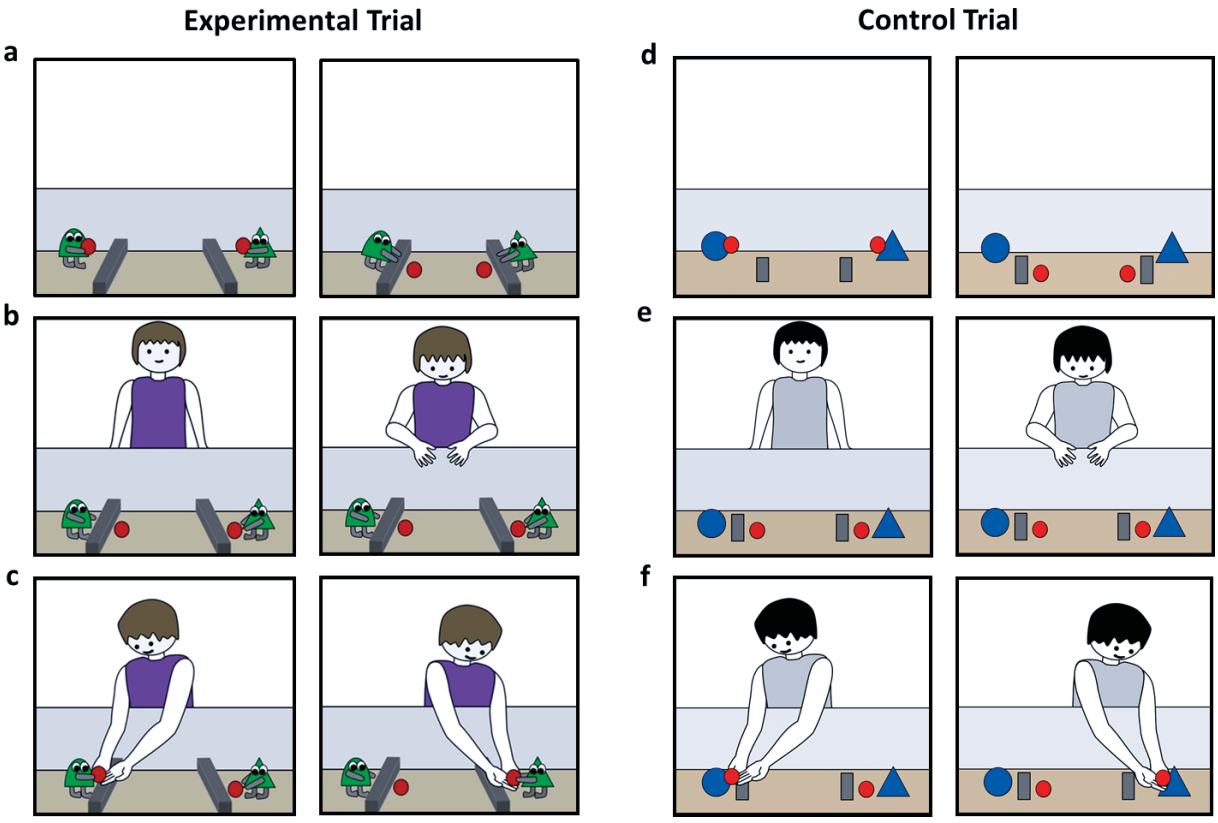

Figure 3. Sample picture stories for the experimental trials and the control trial that were used to assess infants' understanding of others' needs. In the familiarization phase of the experimental trials (a), two characters entered the scene, picked up the balls in front of them, and played with them, jumping up and down, and the scene faded out (a, left). The characters then entered the scene for the second time. This time, both balls were placed behind obstacles, and the characters reached out for them unsuccessfully, and the scene faded out (a, right). Before the characters entered the scene again, a helper appeared in the background (b, left). This time, an obstacle prevented one character (character in need) from reaching the ball, but the other character (character not in need) was able to reach the ball. In the anticipatory-looking phase (b, right), the helper looked to both sides and then leaned over to engage in the scene. The scene then paused to provoke anticipatory-looking behavior. For the violation-of-expectation phase (c), in half of the trials, the helper helped the character in need (expected condition; c, left); in the other half of the trials, the helper helped the other character, who was able to reach the ball on their own (unexpected condition; c, right). In the control trials (d-f), the shapes, the general configuration of the scene, and the helper's behavior resembled those used in the experimental trials. In contrast to the experimental trials, the shapes did not have arms, legs, or googly eyes. The shapes did not enter the scene and move toward the balls, as they did in the experimental condition. These changes were made to avoid the interpretation that the shapes had an intention. Finally, the helper's behavior was identical to that in the anticipatory-looking phase (e, left) and the violation-of-expectation phase (f) of the experimental trials. Infants' gaze behavior was recorded with an eye-tracker. Infants saw a total of six picture stories that varied in the color and shape of the characters and were counterbalanced for several aspects (see Köster et al., 2016, Figure 1). One non-social control trial was always shown before the experimental trials. (cf. Köster et al., 2016).

To conclude, infants possess an understanding of others' needs already in their first year, and thereby have an essential cognitive prerequisite to orient their helping behavior at others' needs to benefit the other, at the beginning of their second year. However, indicating

that infants understand others' needs already in their first year, and that it was not related to infants' early helping behavior, the present findings raise the question for further developmental attainments that underlie the emergence of helping behavior that may link their early prosocial understanding to their actual prosocial behavior at the beginning of the second year.

Noteworthy, when helping situations become more complex, it becomes more difficult to identify the need of the other individual and situations require further socio-cognitive and problem-solving abilities to identify the need. For example, identifying the functioning of an apparatus in a wrong means situation (Warneken & Tomasello, 2006) or even a false belief understanding (Buttelmann et al., 2009).

Study 2: From thinking to acting prosocial: Infants help to benefit others. Based on this first study of my dissertation (Köster et al., 2016), we proposed that the tremendous motor developments that occur around the first birthday (e.g., Adolph & Tamis-LeMonda, 2014) and the growing competencies to coordinate the behavior in social interactions around this age (Carpenter, Nagell, & Tomasello, 1998) are critical factors underlying the emergence of infants' helping behavior. This proposal is based on studies that indicate an increase in object related interactions associated with the transition from crawling to walking, at the beginning of the first year (Clearfield, 2011; Karasik, Tamis-LeMonda, & Adolph, 2011; for a review, see Adolph & Tamis-LeMonda, 2014) and the important role of social interactions for early helping behavior (Barragan, & Dweck, 2014; Cirelli, Einarson, & Trainor, 2014a). If infants were motivated to benefit other individuals in need from early on, these skills would enable them to put their prosocial tendencies into action and should, in consequence, establish the link between their prosocial understanding and helping behavior.

To test this hypothesis, we assessed the understanding of others' needs in 10- and 16-month-old infants (n = 41 and n = 37) from an urban Japanese context in Kyoto, using the same eye-tracking paradigm as before (see Figure 3 and the descriptions above; cf. Köster et

al., 2016), but with longer still frames at the end of each trial (10s violation of expectation phase, instead of 3s), more control trials shown at the beginning of each session (four trials instead of one trial), and more experimental trials (eight trials instead of six trials). We further looked at infants' helping behavior in three behavioral tasks, namely a paper ball task, a cup task, and an informative pointing paradigm (see Figure 1). Here, the critical question was whether infants' motor abilities and social interaction skills are related to their early helping behavior and would moderate the relation between infants' prosocial understanding and helping behavior at the beginning of the second year when they begin to show reliable helping tendencies. Therefore, we assessed 16-month-olds' fine and gross motor abilities with age appropriate tasks of the Bayley scales (Bayley, 1993). In particular, we looked at how coordinated infants took apart Duplo bricks, put ten paper balls in a container, and which grip they used when holding a pen to draw (fine motor skills) as well as their abilities to stand up, to remain standing when they were put in stand, and to walk (gross motor skills). Additionally, we tested their social interaction skills when rolling a ball or a car back and forth with an experimenter (Mundy et al., 2003). For the main analyses, we aggregated the eye-tracking measures and the data from the behavioral task into one single score for each measure, in particular, understanding others' needs, helping behavior, fine motor skills, gross motor skills, and social interaction skills (see methods section in Köster et al., submitted).

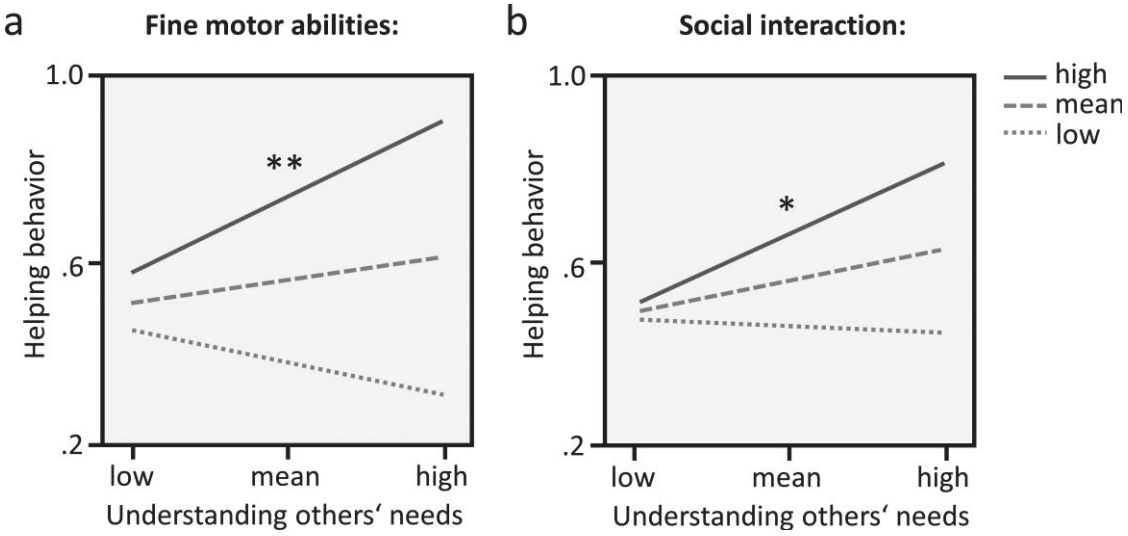

Figure 4. Simple slopes analyses of the moderation effects. The lines depict the conditional effects between infants' understanding of others' needs and their helping behavior at different levels of the moderators, namely infants' fine motor abilities (a) and social interaction skills (b). Levels of the moderator and infants' understanding of others' needs correspond to plus 1 *SD* (high), the mean, and minus 1 *SD* (low) of the scores that were entered into the regression models. Infants' understanding of others' needs was associated with their helping behavior at high levels of the moderator variables, * $p < .05$, ** $p < .01$. (cf. Köster et al., submitted)

The results provided further evidence that infants understand others' needs. This was indicated by a higher proportion of anticipatory gaze behavior on the character in need for 16-month-olds (but not for 10-month-olds) and longer looking times when the helper helped the character that did not require help, instead of the character in need, for both 10- and 16-month-olds. Thus, results were less clear for 10-month-olds than for the infants between 9 and 11 months in the previous study. However, in contrast to the previous study, we found a close correlation between both measures (anticipatory looking and violation of expectation) in both age groups, suggesting that both measures assess a similar construct at both ages. Infants only helped reliably at 16 months of age, where all three helping scores were correlated. Like in the first study, there was no direct relation between infants' understanding of others' needs and their helping behavior in the group of 16-month-olds. However, their helping behavior was closely correlated with their fine and gross motor abilities as well as their social engagement with the experimenter. Most importantly, we found that 16-month-olds' fine motor abilities and their social interaction skills moderated the relation between infants'

understanding of others needs and their helping behavior (see Figure 4). This indicates that their motor and social interaction skills enable them to put their understanding of others' needs into prosocial actions. Thus, infants orient their help at others' needs to benefit other individuals, as soon as they possess a certain level of motor coordination or social interaction abilities that allow them to engage helpfully in this situation.

Regarding infants' motor abilities, already Rheingold (1982) noted that infants' helping behaviors require an "awareness of themselves as actors" (p. 114). Thus, besides the mere competence to act helpfully, their emerging motor abilities may come with a novel awareness of themselves in their physical and social environment. This may include an awareness of their own competencies to engage helpfully in a certain situation. There is good evidence for perceptual changes that come with the ability to walk around the first birthday (action-perception coupling; Anderson et al., 2013). Walking upright literally provides them with a novel view on their physical and social world (Franchak, Kretch, Soska, & Adolph, 2011), such as illustrated for the case of infants' wariness of heights. That is, when infants first start walking, they would readily walk and fall down a steep cliff of 90cm (Adolph, 1997), which they would not go down in a crawling posture. The ontogenesis of infants' wariness of heights could be causally explained by the novel visual proprioception that comes with their upright mobility (Dahl et al., 2013). These perceptual changes are likely due to the relation between self-produced locomotion and contingent changes in visual proprioceptive experiences, namely the optical flow of the environment that comes with upright walking (Adolph & Tamis-LeMonda, 2014; Anderson et al., 2013). That self-produced locomotion also comes with qualitative changes in their interaction with their social environment is suggested by differences in the way infants bid objects to other people (Karasik et al., 2011) and an increase in bidding actions when compared to same-aged crawling infants in a baby walker (Clearfield, 2011). Similarly, infants' fine motor abilities may not only provide infants with novel abilities to haptically explore and perceive objects (Bushnell & Boudreau, 1993),

but are very likely to come with an awareness about the own abilities to manipulate or displace an object, such as, for example, shown by a better understanding of goal-directed actions in infants that comes with better abilities to perform goal-directed behaviors themselves (Kanakogi & Itakura, 2011). Thus, it may be suggested that infants' novel motor abilities come with a novel awareness of their potential role as a helper, or at least an implicit awareness about the own abilities to engage in a certain situation. In the present study, both gross and fine motor development correlated with infants' helping behavior, but only their fine motor abilities moderated between their prosocial understanding of others' needs and their helping behavior. This may be due to the specific affordances of the out-of-reach tasks, such as grasping and displacing an object. In these tasks, fine motor skills (and presumably an awareness about these competencies) are putatively more important to put neediness considerations into helpful actions.

Furthermore, we found that social interaction skills, namely rolling a ball or a car back and forth with the experimenter, correlated with infants' tendencies to help and also moderated between infants' prosocial understanding and their helping behavior. However, social interaction skills did not correlate with their fine and gross motor abilities, as expected based on former studies (Clearfield, 2011; Karasik et al., 2011). Here, it may be speculated that, because infants' dyadic engagement in turn-taking tasks emerges considerably earlier between nine and twelve months (Tomasello et al., 2005), it may not only reflect their social interaction skills but also their motivation to engage with the experimenter (Barragan, & Dweck, 2014).

To summarize, infants possess the socio-cognitive abilities to understand others' needs already in the first year and they orient their helping behavior at these needs. Importantly, the link between infants' prosocial understanding and their prosocial action is established by their motor and social interaction skills (or possibly also the motivation to engage with the other individual) that allow infants to put their prosocial thoughts into action. Infants' developing

motor skills possibly come with an awareness for their competencies to engage helpfully when others are in need for help.

That infants orient their helping behavior at others' needs is an essential precondition for early helping behavior to be prosocial (by the definition above). However, it remains an open question, if infants are intrinsically motivated to benefit the other individuals, which would be a further necessary condition of early helping to be motivated altruistically. In turn, it will be discussed which further factors may be involved in infants' motivation to help other individuals in need.

Socialization in the cultural context

Further critical questions include how socialization experiences influence early helping behavior and how their influence unfolds throughout the early ontogeny of helping behavior. Socialization has long been viewed as a central factor in the development of prosocial behavior in children (Hastings, Utendale, & Sullivan, 2007; Whiting & Edwards, 1992), for example, by anthropologists who observed very different forms of engagement of young children in household chores across cultures (Whiting & Edwards, 1992; for a more recent work see Ochs & Izquirdo, 2009). This view was challenged by Warneken and Tomasello's (2009a, 2009b) proposal that socialization does not play a critical role in early ontogeny of helping behavior. In support of their assumption, these authors found evidence that material reward did not reinforce, but even undermine helping rates in 20-month-olds, possibly due to an overjustification effect (Warneken & Tomasello, 2008) and that encouragement by a parent did not further increase helping behavior at the age of 24 months, when overall helping rates were already at a very high level (Warneken & Tomasello, 2013). However, accumulating empirical studies from the recent years document how socialization within the family and the cultural context influences infants' helping tendencies from early on.

In line with the idea that helping behavior develops in the social interaction within the family (social-interaction view; Dahl, 2015) and that helping emerges in children's participation in daily activities (Rheingold, 1982; Rogoff, 2003), it is assumed that socialization experiences influence infants' helping tendencies from early on (see also Köster et al., 2015). Hammond and Carpendale (2015) found that the more parents supported and encouraged their infants to help when cleaning up a picnic set together, the more infants helped an experimenter afterwards. Furthermore, Dahl (2015) observed parental and infants' behavior at home in three longitudinal sessions, when infants were 13-15, 19 and 24 months old. He found that the encouragement to help by family members in the first and second session, at 13-15 and 19 months, had positive effects on infants' helping in the subsequent sessions. Interestingly, he found that reinforcement by family members (praise or thanking) at 13-15 months was positively associated with infants' helping in the later sessions, but that reinforcement at 19 months had negative effects on helping behaviors shown at 24 months. This suggests critical time windows for specific socialization practices to be effective. In a subsequent laboratory study (Dahl et al., under review) infants between 13 and 15 months were more helpful after parents explicitly encouraged and praised infants in helping situations, compared to a control group, in which parents did not encourage their children. However, encouragement and praise were not effective in older children, who already helped at high rates, also without scaffolding. These findings provide compelling evidence that the socialization within the household and when completing simple chores influence the ontogeny of helping behavior from early on.

Culture-specific influences. Helping others may be conceptualized very differently in different cultural contexts. To give an example, Miller and colleagues (1990) found that Hindu Indians tended to frame help towards another person as a social responsibility, also in less severe, non-life-threatening situations, while European Americans tended to interpret helping in these situations as an issue of personal choice. Furthermore, in US-American folk

theories, helping behavior is only considered prosocial if it is shown deliberately, that is, based on personal choice or guided by a value that has personal significance (Miller & Bersoff, 1992).

From a developmental perspective, the intriguing question is how different meanings of helping behavior may translate into culture-specific parenting practices and how these, in turn, influence the ontogeny of helping behavior (see also Köster et al., 2015). However, developmental psychologists have only recently begun to investigate the ontogeny of early helping behavior across cultures. In a first study, Callaghan and colleagues (2011) compared infants' helping tendencies at 18 and 24 months in three cultural contexts (rural regions of Canada, India, and Peru) and found overall similar rates of helping behavior, but somewhat higher rates of helping in 24-month-old Canadian compared to Indian infants. A recent study by Giner, Kärtner and Chaudhary (under review) found that 18-month-olds from an urban Indian sample from Delhi helped at higher rates than their counterparts from an urban German context. Looking at mothers' socialization strategies, assessed by questionnaires, the authors found that mothers' punitive practices were high in the Hindu Indian sample and were positively correlated to infants' helping behavior, whereas punitive practices were relatively lower in Germany and correlated negatively with infants' helping. These findings are consistent with the high emphasis on interpersonal responsibilities found in Hindu Indians (Miller et al., 1990), which presumably lead to a stronger social regulation by the parents (Giner et al., under review). Furthermore, these findings suggest that culture-specific socialization practices influence infants' helping behavior, from its emergence in the second year.

Relational and autonomous developmental pathways. How may cross-cultural findings and approaches be systematized? Building on the ecosocial model of child development (Keller, 2007; Keller & Kärtner, 2013) and findings from anthropology, we hypothesized two developmental pathways towards prosocial behavior, namely for

autonomous and relational contexts used as prototypes[3] (Köster, Schuhmacher, & Kärtner, 2015). Culture may be defined as the shared beliefs (cultural meaning) and shared activities (cultural practices) that are assumed to have evolved as adaptations to different ecological and social environmental conditions (Keller, 2007). In particular, the ecosocial model of development describes two prototypical ecosocial contexts, which give rise to specific cultural models, comprising caregivers' ethnotheories, socialization goals, and parenting behavior. In turn, parental socialization practices are thought to explain cultural differences in child development from early on, as documented for the 2-month shift (Kärtner et al., 2008), attachment styles (Keller, 2013), and mirror self-recognition (Kärtner, Keller, Chaudhary, & Yovsi, 2012). Here, the ecosocial model of child development (Keller 2007; Keller & Kärtner, 2013) is used as a heuristic to interpret cultural variations in the meaning and socialization of helping behavior and is proposed as a theoretical framework, to further investigate cultural influences on early helping behavior.

The prototype of relational ecosocial contexts are subsistence-based farming ecologies in non-Western societies with extended family systems and low levels of formal education. Caregivers show a high emphasis on socialization goals associated with hierarchical relatedness, such as respect, obedience, and taking on responsibilities associated with social roles (Kärtner et al., 2008; Keller, 2007). In ecologies close to this prototype, children were reported to engage in daily tasks from early on (Nsamenang, 1992), were assigned more responsible tasks as they got older, such as sibling care (Whiting & Edwards, 1992) and were involved in domestic work (Ochs & Izquierdo, 2009). High levels of compliance with parental commands in these contexts (Keller et al., 2004) possibly indicate the internalization of social

[3] Beyond the two prototypical ecosocial contexts described here, there are certainly many other ecosocial contexts that give rise to very different cultural models. To give one example, one other often-studied context is educated urban middle-class families from a non-Western society. In these contexts, cultural models are often composed of elements of both prototypes described here and are thus referred to as autonomous-relational (Kağitçibaşi,, 2007; Keller, 2007).

norms (Ogunnaike & Houser, 2002). Based on these considerations, we assumed that in relational cultural contexts, helping others is conceptualized as an interpersonal responsibility.

Prototypical autonomous ecosocial contexts are urban middle-class families in Western societies that live as nuclear families and have high levels of formal education. Here, caregivers emphasize socialization goals associated with psychological autonomy, such as individuality, independence, and personal choice (Kärtner et al., 2008; Keller, 2007). In these contexts, the value of children is rather psychological than economic (cf. Trommsdorff & Nauck, 2005). An early involvement in household chores and taking over responsibilities are of lower significance in Western urban middle-class samples (Ochs & Izquierdo, 2009; Whiting & Edwards, 1992). First empirical evidence for the meaning and interpretation of situations in which others are in need in Western societies came from the studies by Miller and colleagues (1990) mentioned above. These findings indicate that people from autonomous cultural contexts may conceptualize helping others as a matter of personal choice, in most situations.

In accordance with the ecosocial model of child development, different conceptions of helping others, namely as interpersonal responsibility or personal choice, may translate into different parental socialization practices and thereby influence infants' understanding of helping others from early on.

Study 3: Cultural influences on toddlers' prosocial behavior: How maternal task assignment relates to helping others. In the third study of my dissertation (Köster et al., in press), we systematically investigated how mothers in three different cultural contexts assign tasks to their children and how this would relate to requested behavior and helping behavior of 18- to 30-month-old toddlers[4]. Based on the proposal of relational and autonomous developmental pathways, we assessed 107 mother-child dyads from three prototypical cultural

[4] Note that the term toddler will be used in the description of this study, because the age of the children ranged up to 30 months.

contexts. These were rural villages in the Brazilian Amazon region near Belém (relational context), an urban sample from Münster, Germany, (autonomous context) and an urban sample from São Paulo in Brazil (autonomous-relational context). To keep this synopsis concise, the results from the São Paulo sample will not be reported and discussed (for details see Köster et al., in press). During one home visit, maternal scaffolding during task assignment and completion was assessed in a standardized situation, that was, asking the toddler to put a pen and a cup on a table. Furthermore, we evaluated toddlers' requested behavior in the same task and toddlers' helping behavior towards an experimenter who reached out for three clothespins, which she formerly dropped on a ground and could not reach in a second task.

We hypothesized that, first, the cultural background informs maternal scaffolding during the assignment of daily tasks and, second, that culture-specific scaffolding styles influence infants' helping tendencies from early on. Based on the considerations above, we predicted that mothers in relational cultural contexts emphasize toddlers' interpersonal responsibility by assigning tasks in a serious and insistent manner (assertive scaffolding). We further predicted that mothers in autonomous cultural contexts emphasize toddlers' autonomy and personal choice by asking, pleading, and providing explanations when assigning tasks (deliberate scaffolding). We assumed that culture-specific maternal scaffolding strategies would influence toddlers' helping behavior towards the experimenter. Furthermore, due to the theoretical link between a child's responsiveness to parental requests and their prosocial development in relational contexts, toddlers' requested behavior was expected to mediate the relation between maternal scaffolding and toddlers' helping in villages near Belém.

In line with these hypotheses, maternal scaffolding during task assignment differed between cultural contexts and was related to toddlers' requested behavior and helping behavior in culture-specific ways (see Figure 5). Brazilian mothers showed higher levels of assertive scaffolding than German mothers, while German mothers employed deliberate

scaffolding strategies more often than Brazilian mothers. Deliberate socialization practices were almost absent in Belém. With regard to infants' responsive behavior in the immediate situation, assertive scaffolding practices related to toddlers' requested behavior in all three samples. Importantly, assertive scaffolding was associated with toddlers' helping in rural Brazil, while mothers' deliberate scaffolding related to toddlers' helping behavior in urban Germany. Although infants' requested behavior did not mediate between maternal assertive scaffolding and infants' helping significantly, there was a close association between the three measures in villages near Belém.

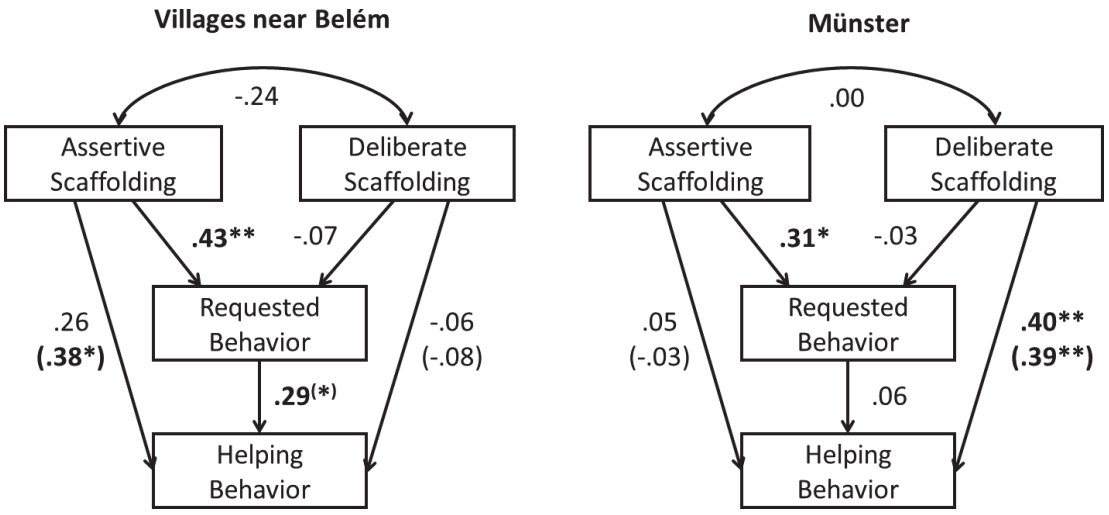

Figure 5. Path analyses of maternal scaffolding styles and toddlers' requested behavior and helping behavior. Paths are labeled with standardized direct β and total effects β_{tot} in parentheses. Relevant regression weights are bold faced. Dependent variables are tagged with the corresponding squared multiple correlation coefficient R^2. Note that standardized residuals, controlled for age and gender, were used for all variables and error terms were included for the dependent variables. $^{(*)}$ $p < .10$, * $p < .05$, ** $p < .01$. (modified from Köster et al., in press)

Overall, these findings support our assumption that socialization practices influence toddlers' tendency to help others from early on and suggest culture-specific developmental pathways underlying early helping behavior. In particular, our findings indicate that, more generally, across cultures, serious and insistent requesting motivates toddlers' behavior in

situations in which mothers assign tasks directly. Furthermore, toddlers' motivation to help, that is, being responsive to others' needs outside the direct mother-child interaction, depends on the way caregivers structure the assignment of simple chores, primarily as an obligation or personal choice. Embedding the present findings into a broader context, the moderating role of culture may be understood in terms of the different social norms and self-concepts in autonomous and relational ecosocial contexts (Keller, 2007). These may guide the social interactions of caregivers and children in a variety of situations and thus lead to culture-specific relations between maternal socialization strategies and toddlers' social development. In particular, maternal assertive scaffolding may affect toddlers' helping behavior in relational contexts, where toddlers' hierarchical status and social responsibility are emphasized in social interactions due to a relational conceptualization of the self. However, this may not be the case in autonomous contexts, where the caregivers emphasize individual needs and a development towards taking own decisions due to an autonomous self-concept.

Taken together, the way mothers' and family members' scaffold infants' social responsiveness plays a significant role in the ontogeny of early helping, also when manipulated experimentally. This indicates an essential role of socialization processes in infants' emerging helpful acts at the beginning of the first year. Furthermore, mothers socialize their children differently in different cultural contexts and influence infants' helping behavior in culture-specific ways, which may be the basis for the transmission of culture-specific meanings underlying early helping behavior, including the own role as a helper, such as being responsible to help in a situation or having the personal choice to provide help. Thus, similar helping acts may be motivated differently in different cultural contexts.

Situational Influences

I included influences of the social situation on early helping and anticipated consequences (see next section), which were not a subject of investigation in my dissertation. This is because they complement the overall picture of the cognitive and motivational

underpinnings of early helping behavior. Regarding situational influences, helping always occurs in a social context, including the individual in need and further people in the situation, which could evaluate the infant or also engage helpfully in place of the child. The social situation will be in the focus here. The structure of the specific problem that the helpee encounters is discussed above, with regard to the socio-cognitive abilities required to identify the need of another individual in a certain situation.

Recent findings highlight the important role of former social interactions with the recipient of help. For example, Barragan and Dweck (2014) found that simple reciprocal play interactions, such as rolling a ball back and forth between the infant and the experimenter, had a profound impact on subsequent helping tendencies in 1- and 2-year-olds. Namely, helping rates were about double as high, when compared to a control condition, in which the infant and experimenter played in parallel, without exchanging the ball. This effect also transferred to other recipients of help. Likewise, we found in our study (Köster et al., submitted) that former social interactions with the experimenter were associated with higher helping rates at 16 months of age. Additionally, works by Cirelli and colleagues further indicate that 14-month-olds' helping towards an experimenter was increased after synchronous rhythmic bouncing of the experimenter and the infant (held by a second experimenter), compared to a control condition, in which experimenter and infant moved asynchronously (Cirelli, Einarson, & Trainor, 2014a). Contrary to the findings by Barragan and Dweck (2014), this manipulation did not affect helping behavior towards a second experimenter, who did not bounce with the baby previously, in a subsequent study (Cirelli, Wan, & Trainor, 2014b). In another study, 18-month-olds that were mimicked by an experimenter showed more helping towards this experimenter but also to another person (Carpenter, Uebel, & Tomasello, 2013). Furthermore, infants at 21 months of age were more willing to help someone who gave them a toy or was willing to pass them a toy compared to an individual that did not give them a toy or was unwilling to do so (Dunfield & Kuhlmeier, 2010). Thus, simple dyadic interactions,

synchronous movements with the experimenter and, possibly, reciprocity considerations motivate early helping behavior. More generally, the motivation to relate to others, or to strengthen a bond with interaction partners, may motivate early helping behavior. In line with this view, Over and Carpenter (2009) found that priming 18-month-olds with photographs evoking affiliation led to increases in infants' helping behavior.

Besides former social interactions, some further characteristics of the recipient of help were investigated in infancy. For example, testing whether 16- to 27-month-old infants would rather help an antisocial or a prosocial individual (i.e., taking a ball from another person or giving a ball), Dahl, Schuck, and Campos (2013) found that helping behavior was selectively delivered to the prosocial individual, but only in the oldest age group, around 26 months of age. Furthermore, infants at 18 months of age helped at high rates, even if the recipient was anonymous or not even present (Hepach, Haberl, Lambert, & Tomasello, 2016). Somewhat later in the preschool years, at three years of age, it was found that children selectively avoid helping a stranger who harmed other individuals (Vaish, Charpenter, & Tomasello, 2010). In their fifth year, children helped at higher rates when the recipient belonged to the same group (Plötner, Over, Carpenter, & Tomasello, 2015).

Regarding other people in the room, no effect was found in the second year, comparing conditions in which a mother was present or not (Warneken & Tomasello, 2013). At about five years of age infants helped more, when someone was watching them (e.g., Engelmann, Herrmann, & Tomasello, 2012), and showed a bystander effect, when two further individuals were also able to help (Plötner et al., 2015).

Taken together, although it was formerly recognized that helping becomes more and more selective in the preschool years (Hay & Cook, 2007), recent findings suggest that infants' tendencies to help another individual in a certain situation can be pretty selective from early on. In particular, subtle variations in recent social interaction experiences can critically influence early helping behavior. Infants seem to be particularly motivated to help

others after reciprocal or synchronous interactions, possibly motivated by a need to affiliate or strengthen social bonds with others. However, in the second year, there is not much evidence that further characteristics of the helpee or the presence of other people in the room do play a critical role.

Anticipated consequences of early helping behavior

Given that infants understand instrumental needs of others in terms of their unachieved goal (Köster et al., 2016), infants most likely anticipate that their helping behavior will fulfill the goal of the other individual. In this section, I will discuss positive consequences helping behavior may have for the helper, for example, praise or positive experiences elicited by (former) helpful actions. These could reinforce and thereby motivate and stabilize early helping behavior. Here, I will discuss extrinsic consequences and intrinsic (psychological or physiological) consequences that may come with early helpful acts.

With regard to extrinsic consequences, there is a debate whether helping behavior may be reinforced in the social context, for example, by rewards, by reciprocation, or possibly an increase in reputation. How reinforcement in the social context influences subsequent helping behavior is discussed in detail as a socialization process (see above). Most importantly, reinforcement by the parents (e.g., praise after helping) had positive effects on subsequent helping behavior in 13- to 15-month-olds (Dahl, 2015; Dahl et al., under review), but not in about 20-month-olds. At this age, helping tendencies were even found to be undermined by material reinforcement (Warneken & Tomasello, 2008). Regarding reciprocity considerations, infants were more willing to give something to someone who was previously willing to give something to them (Dunfield & Kuhlmeier, 2010). However, to the best of my knowledge, there has been no study that directly tested how the reciprocation of helping acts may reinforce subsequent helping behavior in infants. Furthermore, I am not aware of any study that investigated the consequences with regard to reputation, although praise by the parents may be seen as a proximate indicator for a gain in reputation.

Intrinsic factors may include positive affect, elicited by seeing others' needs fulfilled (Hepach, Vaish, Grossmann, & Tomasello, in press; Hepach, Vaish, & Tomasello, 2012), a fulfilled need to affiliate with others (Over & Carpenter, 2009) or also an experience of self-efficacy elicited by helping (discussed as a general motivational factor; e.g., Heckhausen & Heckhausen, 2006). Previous studies primarily looked at the physiological consequences of situations when infants helped others, themselves, or observed others being helped in an out-of-reach task, as measured by infants' pupil dilation, indexing infants' sympathetic arousal (Hepach et al., 2012). These authors found that two-year-old infants want to see others being helped, irrespective of whether they helped themselves or the help was delivered by a third person. This was indicated by a decrease in pupil size, indicating decreased sympathetic arousal, after the recipient received help in both conditions, compared to a control condition in which the recipient did not achieve her goal. In a second study, the authors added further control conditions to rule out that infants' arousal was due to the need of the recipient, but not due to things being out of order, after an object fell down (Hepach et al., 2015). Here, the decrease in sympathetic arousal is viewed as a positive consequence, namely a "relief of tension" that is elicited by the need of another individual. However, the increase in sympathetic arousal when observing another individual in need may likewise be viewed as a motivating factor (i.e., psychological engagement in the situation; Hepach et al., 2015) that leads to helping behavior. This idea is supported by the finding that higher levels of arousal were associated with faster helping responses (Hepach et al., 2015) and will be discussed in more detail in the next section, as a proximal biological mechanism that motivates helping. There is first evidence that giving others something they desire may elicit positive emotional states in the giver. This was indicated by the positive emotions, measured in facial expressions, after 22-month-olds have had given a found treat to another individual (Aknin, Hamlin, & Dunn, 2012). In their experiment, the positive emotions elicited by own giving

actions exceeded the positive emotions that were elicited when another person gave treats to this individual or when the infant received the treats for themselves.

Taken together, it seems that helping might be reinforced extrinsically by reactions of close others, with the best evidence for reinforcement by family members in the beginning of the first year. Intrinsically, positive emotions that possibly come with helping others and the relief from an aroused state when helping others (or seeing others being helped) may influence infants' early helping tendencies. These factors may motivate and stabilize early helping behavior.

Helping behavior as a complex phenomenon

Thus far, I reviewed recent empirical findings, which underline that several factors significantly contribute to infants' early tendency to help others in a certain situation. I will now summarize these factors and conclude that the emergence of early helping behavior may only be fully understood, considering the synergetic interplay between these factors and which conclusions may be drawn for infants' motivation to help others.

First, human infants' socio-cognitive abilities allow them to understand others' needs, if other individuals are not able to achieve a goal due to an obstacle (Köster et al, 2016), at the end of their first year. They furthermore direct their helpful acts towards others' needs, as soon as the required motor repertoire and the motivation to engage in social interactions with the experimenter are in place (Köster et al., in press), at the beginning of their second year. In addition to the mere competence to act helpfully, infants' developing motor skills around the first birthday presumably come with an awareness for their competencies to engage in their physical and social environment (Anderson et al., 2013), such as bidding objects to others (Clearfield, 2011, Karasik, 2011), and thus with an, at least implicit, awareness of the own ability to help in a certain situation. To understand whether infants are intrinsically motivated to benefit others, it is worth looking at further factors that influence infants' motivation to help.

Second, there is now compelling evidence that mothers' and family members' scaffolding of helping occasions plays a significant role in the early ontogeny of helping behavior (Dahl, 2015; Hammond & Carpendale, 2015), also when manipulated experimentally (Dahl, under review). Furthermore, there seem to be particular time windows, when specific parental practices are effective (Dahl, 2015). Mothers socialize their children differently in different cultural contexts, which influences infants' helping behavior in culture-specific ways (Giner et al., under review; Köster et al., in press). How helping occasions are structured is seen as an important context for the transmission of culture-specific meanings underlying early helping behavior (Köster et al., 2015). For example, depending on culture-specific socialization experiences, infants may perceive their own help in a situation as a matter of interpersonal responsibility or a matter of personal choice (Köster et al., in press).

Third, regarding the social context in which helping behavior occurs, recent findings suggest that infants' tendencies to help another individual may critically depend on subtle variations in social interaction experiences: Infants are much more likely to help another individual in an out-of-reach situation after they rolled a ball back and forth with them (Barragan & Dweck, 2015; Köster et al., submitted) or after they bounced up and down with them in synchrony (Cirelli et al., 2014a, 2014b). Furthermore, priming infants with affiliation increased helping rates (Over & Carpenter, 2009). This indicates that early helping behavior is facilitated by a motivation to stabilize relations with social interaction partners, possibly driven by a more general motivation to affiliate with others.

Fourth, helping might be reinforced extrinsically by reactions of the social environment, with the best evidence for praise and thanking by family members (Dahl, 2015; Dahl et al., under review), in the first months of the second year. Intrinsically, positive emotions, such as the relief from an aroused state, elicited by helping others (or seeing others

being helped, Hepach et al., 2012) and possibly also the positive emotions elicited by giving actions (Aknin et al., 2012) may motivate and stabilize helping behavior.

Overall, the different factors that may contribute to infants' motivation to help in a certain situation illustrate that early helping may be best understood as a complex phenomenon that emerges from the interplay between these factors. For instance, this is illustrated by the interplay of infants' understanding of others needs with their motor abilities and their social engagement with the experimenter in the ontogeny of infants' helping tendencies (Köster et al., submitted). Noteworthy, early helping behavior may be motivated differently in different situations. With regard to an altruistic motivation, the critical question is whether infants' helping is intrinsically motivated to benefit the other individual, at least in some situations. For example, helping others may be motivated to support the goal achievement of another individual, based on deliberate choice, in some cases, while it may be guided by social responsibility in other cases (Köster et al., in press), or possibly even to avoid negative consequences (Giner et al., under review). Here, infants' deliberate decision (of course in a very rudimentary sense) to provide help in a certain situation may possibly qualify for an altruistic motivation, if the leading motivation is to help the other individual. However, the underlying motivation may likewise be more similar in both situations, such as a motivation to relate to and to affiliate with others, with very different cultural solutions in contexts that are characterized by very different interpersonal relationships, namely, by cultural models of psychological autonomy or hierarchical relatedness (Keller & Kärtner, 2013). Therefore, it remains an open question whether infants' helping behavior is, at least in some situations, based on an altruistic motivation to benefit another individual or if it is rather based on more general social motives.

It is important to note at this point that the diversity of processes that may contribute to infants' motivation to help in a certain situation do not preclude helping behavior to be motivated altruistically. For example, to benefit others may innately (or based on social

learning) be perceived as a morally good thing to do, and be motivated intrinsically. To give another example, positive emotions elicited by helping may not only have a reinforcing effect but are likely also due to an excitement that the other person received help. Thus, the processes influencing early helping described here do not imply that helping may not be motivated altruistically in certain situations. Some of these processes may even be seen as the basic processes that underlie an intrinsic motivation to benefit another individual in a certain situation.

The biological foundations of early helping behavior

To fully understand the cognitive and motivational basis of early helping behavior, it is important to look at its biological foundations (Tinbergen, 1963). That is, why helping behavior may have evolved in humans and what proximal biological mechanisms underpin the factors that motivate helping behavior in a certain situation (outlined above).

A central debate that revolves around the biological foundations of early helping behavior is the question whether early helping is based on a natural altruistic predisposition, namely an altruistic human trait (Warneken & Tomasello, 2009a, 2009b). According to a natural altruism view, early helping is based on such an "altruistic motivation to act on behalf of the other" (Tomasello & Warneken, 2007, p. 271). This proposal is based on, first, the idea that altruistic traits are plausible from an evolutionary perspective (Warneken & Tomasello 2009b), second, the cladistics argument that helping behavior is also found in our closest ancestors (e.g., Warneken & Tomasello, 2006), and, third, that because of the early ontogeny of helping, it is "implausible" to assume that social learning plays a critical role at an early age (Warneken, 2015), as supported by the findings that encouragement (Tomasello & Warneken, 2013) and reinforcement (Warneken & Tomasello, 2008) did not increase or even undermined infants' helping tendencies (but see the section on socialization).

It goes without saying that helping others is deeply grounded in our biology that lays the ground for our social human nature (e.g., Keller, 2007) and thereby for the factors that

motivate infants' helping behavior in a certain situation discussed above. These comprise the biological foundations of the socio-cognitive abilities to understand others' needs and the own capacity to help (Köster et al., submitted), the biological programs that underpin mother-infant interactions (Keller, 2007), and a need to relate to and to affiliate with others (Over & Carpenter, 2009; Baumeister & Leary, 1995).

However, is it, from a biological perspective, reasonable, or even necessary, to assume that infants' helping behavior is naturally altruistic, or may it rather "only" be grounded in infants' social human nature? To discuss and understand the biological foundations of infants' motivation to help, it is here distinguished between ultimate and proximate explanations (Tinbergen, 1963). This means, asking *why* prosocial or even altruistic traits may have evolved in the phylogeny (ultimate explanation) and *how* it is functionally achieved in ontogeny (proximate explanation; see also Scott-Phillips, Dickins, & West, 2011). Regarding the debate on altruism, the ultimate question would then be why altruistic traits may have been selected in evolution and the proximate question would be how altruistic tendencies may be implemented in proximate biological mechanisms.

Evolutionary perspective

From an evolutionary perspective (for similar versions of this argument, see Eisenberg et al., 2006; Warneken & Tomasello, 2009b), it is reasonable that humans help their relatives (kin), who share their genes (Hamilton, 1963). This is, given the potential inequality between the costs for the helper and a higher benefit for the recipient of help and the shared genes of kin, helping may lead to an increase in overall fitness (inclusive fitness). The critical question is, why humans may also benefit (increase the reproductive fitness) of individuals, who do not share the same gene pool (non-kin). One possible argument is that tendencies to help and cooperate with others is an evolutionary winning strategy in stable social groups, in competition with other groups, and that prosocial (or even altruistic) traits may thus have been coevolved in group selection processes (e.g., Chudek & Henrich, 2011). More specifically,

our ancestors may have started off helping their kin (which most group members were) and also with non-relatives in their group, possibly based on, to give two common examples, indirect reciprocity and reputation (e.g., Nowak & Sigmund, 2005). In this way, living in stable group settings in our ancestral environment may have led to a coevolution of prosocial or even altruistic traits. Note that these accounts presuppose effective mechanisms to sanction free-riders, that is, individuals that take benefits but do not contribute to the group beneficially (e.g., Chudek & Henrich, 2011). Here, human culture may be a key for stable moral systems (including mechanisms of reward and sanctions) within stable groups and thus have fostered new prosocial motives in evolution (e.g., Boyd & Richerson, 2009). A specific adaptive function that was discussed for helping behavior as an early emerging trait is the value of children's participation in chores in subsistence-based farming communities (Warneken, 2015).

On an empirical basis, it is argued that helping tendencies may indicate an altruistic human trait because our closest genetic relatives help humans (Warneken & Tomasello, 2006) and conspecifics (Melis et al., 2010). However, although these findings suggest similar socio-cognitive processes in humans and chimpanzees, the question for a potential altruistic motivation remains the same for chimpanzees as for humans. Another line of research looked at genetic and environmental influences, comparing monozygotic and dizygotic twins. These findings indicate that there may indeed be a genetic influence on infants' empathically motivated helping and comforting (Knafo, Zahn-Waxler, Van Hulle, Robinson, & Rhee, 2008), but also suggest that genetic influences on children's prosocial behavior, here assessed with questionnaires, may rather unfold over the course of child development (Knafo & Plomin, 2006). Again, the question whether genetic influences indicate human social traits or altruistic traits remains.

To conclude, human evolutionary history, as sketched here or possibly also driven by further or different evolutionary processes, has certainly given rise to our social human nature.

This is because humans possess immense social capacities that have to have been selected for throughout evolution. However, from an evolutionary perspective, it remains unclear whether the emergence of early helping behavior is based on human social traits or even an altruistic trait.

Proximate biological mechanisms

Whether or not infants' helping is ultimately based on altruistic traits or rather on human social traits, there must be proximate biological mechanisms that put either sort of trait into action. This is, the way genes execute their proximate effects in the human genotype and lay the ground for the psychological factors that underpin helping behavior in a certain situation. Proximate explanations comprise the neurophysiological mechanisms that underpin the factors that motivate helping behavior in a certain situation and their ontogenetic development (Tinbergen, 1963).

How do infants understand that other individuals are in need when they are unable to achieve a goal on their own? The clear structure in out-of-reach tasks may provide infants with the opportunity to directly match to the situation of the other. Direct-matching was formerly defined as a "mechanism that directly maps a pictorial or kinematic description of the observed action onto an internal motor representation of the same action" (Iacoboni et al., 1999; cited after Kenward & Gredebäck, 2013), which is based on the mirror neuron system (e.g., Iacoboni et al., 2005). This would allow infants to represent and gain insight into the situation of the other individual and, therefore, that the other individual cannot fulfill their intention.

Matching the own perspective to the perspective of the other may furthermore allow infants to gain insight into the psychological state of the other that is inherent to this situation (Barresi & Moore, 1996; as outlined in the situational helping account, Kärtner et al., 2010). Infants may indeed be aroused by the unachieved goal as observers of an out-of-reach situation, as suggested by the works by Hepach and colleagues (2012, 2015), who have shown

that observing other individuals in need leads to a sympathetic arousal that motivates infants to help. Specifically, infants with higher levels of arousal helped faster (Hepach et al., 2015). Their sympathetic arousal only vanished when the other individual received help, but this was independent of the fact whether the help was delivered by themselves or a third person (Hepach et al., 2012). The authors proposed that this arousal may reflect infants' psychological engagement in the situation that motivates them to help. This physiological component may indeed qualify as a genuine concern for the others' needs (Hepach et al., 2012). However, a remaining question is, whether infants help others because they are concerned with the other individual's needs or, alternatively, relieve themselves from their own arousal (as discussed as a consequence of early helping behavior above), or possibly a combination of both. In particular, models of situational helping do not require that the psychological state (such as a desired but unachieved action goal) is located within the other person. However, because infants help and do not take the objects for themselves, it is certainly the instrumental need of the other individual that elicits arousal, but not a need that is not taken over. There are also first hints that giving may indeed lead to greater happiness than receiving in infancy (Aknin et al., 2012).

Further proximate biological factors that lay ground for infants' motivation to engage in a certain situation may be more general human needs for autonomy and relatedness (Keller & Kärtner, 2013) as well as their predispositions to learn from and acquire the meaning systems from their social environment (Keller, 2007), namely, to acquire culture-specific values and behaviors. Regarding infants' needs, these could be the need to experience themselves as autonomous agents within their social environment (Kärtner, 2015) and their need to relate to other individuals (Baumeister & Leary, 1995), as outlined above.

In this sense, besides more general human needs, important proximate biological mechanisms that may motivate early helping behavior could be direct-matching with the others' needs (based on the mirror neuron system), the awareness of own abilities to fulfill the

need of the other (emerging contingently with their novel motor abilities), and possibly a genuine concern for the other's needs (the physiological component inherent to the perceived situation of the other), that motivates them to engage prosocial in this situation.

Overall, the ultimate and proximate explanations for early helping behavior discussed here further underline that the motivation to help others is certainly deeply grounded in our social human nature. However, proximate biological mechanisms do likewise not disentangle social from altruistic mechanisms. Thus, it remains an open question, whether ultimate and proximate mechanisms give rise to an intrinsic altruistic motivation to benefit another individual and, if this would be the case, whether this altruistic motivation would be innate or learned, based on the proximate biological mechanisms outlined here.

Conclusion

How do these factors contribute to the early ontogeny of early helping behavior? Infants usually start to help others, after they have observed the behavior of others and have made sense of their instrumental needs. They have mastered their first steps and have learned how to engage with others in triadic interactions, exchanging objects, and they have experienced encouragement and positive reactions from their environment when pitching in daily tasks or when passing objects to others. Furthermore, infants are motivated to relate to others and are possibly concerned for others in need, being so similar to them. Given the different meanings of helping across cultures, another critical factor in the development of helping behavior is the socialization in the cultural context. Thus, infants' early tendency to help in a certain situation emerges from a complex interplay between several factors that may contribute to infants' perception of a situation affording help, including their own role in this situation (cognitive underpinnings) and their motivation to engage helpfully (motivational underpinnings).

Based on the human evolutionary past, infants are biologically prepared and motivated to socially engage with others and to learn from and to adapt to their social environment

(Keller et al., 2007). Thereby, biology lays the ground for the variety of factors that may influence early helping tendencies in a certain situation. Although it remains an open question, whether infants benefit others based on altruistic tendencies, and whether these would be innate or learned, helping others is deeply grounded in the social human nature.

Perspectives for future research

Still, the influences of the proposed factors on early helping behavior could be better understood. I will outline the perspectives for future research in developmental psychology along the four general factors motivating early helping behavior.

With regard to their socio-cognitive abilities, given that infants understand others' needs already in the first year (Köster et al., 2016; submitted), would it be possible, to provoke helping tendencies already in the first year? For example, one could think about helping tasks that keep infants' motoric requirements very low or in which the target action is well trained. Furthermore, it would be intriguing to better understand the correspondence between infants' motor abilities and an awareness of their capacities to engage helpfully. This could be done, for example, by a fine motor training in an experimental group and by creating helping situations with the specific motor affordances that were trained in this experimental group. Here, infants' understanding of these actions could be tested as a potential mediator in an eye-tracking paradigm, which tests their functional understanding of this action.

Regarding infants' socialization in the cultural context, there are several recent studies that show a significant role of this factor in the early emergence of helping behavior. However, these findings draw a rather complex picture of how socialization influences early helping and how these influences unfold over time (e.g., Dahl, 2015; Dahl et al., under review) and may vary across cultures (Giner et al., under review; Köster et al., in press). Here it might be helpful, to step back a little from observing psychological phenomena "in the box" and enrich our perspective with ethological, naturalistic and longitudinal approaches (for similar proposals see Dahl, submitted; Köster et al., 2015), as recently done in one study by

Dahl (2015). This would certainly help to get a better overview, which socialization practices to look at, also in different cultural contexts. We previously suggested further perspectives for future cross-cultural research on infants' early helping behavior (see Köster et al., 2015).

Situational factors, including former social interactions with the recipient, recently got into research focus (Barragan & Dweck, 2014; Cirelli et al., 2014a, 2014b). These studies bring into awareness the subtle differences in social interactions that can lead to enormous differences in subsequent helping behavior. Methodologically, this requires researchers to rethink their warm-up interactions with the infant, in order to avoid irrelevant variance in behavioral assessments of early helping. However, it would be interesting to disentangle the specific characteristics of interactions that facilitate subsequent helping behaviors, to get a better picture on the mechanisms mediating this effect. For example, Over and Carpenter (2009) found that affiliation may play a critical role in helping. One may test infants' neuroendocrinological response after both affiliative primes (Over & Carpenter, 2009) or social interactions (Barragan & Dweck, 2014; Cirelli et al., 2014a, 2014b) to further test the role of social bonding mechanisms underlying early helping tendencies. Due to the pivotal role of oxytocin in affiliative bonding (Feldmann, 2012), oxytocin levels may be an interesting variable to look at as a mediator between social interaction experience and later helping behavior. Regarding further ideas on how to test reciprocity considerations when helping, one could think of social games that include reciprocal tit-for-tat like helping actions and to test whether children would help in a tit-for-tat manner. This could be done in a more natural environment, such as kindergarten groups. In infants, it could also be tested whether they expect tit-for-tat like interactions in others using an eye-tracking paradigm (for a recent study on giving and taking actions see Tatone, Geraci, & Csibra, 2015).

Regarding the consequences of early helping behavior, it would likewise be interesting to look at the neuroendocrinological responses. For example, following helping actions it could be investigated, whether the activity itself is rewarded by testing positive

endocrinological processes, such as dopamine or oxytocin responses. With regard to the relief of tension when another individual receives help, a major challenge would be to disentangle the source of infants' sympathetic arousal when others are in need. This is, whether infants' arousal indicates a concern for the welfare of the other or infants own discomfort with the unachieved goal in this situation, which motivates them to engage prosaically.

To further explore the proximate biological mechanisms, one may likewise investigate the neuroendocrinology that underlies a potential concern for others, for example, by measuring the endocrinologic response in paradigms similar to those by Hepach and colleagues (2012; 2015). To test whether direct matching processes may contribute to early helpful actions, although methodologically very challenging, it would be interesting to see how the mirror neuron system is involved in understanding others' needs. For example, this could be done by testing the similarity of neuronal activation patterns when infants are confronted with own and others' unachieved goals.

Further topics that deserve more attention in future research include how infants' personality characteristics, such as temperament or shyness, relate to early helping behavior and how infants' early tendencies to help are associated with helping behavior later in development, in childhood or even young adulthood. That is, whether they follow a stable, trait-like developmental trajectory. Social learning processes beyond socialization within the family, such as imitation of helping behavior or the influence of peers, have also not been investigated in the second year.

References

Adolph, K. E., & Tamis-LeMonda, C. S. (2014). The costs and benefits of development: The transition from crawling to walking. *Child Development Perspectives, 8*(4), 187-192. doi:10.1111/cdep.12085

Adolph, K. E., Bertenthal, B. I., Boker, S. M., Goldfield, E. C., & Gibson, E. J. (1997). Learning in the development of infant locomotion. *Monographs of the Society for Research in Child Development, 62*(3), 1-162. doi:10.2307/1166199

Aknin, L. B., Hamlin, J. K., & Dunn, E. W. (2012). Giving leads to happiness in young children. *PLoS One, 7*(6), e39211. doi:10.1371/journal.pone.0039211

Anderson, D. I., Campos, J. J., Witherington, D. C., Dahl, A., Rivera, M., He, M., ... & Barbu-Roth, M. (2013). The role of locomotion in psychological development. *Frontiers in Psychology, 4*(440), 1-17. doi:10.3389/fpsyg.2013.00440

Barragan, R. C., & Dweck, C. S. (2014). Rethinking natural altruism: Simple reciprocal interactions trigger children's benevolence. *Proceedings of the National Academy of Sciences*, *111*(48), 17071-17074. doi:10.1073/pnas.1419408111

Barresi, J., & Moore, C. (1996). Intentional relations and social understanding. *Behavioral and Brain Sciences, 19*(1), 107–122. doi:10.1017/S0140525X00041790

Baumeister, R. F., & Leary, M. R. (1995). The need to belong: desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin*, *117*(3), 497. doi:10.1037/0033-2909.117.3.497

Bayley, N. (1993). *Bayley scales of infant development: manual*. Psychological Corporation.

Behne, T., Carpenter, M., Call, J., & Tomasello, M. (2005). Unwilling versus unable: Infants' understanding of intentional action. *Developmental Psychology, 41*(2), 328-337. doi:10.1037/0012-1649.41.2.328

Bischof-Köhler, D. (2012). Empathy and self-recognition in phylogenetic and ontogenetic perspective. *Emotion Review, 4*(1), 40-48. doi:10.1177/1754073911421377

Boyd, R., & Richerson, P. J. (2009). Culture and the evolution of human cooperation. *Philosophical Transactions of the Royal Society of London B: Biological Sciences, 364*(1533), 3281-3288.

Bushnell, E. W., & Boudreau, J. P. (1993). Motor development and the mind: The potential role of motor abilities as a determinant of aspects of perceptual development. *Child Development, 64*(4), 1005-1021. doi:10.1111/j.1467-8624.1993.tb04184.x

Buttelmann, D., Carpenter, M., & Tomasello, M. (2009). Eighteen-month-old infants show false belief understanding in an active helping paradigm. *Cognition*, *112*(2), 337-342. doi:10.1016/j.cognition.2009.05.006

Callaghan, T., Moll, H., Rakoczy, H., Warneken, F., Liszkowski, U., Behne, T., & Tomasello, M. (2011). Early social cognition in three cultural contexts. *Monographs of the Society for Research in Child Development*, *76*(2), 1-142. doi:10.1111/j.1540-5834.2011.00603.x

Carpendale, J. I., Kettner, V. A., & Audet, K. N. (2014). On the nature of toddlers' helping: Helping or interest in others' activity? *Social Development*, *24*(2), 357–366. doi:10.1111/sode.12094.

Carpenter, M., Nagell, K., & Tomasello, M. (1998). Social cognition, joint attention, and communicative competence from 9 to 15 months of age. *Monographs of the Society for Research in Child Development, 63*(4), 1-174. doi:10.2307/1166214

Carpenter, M., Uebel, J., & Tomasello, M. (2013). Being mimicked increases prosocial behavior in 18-month-old infants. *Child Development*, *84*(5), 1511-1518. doi:10.1111/cdev.12083

Chudek, M., & Henrich, J. (2011). Culture–gene coevolution, norm-psychology and the emergence of human prosociality. *Trends in Cognitive Sciences*, *15*(5), 218-226. doi:10.1016/j.tics.2011.03.003

Cirelli, L. K., Einarson, K. M., & Trainor, L. J. (2014a). Interpersonal synchrony increases prosocial behavior in infants. *Developmental Science*, *17*(6), 1003-1011. doi:10.1111/desc.12193

Cirelli, L. K., Wan, S. J., & Trainor, L. J. (2014b). Fourteen-month-old infants use interpersonal synchrony as a cue to direct helpfulness. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *369*(1658), 20130400. doi:10.1098/rstb.2013.0400

Clearfield, M. W. (2011). Learning to walk changes infants' social interactions. *Infant Behavior and Development*, *34*(1), 15-25. doi:10.1016/j.infbeh.2010.04.008

Dahl, A. (submitted). Ecological commitments.

Dahl, A., Satlof-Bedrick, E. S., Hammond, S. I., Drummond, J., Waugh, W. E., & Brownell (under review). Explicit scaffolding increases simple helping in younger, but not older, infants.

Dahl, A. (2015). The developing social context of infant helping in two US samples. *Child Development*, *86*(4), 1080-1093. doi:10.1111/cdev.12361

Dahl, A., Campos, J. J., Anderson, D. I., Uchiyama, I., Witherington, D. C., Ueno, M., ... & Barbu-Roth, M. (2013). The epigenesis of wariness of heights. *Psychological Science, 24*(7), 1361-1367. doi:10.1177/0956797613476047

Dahl, A., Schuck, R. K., & Campos, J. J. (2013). Do young toddlers act on their social preferences? *Developmental Psychology*, *49*(10), 1964. doi:10.1037/a0031460

Dunfield, K. A., & Kuhlmeier, V. A. (2013). Classifying prosocial behavior: Children's responses to instrumental need, emotional distress, and material desire. *Child Development, 84*(5), 1766–1776. doi:10.1111/cdev.12075

Dunfield, K., Kuhlmeier, V. A., O'Connell, L., & Kelley, E. (2011). Examining the diversity of prosocial behavior: Helping, sharing, and comforting in infancy. *Infancy, 16*(3), 227–247. doi:10.1111/j.1532-7078.2010.00041.x

Eisenberg, N., Fabes, R. A., & Spinrad, T. L. (2006). Prosocial development. In N. Eisenberg, W. Damon & R. M. Lerner (Eds.), *Handbook of child psychology: Vol. 3, social, emotional, and personality development* (6th ed., pp. 646-718). New York: John Wiley & Sons Inc.

Feldman, R. (2012). Oxytocin and social affiliation in humans. *Hormones and Behavior*, *61*(3), 380-391. doi:10.1016/j.yhbeh.2012.01.008

Franchak, J. M., Kretch, K. S., Soska, K. C., & Adolph, K. E. (2011). Head-mounted eye tracking: A new method to describe infant looking. *Child Development, 82*(6), 1738–1750. doi:10.1111/j.1467-8624.2011.01670.x

Giner Torréns, M., Kärtner, J., & Chaudhary N. (under review). The influence of socialization on early helping from a cross-cultural perspective.

Hamilton, W. D. (1963). The evolution of altruistic behavior. *The American Naturalist, 97*(896), 354-356.

Hamlin, J. K., Wynn, K., & Bloom, P. (2007). Social evaluation by preverbal infants. *Nature, 450*(7169), 557-559. doi:10.1038/nature06288

Hammond, S. I., & Carpendale, J. I. (2015). Helping children help: the relation between maternal scaffolding and children's early help. *Social Development*, *24*(2), 367-383. doi:10.1111/sode.12104

Hastings, P. D., Utendale, W. T., & Sullivan, C. (2007). The socialization of prosocial behavior. In J. E. Grusec, & P. D. Hastings (Eds.), *Handbook of socialization: Theory and research* (pp. 638–664). New York: The Guilford Press.

Hay, D. F. (2009). The roots and branches of human altruism. *British Journal of Psychology, 100*(3), 473-479. doi:10.1348/000712609X442096

Hay, D. F., & Cook, K. V. (2007). The transformation of prosocial behavior from infancy to childhood. In C. Brownell & C. B. Kopp (Eds.), *Socioemotional development in the*

toddler years: Transitions and transformations (pp. 100–131). New York: The Guilford Press.

Heckhausen, J., & Heckhausen, H. (2006). *Motivation und Handeln*. Heidelberg: Springer.

Hepach, R., Haberl, K., Lambert, S., & Tomasello, M. (2016). Toddlers help anonymously. *Infancy*. doi:10.1111/infa.12143

Hepach, R., Vaish, A., & Tomasello, M. (2012). Young children are intrinsically motivated to see others helped. *Psychological Science, 23*(9), 967-972. doi:10.1177/0956797612440571

Hepach, R., Vaish, A., Grossmann, T., & Tomasello, M. (in press). Young children want to see others get the help they need. *Child Development.*

Hoffman, M. L. (1982). Development of prosocial motivation: Empathy and guilt. In N. Eisenberg-Berg (Ed.), *Development of prosocial behavior* (pp. 281-313). Orlando, FL: Academic Press.

House, B. R., Silk, J. B., Henrich, J., Barrett, H. C., Scelza, B. A., Boyette, A. H., ... & Laurence, S. (2013). Ontogeny of prosocial behavior across diverse societies. *Proceedings of the National Academy of Sciences*, *110*(36), 14586-14591. doi:10.1073/pnas.1221217110

Iacoboni, M., Molnar-Szakacs, I., Gallese, V., Buccino, G., Mazziotta, J. C., & Rizzolatti, G. (2005). Grasping the intentions of others with one's own mirror neuron system. *PLoS Biology*, *3*(3), e79. doi:10.1371/journal.pbio.0030079

Iacoboni, M., Woods, R. P., Brass, M., Bekkering, H., Mazziotta, J. C., & Rizzolatti, G. (1999). Cortical mechanisms of human imitation. *Science*, *286*(5449), 2526-2528. doi:10.1126/science.286.5449.2526

Jensen, K., Vaish, A., & Schmidt, M. F. (2014). The emergence of human prosociality: Aligning with others through feelings, concerns, and norms. *Frontiers in Psychology*, *5*, 822. doi:10.3389/fpsyg.2014.00822

Kağitçibaşi, Ç. (2007). *Family, self, and human development across countries. Theory and applications* (2nd ed.). Mahwah, NJ: Erlbaum.

Kanakogi, Y., & Itakura, S. (2011). Developmental correspondence between action prediction and motor ability in early infancy. *Nature Communications*, *2*, 341. doi:10.1038/ncomms1342

Karasik, L. B., Tamis-LeMonda, C. S., & Adolph, K. E. (2011). Transition from crawling to walking and infants' actions with objects and people. *Child Development*, *82*(4), 1199-1209. doi:10.1111/j.1467-8624.2011.01595.x

Kärtner, J. (2015). The autonomous developmental pathway: The primacy of subjective mental states for human behavior and experience. *Child Development, 86*, 1298–1309. doi:10.1111/cdev.12377

Kärtner, J., Keller, H., & Chaudhary, N. (2010). Cognitive and social influences on early prosocial behavior in two sociocultural contexts. *Developmental Psychology, 46*(4), 905–14. doi:10.1037/a0019718

Kärtner, J., Keller, H., Chaudhary, N., & Yovsi, R. D. (2012). The development of mirror self-recognition in different sociocultural contexts. *Monographs of the Society for Research in Child Development, 77*(4), 1–87. doi:10.1111/j.1540-5834.2012.00688.x

Kärtner, J., Keller, H., Lamm, B., Abels, M., Yovsi, R., Chaudhary, N., & Su, Y. (2008). Similarities and differences in contingency experiences of 3-month-olds across sociocultural contexts. *Infant Behavior and Development, 31*(3), 488–500. doi:10.1016/j.infbeh.2008.01.001

Kärtner, J., Schuhmacher, N., & Collard, J. (2014). Socio-cognitive influences on the domain-specificity of prosocial behavior in the second year. *Infant Behavior and Development*, *37*(4), 665-675. doi:10.1016/j.infbeh.2014.08.004

Keller, H. (2007). Cultures of infancy. Mahwah, NJ: Erlbaum. Keller, H. (2013). Attachment and Culture. *Journal of Cross-Cultural Psychology*, *44*(2), 175–194. doi:10.1177/0022022112472253

Keller, H., & Kärtner, J. (2013). Development – The cultural solution of universal developmental tasks. In M. J. Gelfand, C. Chiu, & Y. Hong (Eds.), *Advances in Culture and Psychology, Volume Three* (pp. 63–116). New York, NY: Oxford University Press. doi:10.1093/acprof:oso/9780199930449.003.0002

Keller, H., Yovsi, R., Borke, J., Kärtner, J., Jensen, H., & Papaligoura, Z. (2004). Developmental consequences of early parenting experiences: self-recognition and self-regulation in three cultural communities. *Child Development, 75*(6), 1745–60. doi:10.1111/j.1467-8624.2004.00814.x

Kenward, B., & Gredebäck, G. (2013). Infants help a non-human agent. *PloS one*, *8*(9), e75130. doi:10.1371/journal.pone.0075130

Knafo, A., & Plomin, R. (2006). Prosocial behavior from early to middle childhood: genetic and environmental influences on stability and change. *Developmental Psychology*, *42*(5), 771.

Knafo, A., Zahn-Waxler, C., Van Hulle, C., Robinson, J. L., & Rhee, S. H. (2008). The developmental origins of a disposition toward empathy: Genetic and environmental contributions. *Emotion*, *8*(6), 737.

Köster, M., Cavalcante, L., Carvalho, R., Resende, B. D., & Kärtner, J. (in press). Cultural influences on toddlers' prosocial behavior: How maternal task assignment relates to helping others. *Child Development*.

Köster, M., Itakura, S., & Kärtner, J. (submitted). From thinking to acting prosocial: Infants help to benefit others.

Köster, M., Ohmer, X., Nguyen, T. D., & Kärtner, J. (2016). Infants understand others' needs. *Psychological Science, 27*(4), 542-548. doi:10.1177/0956797615627426

Köster, M., Schumacher, N., & Kärtner, J. (2015) A cultural perspective on prosocial development. *Human Ethology Bulletin, 30*(1)*,* 70-81.

Liszkowski, U., Carpenter, M., & Tomasello, M. (2008). Twelve-month-olds communicate helpfully and appropriately for knowledgeable and ignorant partners. *Cognition*, *108*(3), 732-739. doi:10.1207/s15327647jcd0702_2

Melis, A. P., Warneken, F., Jensen, K., Schneider, A. C., Call, J., & Tomasello, M. (2010). Chimpanzees help conspecifics obtain food and non-food items.*Proceedings of the Royal Society of London B: Biological Sciences*. doi:10.1098/rspb.2010.1735

Miller, J. G., & Bersoff, D. M. (1992). Culture and moral judgment: How are conflicts between justice and interpersonal responsibilities resolved? *Journal of Personality and Social Psychology, 62*(4), 541–554. doi:10.1037/0022-3514.62.4.541

Miller, J. G., Bersoff, D. M., & Harwood, R. L. (1990). Perceptions of social responsibilities in India and in the United States: moral imperatives or personal decisions? *Journal of Personality and Social Psychology*, *58*(1), 33–47. doi:http://dx.doi.org/10.1037/0022-3514.58.1.33

Mundy, P., Delgado, C., Block, J., Venezia, M., Hogan, A., & Seibert, J. (2003). *A manual for the Abridged Early Social Communication Scales (ESCS)*. Retrieved 2016, from http://education.ucdavis.edu/?

Nowak, M. A., & Sigmund, K. (2005). Evolution of indirect reciprocity. *Nature*, *437*(7063), 1291-1298. doi:10.1038/nature04131

Nsamenang, B. A. (1992). Perceptions of parenting among the Nso of Cameroon. In B. S. Hewlett (Ed.), *Father–child relations: Cultural and biosocial contexts* (pp. 321–343). Hawthorne, NY: de Gruyter.

Ochs, E., & Izquierdo, C. (2009). Responsibility in childhood: Three developmental trajectories. *Ethos*, *37*(4), 391–413. doi:10.1111/j.1548-1352.2009.01066.x.392

Ogunnaike, O. A., & Houser, R. F. (2002). Yoruba toddlers' engagement in errands and cognitive performance on the Yoruba Mental Subscale. *International Journal of Behavioral Development*, *26*(2), 145–153. doi:10.1080/01650250042000708

Over, H., & Carpenter, M. (2009). Eighteen-month-old infants show increased helping following priming with affiliation. *Psychological Science*, *20*(10), 1189-1193. doi:10.1111/j.1467-9280.2009.02419.x

Paulus, M. (2014). The emergence of prosocial behavior: Why do infants and toddlers help, comfort, and share? *Child Development Perspectives, 8*(2), 77-81. doi:10.1111/cdep.12066

Paulus, M., Kühn-Popp, N., Licata, M., Sodian, B., & Meinhardt, J. (2013). Neural correlates of prosocial behavior in infancy: Different neurophysiological mechanisms support the emergence of helping and comforting. *NeuroImage, 66*, 522–530. doi:10.1016/j.neuroimage.2012.10.041

Rheingold, H. L. (1982). Little children's participation in the work of adults, a nascent prosocial behavior. *Child Development, 53*(1), 114-125.

Rochat, P., Dias, M. D., Liping, G., Broesch, T., Passos-Ferreira, C., Winning, A., & Berg, B. (2009). Fairness in distributive justice by 3-and 5-year-olds across seven cultures. *Journal of Cross-Cultural Psychology*, *40*(3), 416-442. doi:10.1177/0022022109332844

Rogoff, B. (2003). *The cultural nature of human development*. Oxford University Press.

Schäfer, M., Haun, D. B., & Tomasello, M. (2015). Fair is not fair everywhere. *Psychological Science*, *26*(8), 1252-1260. doi:10.1177/0956797615586188

Scott-Phillips, T. C., Dickins, T. E., & West, S. A. (2011). Evolutionary theory and the ultimate–proximate distinction in the human behavioral sciences. *Perspectives on Psychological Science, 6*(1), 38-47. doi:10.1177/1745691610393528

Svetlova, M., Nichols, S. R., & Brownell, C. A. (2010). Toddlers' prosocial behavior: From instrumental to empathic to altruistic helping. *Child Development, 81*(6), 1814–1827. doi:10.1111/j.1467-8624.2010.01512.x

Tatone, D., Geraci, A., & Csibra, G. (2015). Giving and taking: Representational building blocks of active resource-transfer events in human infants. *Cognition*, *137*, 47-62. doi:10.1016/j.cognition.2014.12.007

Tinbergen, N. (1963). On aims and methods of ethology. *Zeitschrift für Tierpsychologie*, *20*(4), 410-433.

Tomasello, M., Carpenter, M., Call, J., Behne, T., & Moll, H. (2005). Understanding and sharing intentions: The origins of cultural cognition. *Behavioral and Brain Sciences, 28*(5), 675-735. doi:10.1017/S0140525X05000129 10.1111/j.1467-8624.2010.01500.x

Trommsdorff, G., & Nauck, B. (2005). *The value of children in cross-cultural perspective. Case studies from eight societies.* Lengerich: Pabst.

Vaish, A., Carpenter, M., & Tomasello, M. (2010). Young children selectively avoid helping people with harmful intentions. *Child Development*, *81*(6), 1661-1669. doi:10.1126/science.1121448

Warneken, F. (2015). Precocious prosociality: why do young children help? *Child Development Perspectives*, *9*(1), 1-6. doi:10.1111/cdep.12101

Warneken, F., & Tomasello, M. (2006). Altruistic helping in human infants and young chimpanzees. *Science, 311*(5765), 1301-1303. doi:10.1126/science.1121448

Warneken, F., & Tomasello, M. (2007). Helping and cooperation at 14 months of age. *Infancy, 11*(3), 271–294. doi:10.1080/15250000701310389

Warneken F, Tomasello M. (2008). Extrinsic rewards undermine altruistic tendencies in 20-month-olds. *Developmental Psychology, 44*(6), 1785-1788. doi:10.1037/a0013860

Warneken, F., & Tomasello, M. (2009a). The roots of human altruism. *British Journal of Psychology*, *100*(3), 455-471. doi:10.1348/000712608X379061

Warneken, F., & Tomasello, M. (2009b). Varieties of altruism in children and chimpanzees. *Trends in Cognitive Science, 13*(9), 397-402. doi:10.1016/j.tics.2009.06.008

Warneken, F., & Tomasello, M. (2013). Parental presence and encouragement do not influence helping in young children. *Infancy*, *18*(3), 345-368. doi:10.1111/j.1532-7078.2012.00120.x

Warneken, F. (2015). Precocious prosociality: why do young children help? *Child Development Perspectives*, *9*(1), 1-6. doi:10.1111/cdep.12101

Whiting, B., & Edwards, C. (1992). *Children of different worlds: The formation of social behavior*. Cambridge, MA: Harvard University Press.

Woodward, A. L. (1998). Infants selectively encode the goal object of an actor's reach. *Cognition, 69*(1), 1-34. doi:10.1016/S0010-0277(98)00058-4

Woodward, A. L. (1999). Infants' ability to distinguish between purposeful and non-purposeful behaviors. *Infant Behavior & Development*, *22*, 145–160. doi:10.1016/S0163-6383(99)00007-7

Wynn, K. (2009). Constraints on natural altruism. *British Journal of Psychology*, *100*(3), 481-485. doi:10.1348/000712609X441312

Part 2:

Publications

Infants understand others' needs

Moritz Köster[1,2]*, Xenia Ohmer[2], Thanh Dung Nguyen[2], Joscha Kärtner[1]

[1] Department of Developmental Psychology, University of Münster, Fliednerstraße 21, 48149 Münster, Germany
[2] Institute of Cognitive Science, University of Osnabrück, Albrechtstraße 28, 49069 Osnabrück, Germany

Corresponding author:
Moritz Köster
Fliednerstraße 21
48149 Münster
Germany
Tel.: +49 (0) 251 8334206
E-mail: moritz.koester@uni-muenster.de

Acknowledgments:
We would like to thank Heidi Keller and the Department of Culture and Development of the University of Osnabrück for their organizational support. Furthermore, we thank Judith Kemper and Lara Richter for their support in the data assessments.

Abstract

Infants begin to help others in their second year of life. However, it is still unclear whether early helping behavior is based on an understanding of others' needs and thus motivated prosocially. In the present eye-tracking study, 9- to 18-month-olds ($N = 71$) saw a needy individual, prevented from goal achievement by an obstacle, at the side of an individual being able to achieve a goal on its own. When a helper engaged in the scene, infants expected helping behavior towards the needy individual, as indicated by anticipatory looking and a violation of expectation paradigm. Interestingly, their prosocial understanding did not differ between age groups and was not related to their helping behavior. Thus, infants understand others' needs, even before they start to help others themselves. This indicates that early helping may indeed be motivated prosocially and raises the question, which other competences underlie the ontogeny of helping behavior.

Keywords: Infant cognition, Eye-Tracking, Prosocial behavior

Infants understand others' needs

Human infants help other individuals from the beginning of their second year of life. They first start to pass over objects out of another individual's reach (Warneken & Tomasello, 2007), before they acquire the ability to help other individuals in a variety of more complex situations around their 18th month (Warneken & Tomasello, 2006). The authors proposed that early helping behavior reflects humans' natural prosocial tendencies (Warneken & Tomasello, 2006; Warneken & Tomasello, 2009). This would presuppose that infants understand the need of other individuals from early on and orient their behavior towards this need, in order to benefit the other (Eisenberg, Fabes, & Spinrad, 2006; Hoffman, 1981). However, helping behavior in out-of-reach situations may be explained more conservatively: First, helping behavior could rely on a more general interest in others' activities and the motivation to socially engage with others (Paulus, 2014; Carpendale, Kettner, & Audet, 2014; Hay, 2009). Second, infants' helping could rely on a contagion process with others' intentions and merely aim at finalizing a goal-directed, but incomplete action (Baressi & Moore, 1996; Kärtner, Keller, & Chaudhary, 2010; Kenward & Gredebäck, 2013). Thus, the cognitive and motivational processes underlying early helping behavior are not well understood.

Here, the critical question is whether infants do understand others' needs, when they begin to engage helpfully. Infants' first understand the goal-directedness of animate actions from 6 month on (Woodward, 1998): They expect that human hands (but not inanimate objects, such as garden tools) reach towards a toy they just reached before, instead of reaching towards a location they reached for previously. From early on infants use their understanding of goal-directed actions to evaluate other individuals (Hamlin, Wynn, & Bloom, 2007): Already 6-month-olds prefer individuals that support goal-directed actions of others (helpers) over those that prevent others' goal-directed actions (hinderers). Infants further understand the intentions underling goal-directed behaviors around their 9th month (Woodward, 1999; Behne, Carpenter, Call, & Tomasello, 2005). For example, 9- to 18-month olds, but not 6-

month-olds, show more impatience if an individual is unwilling to pass over a desired object, compared to a condition in which an individual is unable to pass over a desired object due to an obstacle (Behne et al., 2005). However, it has not been investigated at what age infants begin to understand that other individuals do not only follow goals but are in need of help, i.e., that they are not able to achieve an intended goal by his or her own. Furthermore, it is an open question whether the ontogeny of infants' helping behavior in the second year indicates a maturing understanding of others' needs. Alternatively, infants' may not yet understand others' needs when they begin to help, as suggested by the alternative explanations above, or their prosocial understanding may emerge even earlier.

In the present study, we used eye-tracking measures to investigate infants' understanding of the need of other individuals between 9 and 18 month. In a split-screen design, a character being unable to reach a ball due to an obstacle (needy) was presented at the side of a character being able to reach a ball on its own (not needy). When a helper leaned forward, we tested whether infants' would first look at the needy character (i.e., anticipatory looking), indicating the anticipated action of the helper. Additionally, the helper either gave the ball to the needy character or the other character, not requiring help (i.e., violation of expectation), to further test whether infants would expect help towards the needy character. To investigate how infants' understanding of others' needs relates to their helping behavior, we further assessed infants' behavior in two out-of-reach situations.

Method

Participants. Participants were 71 healthy infants between 9 and 18 month, in three age-groups: 9- to 11- month-olds (n = 21, 12 female, M_{age} = 10.5 months, SD_{age} = 0.8 months), 12- to 14- month-olds (n = 25, 11 female, M_{age} = 13.2 months, SD_{age} = 1.0 months), and 15- to 18- month-olds (n = 25, 11 female, M_{age} = 16.7 months, SD_{age} = 1.2 months). Eleven additional infants were excluded from the eye-tracking analysis due to procedural errors (n = 3) or insufficient eye-tracking recordings (below 70% of the presentation time, n =

8). For the behavioral analyses, 2 further infants had to be excluded due to procedural errors. Participants were recruited in collaboration with local institutions offering courses for mothers. Sample size was determined by the number of infants that could be recruited in these courses. The study was carried out in accordance with the provisions of the World Medical Association Declaration of Helsinki and informed written consent was obtained from one parent of each infant.

Stimulus material. We designed 6 animated picture stories, contrasting a needy character, separated from a ball by an obstacle, and second character, being able to reach a ball, in a split-screen design (see Fig. 1). Each picture story was comprised of an initial familiarization phase and 2 experimentally relevant phases (anticipatory looking and violation of expectation, see Fig. 2). During the familiarization phase both characters entered the scene and played with a ball, before both characters entered the scene a second time and reached out for a ball unsuccessfully, being separated from the ball by an obstacle (see Fig. 2a,b). This was to illustrate the intention of both characters to reach and to play with a ball. Before the start of the experimental phases a human-like agent (helper) appeared in the background of the scene, remaining 3s for an initial familiarization. Subsequently, a needy character, separated from the ball by an obstacle, entered the scene along with a character, able to reach the ball on its own (see Fig. 2c), resembling the situations from the familiarization phase. The characters stopped in front of the obstacle (needy) or the ball (not needy) and remained there for 3 s to familiarize infants with the setup. In the anticipatory looking phase, the helper looked at both characters in turn, before he leaned forward and the scene stopped for another 3 s, to test infants' anticipation for the helpers' action (anticipatory looking, see Fig. 2d). Finally, the helper either helped the needy individual or the individual that did not need help to reach the ball (violation of expectation, see Fig. 2e,f). The scene remained for 3 s to assess toddlers' looking times. To grab and sustain infants' attention, the picture stories were underlaid with sounds for the characters and the helper. Furthermore, to accentuate the

difference between the picture stories, shapes and colors of the characters as well as the color of the helpers' clothing and hair were varied.

Using a within-subject design, each infant saw all 6 picture stories, varying in the obstacles, separating the needy character from the ball (long brick, gap in the ground, cylinders, wall, large ditch, two ditches; see Fig. 1), 3 trials of each condition (expected, unexpected). Furthermore, the picture stories were pseudo-randomized, counterbalancing for several aspects: the order of the 6 picture stories, the order of the violation of expectation condition in phase 3 (expected, unexpected), the shape and the side of the character requiring help (left, right), the order of the familiarization trials (reach first, play first), as well as the sounds made by the characters during reaching and playing ("hmm, hmm, hmm", "hee, hee, hee").

As control condition, infants saw another picture story with geometrical shapes missing googly eyes, arms and legs (see Fig. 3). Furthermore, shapes did not enter the scene, but were already were at their final position, to avoid an intentional interpretation. Besides these differences, the phases of the control trials paralleled those of the experimental trials. This is to control for the possibility that effects may merely be explained by visual differences in the two different configurations of geometrical shapes (needy, not needy), e.g., the distance between the two shapes or the harmonic movement of both shapes in the play sequence of the familiarization phase. To avoid associations with the experimental trials, the control trial was shown at the beginning of each session, prior to the presentation of the experimental trials. In one control trial shown to each participant, infants saw either an expected or an unexpected outcome in the violation of expectation phase.

Eye-tracking procedure and analysis. Infants sat on their parent's lap, while stimuli were presented on a 20" computer screen (47.6 cm × 32.9 cm, 1680 × 1040 pixels), at a distance of 60 to 70 cm. Lights in the laboratory were dimmed. Participants' gaze was tracked with a remote eye-tracking unit (Tobii X1; Tobii Technology, Stockholm, Sweden), at a

sampling rate of 28-32 Hz. Before the start of the experiment, we verified that the eye-tracker could not track the eyes of the mother and carried out a nine-point calibration.

Individual fixations were defined using a Velocity-Threshold Identification filter, implemented in Tobii Studio 3.2, and then exported for further analysis in Matlab. We defined three regions of interest (ROIs), around the relevant elements of the scene, an ellipsis around the helper and rectangles around both characters, cutting out the overlaps with the ROI of the helper. Including all trials with at least one valid fixation into one of the ROIs for each of the experimental phases, an average of 5.7 of 6 trials, remained for the analysis of first fixations and 5.6 of 6 trials for the violation of expectation analysis. In the control condition, all despite two trials in the anticipatory looking phase could be analyzed.

For the analysis of the anticipatory looking phase, we took the first fixation into one of the ROIs of the two characters (needy, not needy), within the 3 s time window after the helper bend over to engage in the scene. The number of first fixations is reported in percent of all valid trials. As a looking time measure in the final scene, we summed the duration of all fixations that fell into the 3 ROIs from the moment the helper took the ball and for the 3 s still frame, when the ball was passed over. Fixation times were averaged over the trials of each condition (expected, unexpected).

Behavioral tasks. Following the eye-tracking assessments and a free play interaction with the experimenter, infants' helping behavior was assessed in two out-of-reach tasks, adapted from earlier studies. In the first task (Hepach, Vaish, & Tomasello, 2012), the experimenter stacked plastic cups on a table, when he successively dropped 3 cups on the ground and reached out for them. For each cup, the experimenter kept his gaze on the cup (first 10s), before he alternated his gaze between cup and child (last 10s). In a second task (Kärtner, Schuhmacher, & Collard, 2014), the experimenter and the infant faced one another across a table. Both had three cups placed in front of them, positioned such that neither could reach the cups on the other side. The experimenter started to collect the cups on his side of the

table, saying "I will now start to collect the cups" and then reached for those cups on the infants' side of the table. Again, the experimenter kept his gaze on the cup (first 10s), before he alternated his gaze between cup and child (last 10s). The proportion of cups the infant passed to the experimenter within 20 s was coded for each task (in percent) and integrated into an average score. Inter-rater agreements were assessed for 25 % of the data (Cohen's kappa: $\kappa_{task1} = .79$, $\kappa_{task2} = .92$).

Statistical analysis. Mixed model analyses of variance (ANOVAs) were used to analyze the first fixations in the anticipatory phase (factors: age group $_{9\text{-}11,\ 12\text{-}14,\ 15\text{-}18}$, ROI $_{needy,\ not\ needy}$) and the fixation duration in the violation of expectation paradigm (factors: age group $_{9\text{-}11,\ 12\text{-}14,\ 15\text{-}18}$, condition $_{expected,\ unexpected}$). The control trial was analyzed by the means of a binominal test for the number of first fixations in the anticipatory phase and by an ANOVA for the fixation duration, with the same factors as in the experimental condition, but with condition as a between factor. To analyze the relation between both indicators of prosocial understanding and helping behavior, we calculated Pearson's correlation between the helping score and the differential between infants' anticipatory fixations (first fixation $_{needy}$ - first fixation $_{not\ needy}$) and looking times in the last scene (fixation duration $_{unexpected}$ - fixation duration $_{expected}$). All main effects and interactions, which are not reported in the paper, were non-significant. All reported *p*-values are two-sided.

Results

Infants in all age groups expected the helper to help the needy individual: First, this is indicated by a higher proportion of first fixations on the needy, opposed to the other character, in the anticipatory looking phase ($M_{needy} = 37.3$ %, $M_{not\ needy} = 29.6$ %), $F(1,68) = 4.10$, $p = .047$. This effect did not differ between age groups (interaction $_{age \times region\ of\ interest}$), $F(2,68) = 0.77$, $p > .250$. Second, infants looked longer at the outcome of the picture stories, in which the helper passed the ball over to the character that was not in need, compared to the outcome of the picture stories, in which the character was able to achieve the ball by its own ($M_{expected}$

= 1.90 s, $M_{\text{unexpected}}$ = 2.06 s), $F(1,68) = 6.24$, $p = .015$. Again, this effect did not differ between age groups (interaction $_{\text{age} \times \text{condition}}$), $F(2,68) = 0.57$, $p > .250$. The similarity across age groups is substantiated by the group means of both measures, see Table 1. Descriptively, the highest differences were found in 9- to 11-month-olds.

In the control condition, we did not find any differences in the proportion of anticipatory looks ($M_{\text{needy control}}$ = 21.1 %, $M_{\text{not needy control}}$ = 25.4 %), $p > .250$, across age groups, or looking times ($M_{\text{expected control}}$ = 2.24 s, $M_{\text{unexpected control}}$ = 2.23 s), $F(1,63) = 0.00$, $p > .250$, interaction $_{\text{age} \times \text{condition}}$, $F(2,62) = 0.39$, $p > .250$.

Infants' helping behavior increased with age ($M_{\text{9- to 11-month}}$ = 10.7 %, $M_{\text{12- to 14-month}}$ = 39.2 %, $M_{\text{15- to 18-month}}$ = 69.8 %), $F(2,68) = 21.16$, $p < .001$. However, infants' helping behavior was not related to the understanding of another individuals' need: First, the proportion of objects handed over to the experimenter was not associated with a higher proportion of anticipatory looks made to the needy versus the other character ($r = .05$, $p > .250$). Second, no correlation was found between infants' help and the differences in looking times between trials with an expected or an unexpected outcome ($r = .03$, $p > .250$), i.e., the helper helping the needy or the other character.

Discussion

The findings of the present study show that infants understand the need of others, even before they start to act prosocially themselves. Furthermore, regarding the engagement of the helper, infants expected that others act prosocially, by orienting their behavior towards the need of others.

Importantly, understanding the need of others is a necessary precondition for early helping behavior to be genuinely prosocial (Eisenberg et al., 2006; Hoffmann, 1981). In the present eye-tracking study, we demonstrate this capacity in young infants, controlling for common alternative interpretations of behavioral studies: In the critical condition, infants saw two characters that, first, could serve as potential partners for a social interaction and, second,

did not complete a goal directed action. Thus, the present results cannot be explained by infants' expectancy that others engage socially or tend to complete an initiated action. The critical difference to earlier studies is that there were two potential recipients out of which only one character needed help to achieve a goal and that gaze behavior, instead of behavioral measures, was used to infer infants' situational understanding. Furthermore, our conclusion is based on converging evidence of two standard measures: First, when the helper engaged in the scene, infants showed anticipatory looking towards the character in need and, second, longer looking times indicate that infants were surprised if the helper helped the other character instead. Additionally, the null results of the control condition indicate that infants did not prefer one scene to the other due to the configuration of elements of the scenes or the former familiarization phase, i.e., the shapes moving together harmonically or independently.

Certainly, the fact that understanding others' needs was not related to toddlers' prosocial behavior does not imply that there is no relation between understanding needs and helping others. In particular, as helping situations get more complex (e.g., Warneken & Tomasello, 2006; Buttelmann, et al., 2009), understanding others' needs is the key to prosocial behavior. However, in these situations the question is less about whether infants are capable of representing others' needs at all, but rather becomes what it takes to identify others' needs, e.g., taking specific obstacles or false beliefs into account. Furthermore, while the present results demonstrate that infants possess the critical and necessary cognitive prerequisite for early helping behavior to be prosocial, this does not imply that all socially responsive and prosocial behavior is motivated prosocially.

The fact that infants start to understand the need of others before they are responsive to these needs themselves raises intriguing questions about further developmental attainments that lead to the emergence of helping behavior in the second year. One key competence underlying early prosocial behavior might be a sense of oneself as an accountable and competent interaction partner in social encounters (Kärtner, 2015). This idea is also implied in

theoretical accounts that emphasize toddlers' emerging motivation and competence to coordinate own with others' behavior during mutual collaboration (Tomasello, Carpenter, Call, Behne, & Moll, 2005). Possibly, an early sense of one's own competences in situations affording help, may benefit, first, from caregivers' scaffolding during infants' task engagement (Hammond & Carpendale, 2015; Köster, Cavalcante, de Carvalho, Resende, & Kärtner, 2016), and, second, from important motor developments occurring around this age, providing infants with novel abilities to engage in their physical and social environment (Neisser, 1993).

References

Barresi, J., & Moore, C. (1996). Intentional relations and social understanding. *Behavioral and Brain Sciences, 19*(01), 107-122. doi:10.1017/S0140525X00041790

Behne, T., Carpenter, M., Call, J., & Tomasello, M. (2005). Unwilling Versus Unable: Infants' Understanding of Intentional Action. *Developmental Psychology, 41*(2), 328-337. doi:10.1037/0012-1649.41.2.328

Buttelmann, D., Carpenter, M., & Tomasello, M. (2009). Eighteen-month-old infants show false belief understanding in an active helping paradigm. Cognition, 112(2), 337-342.

Carpendale, J. I., Kettner, V. A., & Audet, K. N. (2014). On the Nature of Toddlers' Helping: Helping or Interest in Others' Activity? *Social Development, 24*(2), 357-366. doi:10.1111/sode.12094

Eisenberg, N., Fabes, R. A., & Spinrad, T. (2006). Prosocial Development. In N. Eisenberg (Ed.), *Handbook of Child Psychology: Social, Emotional, and Personality Development* (pp. 646-718). New York: Willey.

Hamlin, J. K., Wynn, K., & Bloom, P. (2007). Social evaluation by preverbal infants. *Nature, 450*(7169), 557-559. doi:10.1038/nature06288

Hammond, S. I., & Carpendale, J. I. (2015). Helping Children Help: The Relation between Maternal Scaffolding and Children's Early Help. *Social Development, 24*(2), 367-383. doi:10.1111/sode.12104

Hay, D. F. (2009). The roots and branches of human altruism. *British Journal of Psychology, 100*(3), 473-479. doi:10.1348/000712609X442096

Hepach, R., Vaish, A., & Tomasello, M. (2012). Young children are intrinsically motivated to see others helped. *Psychological Science, 23*(9), 967-972. doi:10.1177/0956797612440571

Hoffman, M. L. (1981). Is altruism part of human nature? *Journal of Personality and Social Psychology, 40*(1), 121-137. doi:10.1037/0022-3514.40.1.121

Kärtner, J., Keller, H., & Chaudhary, N. (2010). Cognitive and Social Influences on Early Prosocial Behavior in Two Sociocultural Contexts. *Developmental Psychology, 46*(4), 905-914. doi:10.1037/a0019718

Kärtner, J., Schuhmacher, N., & Collard, J. (2014). Socio-cognitive influences on the domain-specificity of prosocial behavior in the second year. *Infant Behavior and Development, 37*(4), 665-675. doi:10.1016/j.infbeh.2014.08.004

Kärtner, J. (2015). The autonomous developmental pathway: The primacy of subjective mental states for human behavior and experience. *Child Development*, *86*, 1298-1309. doi:10.1111/cdev.12377

Köster, M., Cavalcante, L., de Carvalho, R.V.C., Resende, R.D., & Kärtner, J. (2016) Cultural influences on toddlers' prosocial behavior: How maternal task assignment relates to helping others. *Child Development.*

Kenward, B., & Gredebäck, G. (2013). Infants help a non-human agent. *PLoS ONE, 8*(11), 1-17. doi:10.1371/journal.pone.0075130

Neisser, U. (1993). *The Perceived self: Ecological and interpersonal sources of self-knowledge.* Cambridge England: Cambridge University Press.

Paulus, M. (2014). The Emergence of Prosocial Behavior: Why Do Infants and Toddlers Help, Comfort, and Share? *Child Development Perspectives, 8*(2), 77-81. doi:10.1111/cdep.12066

Tomasello, M., Carpenter, M., Call, J., Behne, T., & Moll, H. (2005). Understanding and Sharing intentions: the origins of cultural cognition. *Behavioral and Brain Sciences, 28*(5), 675-735. doi:10.1017/S0140525X05000129

Warneken, F., & Tomasello, M. (2006). Altruistic helping in human infants and young chimpanzees. *Science, 311*(5765), 1301-1303. doi:10.1126/science.1121448

Warneken, F., & Tomasello, M. (2007). Helping and cooperation at 14 months of age. Infancy, 11, 271–294. doi:10.1080/15250000701310389

Warneken, F., & Tomasello, M. (2009). Varieties of altruism in children and chimpanzees. *Trends in Cognitive Science, 13*(9), 397-402. doi:10.1016/j.tics.2009.06.008

Woodward, A. L. (1998). Infants selectively encode the goal object of an actor's reach. *Cognition, 69*(1), 1-34. doi:10.1016/S0010-0277(98)00058-4

Woodward, A. L. (1999). Infants' ability to distinguish between purposeful and non-purposeful behaviors. *Infant Behavior and Development, 22*(2), 145-160. doi:10.1016/S0163-6383(99)00007-7

Table 1

Results for the Anticipatory-Looking and Violation-of-Expectation Phases

	Age Group (in month)		
	9-11	12-14	15-18
Anticipatory Looking (% of trials)			
Character in need	39.3 (5.1)	37.0 (3.9)	36.0 (6.1)
Character not in need	26.2 (4.2)	35.7 (4.2)	26.3 (4.2)
Violation of Expectation (looking time in s)			
Character in need receives help	1.77 (.13)	1.91 (.08)	2.00 (.16)
Character not in need receives help	2.03 (.10)	2.06 (.11)	2.10 (.10)

Note: The table presents mean values with standard errors in parentheses.

Figure 1

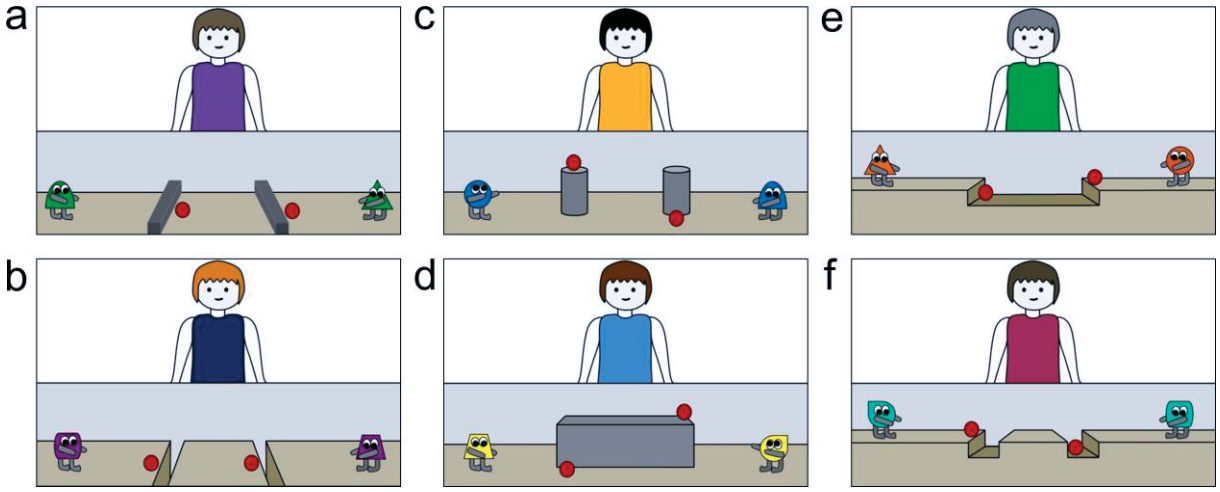

Fig. 1. The six picture stories shown to the infants. Picture stories varied in the type of obstacle, preventing the needy character from goal achievement: long brick (a), gap in the ground (b), cylinders (c), wall (d), large ditch (e), and two ditches (f).

Figure 2

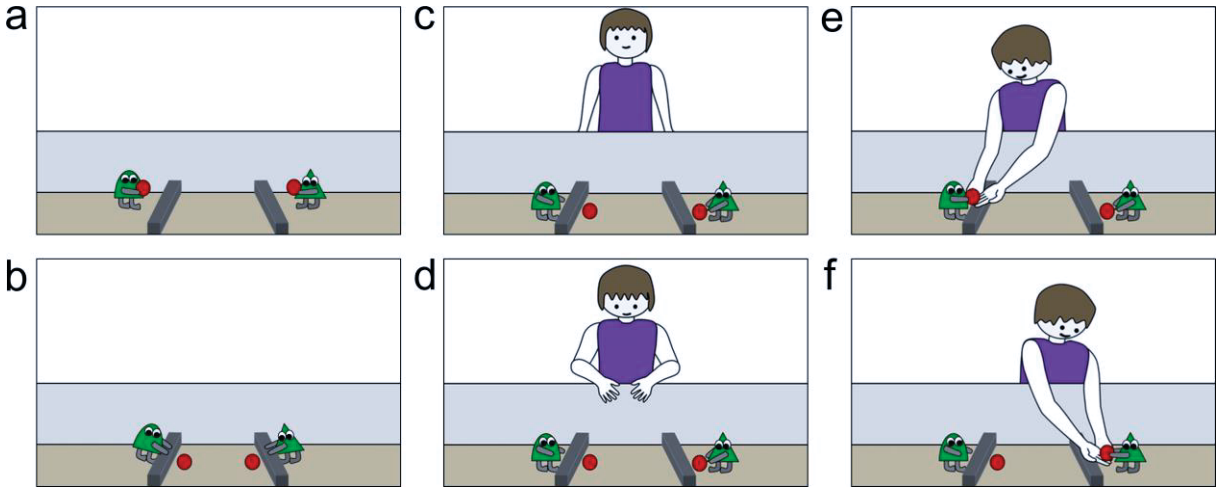

Fig. 2. The sequence of an exemplary picture story. Familiarization phase. Two characters entered the scene, picked up a ball in front of them and played with it, jumping up and down (a). The characters entered the scene a second time. This time the ball was placed behind an obstacle and the characters reached out for it unsuccessfully (b). A helper appeared in the background of the scene, before the characters entered the scene again. This time, one character was faced with an obstacle in front of the ball (needy), while the other character was able to reach the ball (not needy) (c). Anticipatory looking phase. The helper looked to both sides, before he leaned over to engage in the scene and the scene paused to provoke anticipatory looking behavior (d). Violation of expectation paradigm. In half of the trials the helper helped the needy character (expected) (e). In the other half of the trials the helper helped the other character, able to reach the ball on its own (unexpected) (f).

Figure 3

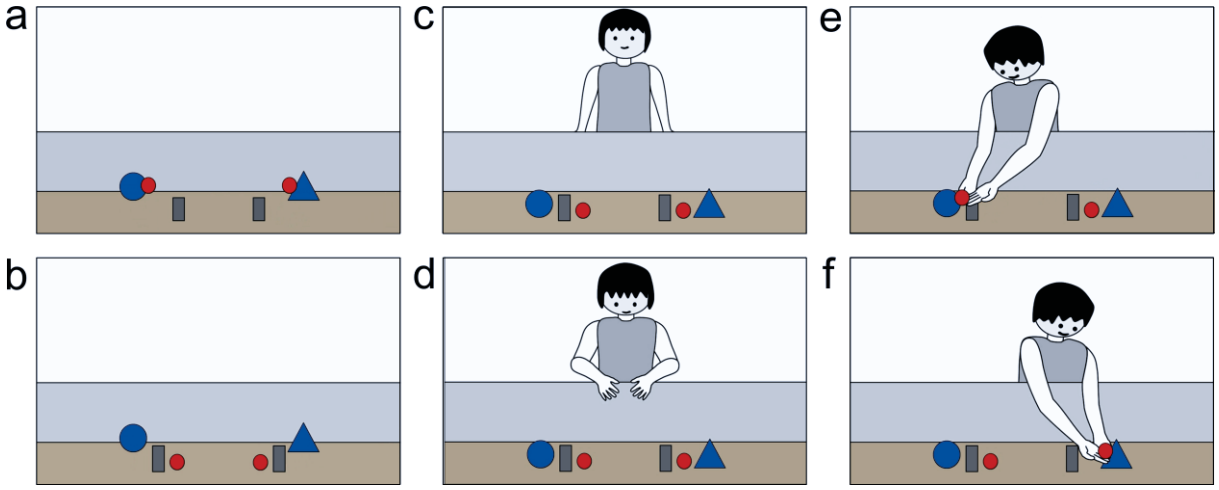

Fig. 3. Control trial, resembling the configuration and movements of shapes as well as helpers' behavior of the experimental trials. Googly eyes, arms and legs were removed. In contrast to the experimental condition, the shapes did not enter and move towards the balls as in the experimental condition, to avoid an intentional interpretation (a-c). The behavior of the helper was identical to the anticipatory looking phase (d) and the violation of expectation phase (e, f) of the experimental trials.

From thinking to acting prosocial: Infants help to benefit others

Moritz Köster[1], Shoji Itakura[2], Joscha Kärtner[1]

[1] Department of Developmental Psychology, University of Münster, Germany

[2] Department of Psychology, Graduate School of Letters, Kyoto University, Japan

Corresponding author:

Moritz Köster

Fliednerstraße 21

48149 Münster

Germany

Tel.: +49 (0) 251 8334206

E-mail: moritz.koester@uni-muenster.de

Acknowledgements:

We would like to thank Chisato Fukuda and Masaki Omori for their assistance with the data assessments and the coding of the behavioral data.

Abstract

Why do infants start to help others in the beginning of the second year? Infants' early helping behavior has often been interpreted as an indicator of their natural altruistic tendencies. However, the cognitive and motivational underpinnings of their earliest helpful acts are still unclear. In the present study we show that 16-month-olds' helping behavior is intended to benefit others, which is an essential precondition for early helping to be altruistic. This is shown by the close link between infants' understanding of others' needs and their helping behavior. Importantly, this link is established by their fine motor abilities and their social interaction skills that both moderate this effect. In addition, infants' fine and gross motor abilities as well as their social engagement with the experimenter were closely related to infants' helping behavior. We assume that their motor skills provide infants with an emerging awareness for their competencies to engage helpfully and thus with the ability to put their understanding of others' needs into helpful actions. Although it remains an open question emerging helping behavior is based on altruistic motives and whether these motives are acquired or innate, infants' helping behavior is deeply grounded in the social human nature.

Keywords: understanding others' needs, motor development, social interaction, helping behavior

From thinking to acting prosocial: Infants help to benefit others

Shortly after their first birthday, infants start to help others to achieve their goals. They pass objects to other individuals who cannot reach the objects (Warneken & Tomasello, 2006; 2007) or they use pointing gestures to indicate the location of objects that another individual is looking for (Liszkowski, Carpenter, & Tomasello, 2008). Although these behaviors are often interpreted as indicators of infants' early altruistic tendencies (Barragan, & Dweck, 2014; Warneken & Tomasello, 2009), the cognitive and motivational underpinnings underlying early helping behavior are still unclear (Paulus, 2014). An essential prerequisite for early helping behavior to be altruistic is that infants' orient their behaviors at others' needs and thus help to benefit another individual (Eisenberg, 2006; Warneken & Tomasello, 2009).

Infants' prosocial understanding emerges in the first year (Hamlin, Wynn, & Bloom, 2007; Köster, Ohmer, Nguyen, & Kärtner, 2016). For example, 6-month-olds prefer helpful individuals that support others to achieve a goal, over those who hinder others to achieve their goal (Hamlin, Wynn, & Bloom, 2007). Furthermore, infants from about 9 months of age understand that other individuals are in need, when these individuals are unable to reach a certain object on their own (Köster et al., 2016). Thus, infants evaluate the helpful actions of others and understand the needs of other individuals, even before they start to help others themselves. However, thus far there is no empirical evidence that infants' early helping behavior is based on their prosocial understanding. Alternatively, early helping behavior may reflect infants' motivation to engage in social interactions with others or to finalize an incomplete action (Paulus, 2014), for example, when another person grasps for an out-of-reach object. These alternatives could explain early helping behavior without a prosocial or even altruistic motivation. Thus, it remains an open question whether infants' earliest helpful acts are motivated by their understanding of others' needs and thus aim to benefit others.

Köster and colleagues (2016) proposed that the tremendous motor developments that occur around the first birthday (Adolph & Tamis-LeMonda, 2014) and the growing

competencies to coordinate their behavior with others around this age (Carpenter, Nagell, & Tomasello, 1998) are critical factors underlying the emergence of infants' helping. This proposal is based on studies that indicate an increase in object-related interactions associated with the transition from crawling to walking at the beginning of the first year (Adolph & Tamis-LeMonda, 2014; Clearfield, 2011; Karasik, Tamis-LeMonda, & Adolph, 2011) and the important role of social interactions for early helping behavior (Barragan, & Dweck, 2014; Cirelli, Einarson, & Trainor, 2014). If infants are motivated to benefit other individuals in need from early on, these skills would enable them to put their prosocial tendencies into action and should, in consequence, establish the link between their prosocial understanding and helping behavior.

Here we assessed the understanding of others' needs in 10 and 16 months old infants, using an eye-tracking paradigm (Köster et al., 2016). This paradigm tested whether infants expect a helper to help a character in need, unable to achieve a goal (anticipatory-looking), and whether they are surprised if a helper helps another character instead, which is able to achieve a goal on its own (violation-of-expectation paradigm; see Figure 1). We further looked at infants helping behavior in three behavioral tasks, namely when an experimenter reached out for paper balls (Warneken & Tomasello, 2006) or for cups that she dropped and was unable to reach (Hepach, Vaish, & Tomasello, 2012) and when the experimenter looked for objects that fell to the ground and were out of her sight (Liszkowski et al., 2008). In accordance with previous research, we expected that infants of both age groups would understand others' needs, but show much higher levels of helping in the older age group. The critical question of the present research was, whether infants' motor abilities and social interaction skills are related to early helping behavior and establish a link between infants' prosocial understanding and helping behavior at the beginning of the second year, when infants begin to reliably help other individuals. We thus assessed 16-month-olds' fine and gross motor abilities with age appropriate tasks of the Bayley scales (Bayley, 1993) and their

social interaction skills when rolling a ball or a car back and forth with an experimenter (Mundy at al., 2003).

Methods

Participants. Participants were 78 healthy full-term infants in two age groups, with 10 months (n = 41, 20 girls, mean age = 10.04 months, age range: 9.43 months to 10.52 months) and 16 months (n = 37, 15 girls, mean age = 16.12 months, age range: 15.55 months to 16.67 months). Additional infants were excluded from the analysis due to insufficient eye-tracking data in the experimentally critical phases (n = 14, see eye-tracking procedure and analysis), mostly due to fuzziness, or incomplete behavioral assessments (n = 1). Infants came from highly educated urban middle-class families in Kyoto, Japan, and participants were recruited from a database of the Kyoto University. The study was carried out in accordance with the provisions of the World Medical Association Declaration of Helsinki and informed written consent was obtained from the mother of each infant.

Understanding others' needs. In eight animated picture stories, a character in need, separated from a ball by an obstacle, was shown along with a second character, being able to reach a ball on its own (see Figure 1 for a sample picture story and Figure 2 for all picture stories shown to the infants). Each picture story comprised an initial familiarization phase and two test phases, namely an anticipatory-looking and a violation-of-expectation phase. During the familiarization phase both characters played with a ball, before they entered the scene a second time and reached out for a ball unsuccessfully because they were separated from the ball by an obstacle (see Figure 1a). This illustrated the intention of both characters to reach for and to play with the ball. Before the start of the experimental phases, a human-like agent (the helper) appeared in the background of the scene and remained there for 3s for an initial familiarization. Subsequently, a character in need, separated from the ball by an obstacle, entered the scene along with a character that was able to reach the ball on its own. The characters stopped in front of the obstacle (character in need) or the ball (character not in

need) and remained there for 3 s to familiarize infants with the setup. In the anticipatory-looking phase, the helper looked at both characters in turn before he leaned forward and the scene stopped for another 3 s to test infants' anticipated action of the helper (anticipatory-looking phase, see Figure 1b). Finally, the helper helped either the needy character (expected outcome) or the character not in need (unexpected outcome, see Figure 1c). The scene remained for 10 s to assess infants' looking times (violation-of-expectation phase).

Using a within-subject design, each infant saw all eight picture stories in a pseudo-randomized order and counterbalanced for several aspects: The action of the helper in the violation-of-expectation phase (expected, unexpected), the shape and the side of the character requiring help (left, right), and the order of the familiarization trials (reach first, play first). Picture stories varied in the obstacles (see Figure 2) and, in order to sustain infants' attention, we underlaid the picture stories with sounds and varied the shapes and colors of the characters.

In four non-social control trials, infants saw four picture stories with geometrical shapes without googly eyes, arms and legs (see Figure 3), to control for the possibility that effects may merely be explained by visual differences in the two different configurations of geometrical shapes, e.g., the distance between the two shapes or the harmonic movement of both shapes in the play sequence of the familiarization phase. The sequence of these picture stories were identical to the experimental trials, but the shapes did not enter the scene and were already at their final position, to avoid an intentional interpretation. Furthermore, to prevent associations with the experimental trials, the control trials were shown at the beginning of each session, prior to the experimental trials.

Eye-tracking procedure and analysis. Infants sat on their parent's lap, while stimuli were presented on a 24 inch computer screen (at 1728 × 1080 pixels of the full HD resolution), at a distance of 60 to 70 cm. Lights in the laboratory were dimmed. Participants'

gaze was tracked with a remote eye-tracking unit (Tobii X60; Tobii Technology, Stockholm, Sweden), at a sampling rate of 60 Hz. A 5-point calibration was used.

Individual fixations (Velocity-Threshold Identification filter, Tobii Studio 3.3.2) were exported and analyzed in MATLAB (Version R2013a). We defined three areas of interest (AOIs), around the relevant elements of the scene (the two characters and the helper). Infants with less than two valid trials, this is, trials with at least one fixation into the three AOIs, for each experimental phase and outcome (anticipatory-looking, expected outcome, unexpected outcome), were excluded from the analysis. For the analysis of the anticipatory-looking phase, we took the first fixation into one of the AOIs of the two characters (needy, not needy), within the 3 s still frame after the helper bend over to engage in the scene. The number of first fixations is reported in percentage of all valid trials. For the looking time measure in the final scene, we summed the duration of all fixations that fell into the three AOIs from the moment the helper took the ball and for the remaining 10 s, after the ball was passed over. Fixation times were averaged over trials, separately for conditions (expected, unexpected). For the integrated score we used the relative frequency of first fixations on the character in need (of all first fixations on one of the two characters) and the relative, average duration for the unexpected outcome (of the summed average duration of both outcomes). Both scores were z-standardized and then averaged to obtain a single measure for infants understanding of other needs.

Prosocial behavior. Infants' helping behavior was assessed in three task. In the first task (Hepach et al., 2012), the experimenter stacked plastic cups on a table, and then successively dropped 3 cups on the ground and reached out for them unsuccessfully. In a second task (Warneken & Tomasello, 2006), the experimenter and the infant faced one another across a table. Both had three paper balls placed in front of them. The experimenter started to collect the paper balls on her side of the table and then reached for the cups on the infants' side of the table. In both tasks, the experimenter reached out for each object for 30 s

and kept his gaze on the cup (first 15s), before he alternated her gaze between cup and child (last 15s). Third, we assessed infants helping in an informative pointing tasks (Liszkowski et al., 2008). As in the original study, infants sat on their parent's lap and observed the experimenter putting three objects (i.e., office supplies) from a table into boxes at her left or right. When the experimenter was occupied, putting away the second last object, the table flapped half way down on the opposite side, such that the experimenter could not see, how the last object fell from the table. The experimenter turned back, noticed that the object was missing and indicated that she did not know where the object is, looking back and forth between the infant and the empty table for 30 s, uttering "hm… that's strange" (first 15 s) and "hm…Where is it?" (last 15 s). The three helping tasks were correlated, all $r > .30$, all $p < .079$. The proportion of valid trials the infant helped or informed the experimenter was coded, separately for each task, and then averaged for an overall helping score. Inter-rater agreements for 20 % of the data were above Cohen's $\kappa > .88$.

Fine and gross motor skills. Fine and gross motor skills of 16-month-olds' were assessed with age appropriate tasks of the Bayley scales (Bayley, 1993). For fine motor skills, we tested infants' abilities to take apart Duplo bricks, to put 10 paper balls in a container, and their grip when holding a pen to draw. For their gross motor skills, we tested infants' abilities to stand up, to remain standing when they were put in stand, and to walk. Correlations were significant between the fine motor tasks, all $r > .34$, all $p < .041$, and the gross motor tasks, all $r > .65$, all $p < .001$. For each motor task, the level of coordination was rated on a 3- to 5-point Likert scale, before the ratings of each task were rescaled to a scale from 0 to 1 and then averaged to obtain one single score, separately for the fine and the gross motor abilities. Inter-rater agreements for at least 20 % of the data were above Cohens $\kappa > .76$ for fine motor tasks and above Cohen's $\kappa > .62$ for gross motor tasks.

Social interaction. We tested 16-month-olds' social interaction skills in a turn-taking task (Mundy et al., 2003). The experimenter sat opposite of the child on the floor and rolled a

ball and a car to the infant, three times per object. The experimenter then put her hands apart in a posture ready to receive the ball or car. The experimenter waited in this posture, looking at the infant (first 15 s) and then uttered "hey…pass me the car/ball" (last 15 s). The tasks were not correlated, $r = .13$, $p = .441$. The percentage of valid trials the infant rolled back the ball or car was coded for each object and then averaged for an overall social interaction score. Inter-rater agreements for 20 % of the data was Cohen's $\kappa = .64$.

Results

The infants of both age groups understood the characters' needs in the picture stories (see TABLE 1). This was indicated by a higher percentage of first fixations on the character in need ($M = 36.7$ %) compared to the character not in need ($M = 25.9$ %) in the anticipatory-looking phase, $F(1, 76) = 11.65$, $p = 001$, and longer looking times when the helper passed the ball to the character that was not in need (unexpected outcome: $M = 2.59$ s), compared to picture stories in which the helper gave the ball to the character in need (expected outcome: $M = 2.31$ s), $F(1, 76) = 4.22$, $p = .043$. In the anticipatory-looking phase, there was a trend for an Age × Condition interaction, $F(1, 76) = 3.42$, $p = .068$, with a significant effect in the older, $t(36) = 3.55$, $p = .001$, but not in the younger age group, $t(40) = 1.16$, $p = .254$. There was no interaction with age in the violation-of-expectation phase, but older infants looked overall longer on the scene, main effect age: $F(1, 76) = 10.36$, $p = .002$. Underlining that both measures of prosocial understanding capture the same concept, we found that both measures were correlated, $r = -.28$, $p = .017$ (younger infants: $r = -.31$, $p = .060$; older infants, $r = -.33$, $p = .047$).

In four non-social control trials, we used geometrical shapes without googly arms, eyes and legs, and which did not walk into the scene but where already at their final position. This was to avoid an intentional interpretation of the picture stories and thereby to rule out the possibility that differences in gaze behavior would result from physical features of the picture stories. There were no significant differences in the anticipatory-looking (character in need: M

= 26.3%; character not in need: M = 21.6 %), $F(1, 76) = 1.38$, $p = .244$, and the violation-of-expectation phase (character in need received help: M = 2.94 s; character not in need received help: M = 2.92 s), $F(1, 76) = .01$, $p = .909$, without any interaction between age and condition, $F(1, 76) < 1.53$, $p > .221$, for both measures.

Overall rates of helping behavior were much higher in 16-month-olds (M = 54.6 %, SD = 33.1 %), compared to 10-month-olds (M = 8.0 %, SD = 16.1 %), $t(74) = -7.86$, $p < .001$, (separated by task: all $|t| > 5.00$, all $p > .001$), see Table 2 for the mean values by task. Due to the low levels of helping behavior in 10-month olds', further analyses were only conducted in the older age-group. When motor and social interaction skills were not considered, sixteen-month-olds' understanding of others' needs was not related to their helping behavior, $r = .09$, $p = .596$.

Sixteen-month-olds had a rather high level of coordination in the fine motor (Score: M = .79, SD = .15) and the gross motor tasks (Score: M = .81, SD = .21) and socially interacted with the experimenter on average in 65.5 % (SD = 28.5 %) of all trials. All three measures were closely associated with infants' helping behavior, namely infants' fine motor abilities, $r = .47$, $p = .004$, gross motor abilities, $r = .41$, $p = .013$, and social interaction scores, $r = .37$, $p = .024$. Furthermore, we found a relation between infants' fine and gross motor skills, $r = .32$, $p = .052$, but not between the two motor scores and the social interaction score, both $|r| < .02$, $p > .89$.

We used moderation analyses to test whether the link between understanding others' needs and infants' helping behavior would be established by higher motor and social interaction skills, entered as moderators in three independent regression models (Model 1 in PROCESS; Hayes, 2013). The overall regression models were significant for fine motor abilities and social interaction skills, $F(3, 33) = 9.11$, $p < .001$, $R^2 = .35$, and, $F(3, 33) = 6.17$, $p = .002$, $R^2 = .21$, but not for gross motor skills, $F(3, 33) = 2.44$, $p = .081$, $R^2 = .19$. Both fine motor abilities and social interaction skills moderated the relation between infants

understanding of others' needs and their helping behavior, as indicated by a significant and a marginally significant interaction term, $b = .44$, $SE = .26$, $t(33) = 3.03$, $p = .005$, and, $b = .17$, $SE = .09$, $t(32) = 1.79$, $p = .062$, respectively. Furthermore, infants fine motor skills remained a significant predictor in the moderation model, $b = 1.15$, $SE = .26$, $t(33) = 11.75$, $p < .001$. Simple slopes analyses revealed that the moderation effects were mainly driven by the positive relations between infants' prosocial understanding and helping for children with high fine motor or social interaction skills, see Figure 4, i.e., both conditional effects at 1 *SD* above the group mean of the moderators were significant, $b = .10$, $SE = .03$, $t(33) = 2.76$, $p = .008$, and , $b = .09$, $SE = .04$, $t(33) = 2.37$, $p = .024$. The conditional effects at the group mean or 1 *SD* below did not reach significance in both models, all $|t| < 1.61$, $p > .116$.

Discussion

To summarize, we could replicate that infants understand others' needs in their first year (Köster et al., 2016), with infants from a different cultural context. Most strikingly, 16-month-olds' fine and gross motor abilities and their social interaction scores were significantly related to their helping behavior and, furthermore, their fine motor abilities and their social interaction established the link between infants' understanding of others' needs and their helping behavior. Thus, we could confirm our proposal that infants' motor and social interaction skills enable infants to put their understanding of others' needs into prosocial actions.

Already Rheingold (1982) noted that infants' helping behaviors require an "awareness of themselves as actors" (p. 114). In this sense, besides the mere competence to act helpfully, motor abilities may provide infants with an emerging awareness for their own competences to engage helpfully in a certain situation (i.e., action-perception coupling; Anderson et al., 2013). For infants' fine motor skills, this is for example indicated by the close correspondence between coordination of goal-directed actions and their understanding of goal-directed actions (Kanakogi & Itakura, 2011). Regarding infants' gross motor abilities, infants' ability to walk

upright is associated with a better awareness of and coordination in their physical environmentas well as a qualitative change in their social interactions with others, as shown for the wariness of heights (Dahl et al., 2013) and infants bidding of objects to other people (Clearfield, 2011; Karasik et al., 2011) at the end of the first year. However, although infants' social interaction with the experimenter predicted their helping behavior, it did not correlate with their motor abilities. This was possibly due to the relatively low motor demands of the turn taking task for 16-month-olds' (an object directed impetus while sitting). Thus, infants' social engagement may rather reflect their motivation to socially interact with the experimenter. This is in line with findings that former contingent social interactions with a helpee (Barragan, & Dweck, 2014; Carpenter, Uebel, & Tomasello, 2013; Cirelli et al., 2014) or affiliative primes (Over & Carpenter, 2009) that motivate early helping behavior.

Importantly, infants' fine motor skills and their social engagement established a link between their prosocial understanding of others' needs and their helping behavior. Thereby our study provides first evidence that infants put their prosocial understanding of others' needs into helpful actions from early on. This is, as soon as they have the behavioral repertoire to help and are motivated to engage with the helpee.

Infants help to benefit others, which is an essential precondition for early helping behavior to be altruistic. However, for early helping to be altruistic, it is furthermore essential that infants are intrinsically motivated to benefit the other. Suggesting that infants may indeed possess an intrinsic desire that other individuals in need receive help, Hepach and colleagues (2012) found increased sympathetic arousal (indicated by the pupillary response) when infants observed another individual in need for help. However, several further factors have recently been demonstrated to motivate infants' to help. These include maternal socialization practices, such as praise and thanking (Dahl, 2015; Köster, Cavalcante, Carvalho, Resende, & Kärtner, in press), former social interaction with the helpee (Barragan, & Dweck, 2014; Cirelli et al., 2014) and, possibly, reciprocity considerations (Dunfield & Kuhlmeier, 2010). In addition,

the present findings indicate a critical role of infants' motor abilities and social engagement in the ontogeny of helping.

Due to the many factors that may contribute to infants' early motivation to help others, it remains an open question, whether early helping tendencies indicate an altruistic motivation and whether these motives are acquired or innate. However, given that early helping relies on infants' socio-cognitive (learning) abilities to understand others' needs, a sense of themselves as autonomous agents in the social context (Kärtner, 2015), the motivation to socially engage with and to relate to others (Keller & Kärtner, 2013; see also Baumeister & Leary, 1995), and a strong motivation to share psychological states with others (Tomasello, Carpenter, Call, Behne, & Moll, 2005), there is no doubt that early helping behavior is deeply grounded in the social human nature.

To conclude, the findings of the present study suggest that infants understand others' needs already in their first year and they orient their helping behavior towards the needs of others as soon as they possess the motor abilities and the social motivation to help others. However, the present findings also suggest that besides the prosocial intention to benefit others, the early emergence of helping behavior relies on the interplay between several factors, which include an awareness of the own potential role as a helper and the motivation to interact with others socially.

References

Adolph, K. E., & Tamis-LeMonda, C. S. (2014). The costs and benefits of development: The transition from crawling to walking. *Child Development Perspectives, 8*(4), 187-192. doi:10.1111/cdep.12085

Anderson, D. I., Campos, J. J., Witherington, D. C., Dahl, A., Rivera, M., He, M., ... & Barbu-Roth, M. (2013). The role of locomotion in psychological development. *Frontiers in Psychology, 4*(440), 1-17. doi:10.3389/fpsyg.2013.00440

Barragan, R. C., & Dweck, C. S. (2014). Rethinking natural altruism: Simple reciprocal interactions trigger children's benevolence. *Proceedings of the National Academy of Sciences*, *111*(48), 17071-17074. doi:10.1073/pnas.1419408111

Baumeister, R. F., & Leary, M. R. (1995). The need to belong: desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin, 117*(3), 497. doi:10.1037/0033-2909.117.3.497

Bayley, N. (1993). *Bayley scales of infant development: manual*. Psychological Corporation.

Carpenter, M., Nagell, K., & Tomasello, M. (1998). Social cognition, joint attention, and communicative competence from 9 to 15 months of age. *Monographs of the Society for Research in Child Development, 63* (4, Serial No. 255).

Carpenter, M., Uebel, J., & Tomasello, M. (2013). Being mimicked increases prosocial behavior in 18-month-old infants. *Child Development*, *84*(5), 1511-1518. doi:10.1111/cdev.12083

Cirelli, L. K., Einarson, K. M., & Trainor, L. J. (2014). Interpersonal synchrony increases prosocial behavior in infants. *Developmental Science*, *17*(6), 1003-1011. doi: 10.1111/desc.12193

Clearfield, M. W. (2011). Learning to walk changes infants' social interactions. *Infant Behavior and Development*, *34*(1), 15-25.

Dahl, A. (2015). The developing social context of infant helping in two US samples. *Child Development*, *86*(4), 1080-1093. doi:10.1111/cdev.12361

Dunfield, K. A., & Kuhlmeier, V. A. (2010). Intention-mediated selective helping in infancy. Psychological science. doi:10.1177/0956797610364119

Eisenberg, N., Fabes, R. A., & Spinrad, T. (2006). Prosocial Development. In N. Eisenberg (Ed.), *Handbook of Child Psychology: Social, Emotional, and Personality Development* (pp. 646-718). New York: Willey.

Hamlin, J. K., Wynn, K., & Bloom, P. (2007). Social evaluation by preverbal infants. *Nature, 450*(7169), 557-559. doi:10.1038/nature06288

Hayes, A. F. (2013). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. Guilford Press.

Hepach, R., Vaish, A., & Tomasello, M. (2012). Young children are intrinsically motivated to see others helped. *Psychological Science, 23*(9), 967-972. doi:10.1177/0956797612440571

Kanakogi, Y., & Itakura, S. (2011). Developmental correspondence between action prediction and motor ability in early infancy. *Nature communications*, *2*, 341. doi:10.1038/ncomms1342

Karasik, L. B., Tamis-LeMonda, C. S., & Adolph, K. E. (2011). Transition from crawling to walking and infants' actions with objects and people. *Child Development*, *82*(4), 1199-1209. doi:10.1111/j.1467-8624.2011.01595.x

Köster, M., Cavalcante, L., Carvalho, R., Resende, B. D., & Kärtner, J. (in press). Cultural influences on toddlers' prosocial behavior: How maternal task assignment relates to helping others. *Child Development.*

Köster, M., Ohmer, X., Nguyen, T. D., & Kärtner, J. (2016). Infants Understand Others' Needs. *Psychological Science, 27*(4), 542-548. doi:10.1177/0956797615627426

Liszkowski, U., Carpenter, M., & Tomasello, M. (2008). Twelve-month-olds communicate helpfully and appropriately for knowledgeable and ignorant partners. *Cognition*, *108*(3), 732-739. doi:10.1207/s15327647jcd0702_2

Mundy, P., Delgado, C., Block, J., Venezia, M., Hogan, A., &Seibert, J. (2003). *A manual for the Abridged Early Social Communication Scales (ESCS)*. Retrieved 2016, from http://education.ucdavis.edu/? Neisser, U. (1993). *The Perceived self: Ecological and interpersonal sources of self-knowledge.* Cambridge England: Cambridge University Press.

Over, H., & Carpenter, M. (2009). Eighteen-month-old infants show increased helping following priming with affiliation. *Psychological Science, 20*(10), 1189-1193. doi:10.1111/j.1467-9280.2009.02419.x

Paulus, M. (2014). The Emergence of Prosocial Behavior: Why Do Infants and Toddlers Help, Comfort, and Share? *Child Development Perspectives, 8*(2), 77-81. doi:10.1111/cdep.12066

Rheingold, H. L. (1982). Little children's participation in the work of adults, a nascent prosocial behavior. *Child Development, 53*(1), 114-125.

Tomasello, M., Carpenter, M., Call, J., Behne, T., & Moll, H. (2005). Understanding and Sharing intentions: the origins of cultural cognition. *Behavioral and Brain Sciences, 28*(5), 675-735. doi:10.1017/S0140525X05000129

Warneken, F., & Tomasello, M. (2006). Altruistic helping in human infants and young chimpanzees. *Science, 311*(5765), 1301-1303. doi:10.1126/science.1121448

Warneken, F., & Tomasello, M. (2007). Helping and cooperation at 14 months of age. *Infancy, 11*(3), 271–294. doi:10.1080/15250000701310389

Warneken, F., & Tomasello, M. (2009). Varieties of altruism in children and chimpanzees. *Trends in Cognitive Science, 13*(9), 397-402. doi:10.1016/j.tics.2009.06.008

Table 1

Results for the Anticipatory-Looking and Violation-of-Expectation Phases

	Age group	
	10 months	16 months
Anticipatory-looking (% of trials)		
First look at the character in need	29.7 (3.5)	44.5 (3.1)
First look at the character not in need	24.6 (3.1)	27.4 (3.1)
Violation-of-expectation (looking time in s)		
Character in need received help	1.76 (.26)	2.93 (.26)
Character not in need received help	2.07 (.24)	3.18 (.31)

Note: The table presents mean values with standard errors in parentheses.

Table 2

Results of the helping tasks

	Age group	
	10 months	16 months
Cup task	10.4 (.03)	54.6 (.07)
Paperball task	8.1 (.04)	66.7 (.07)
Informative pointing task	6.5 (.03)	47.1 (.07)

Note: Values indicate the mean percentage of trials that infants helped in the respective task, together with standard errors in parentheses.

Figure 1

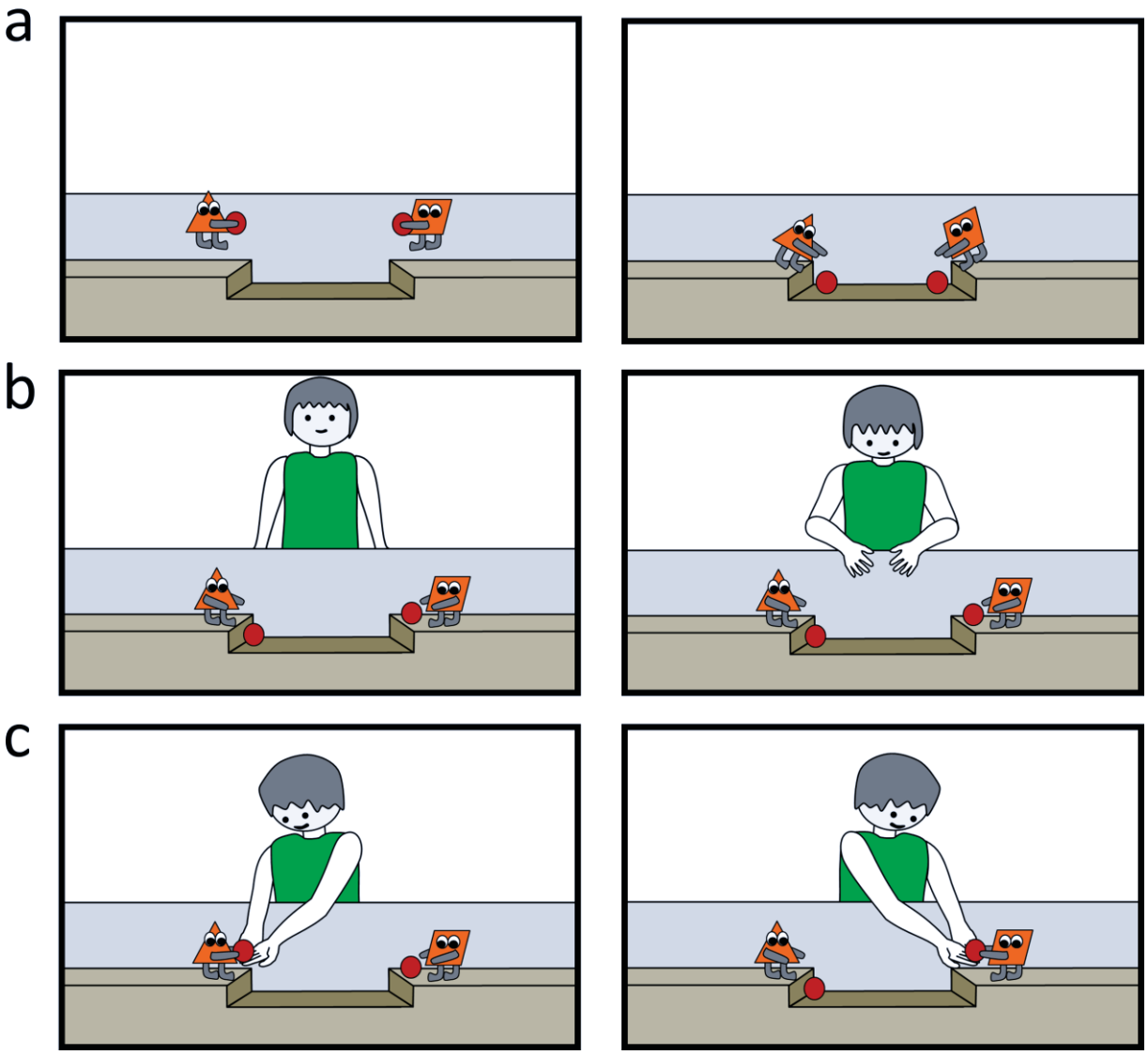

Figure 1. The sequence of a sample picture story. In the familiarization phase (a), the two characters entered the scene, picked up a ball in front of them and played with it, jumping up and down. The scene faded out, before the characters entered the scene a second time. This time the ball was placed behind an obstacle and the characters reached out for it unsuccessfully. In the anticipatory-looking phase (b), a helper appeared in the background of the scene and the characters entered the scene again. This time, one character (character in need) was prevented from reaching the ball, but the other character (character not in need) was able to reach the ball. The helper looked to both sides, before he leaned over to engage in the scene. The scene paused for 3 s to provoke anticipatory-looking behavior (b, left panel). In the violation-of-expectation phase, in half of the trials the helper helped the character in need (expected; c, left panel); in the other half of the trials the helper helped the other character, which was able to reach the ball on its own (unexpected outcome; c, right panel).

Figure 2

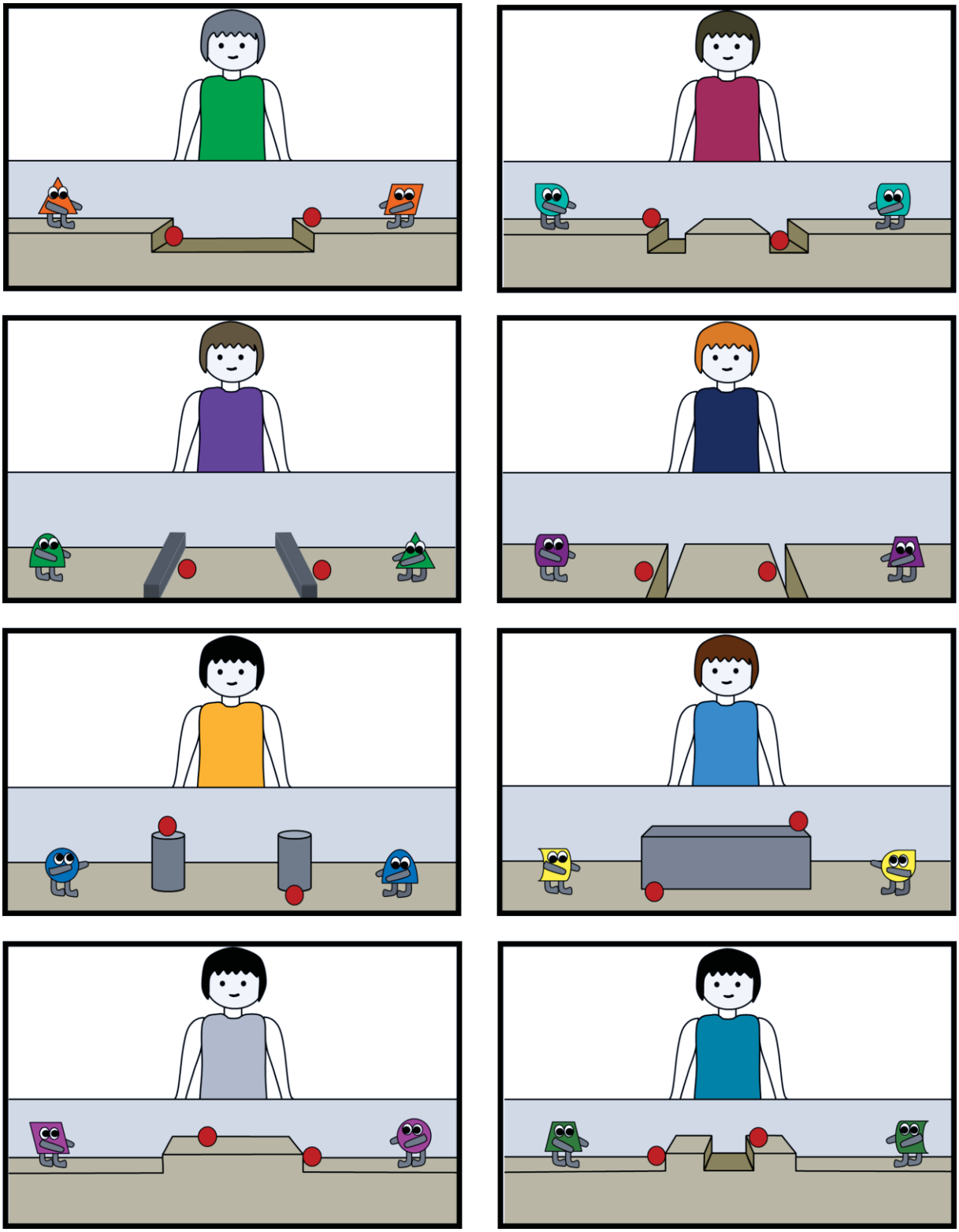

Figure 2. The eight picture stories shown to the infants. Picture stories varied in the type of obstacle, preventing the character in need from goal achievement (top, left to bottom, right): large ditch, and two ditches, long brick, gap in the ground, cylinders, wall, one hill, two hills.

Figure 3

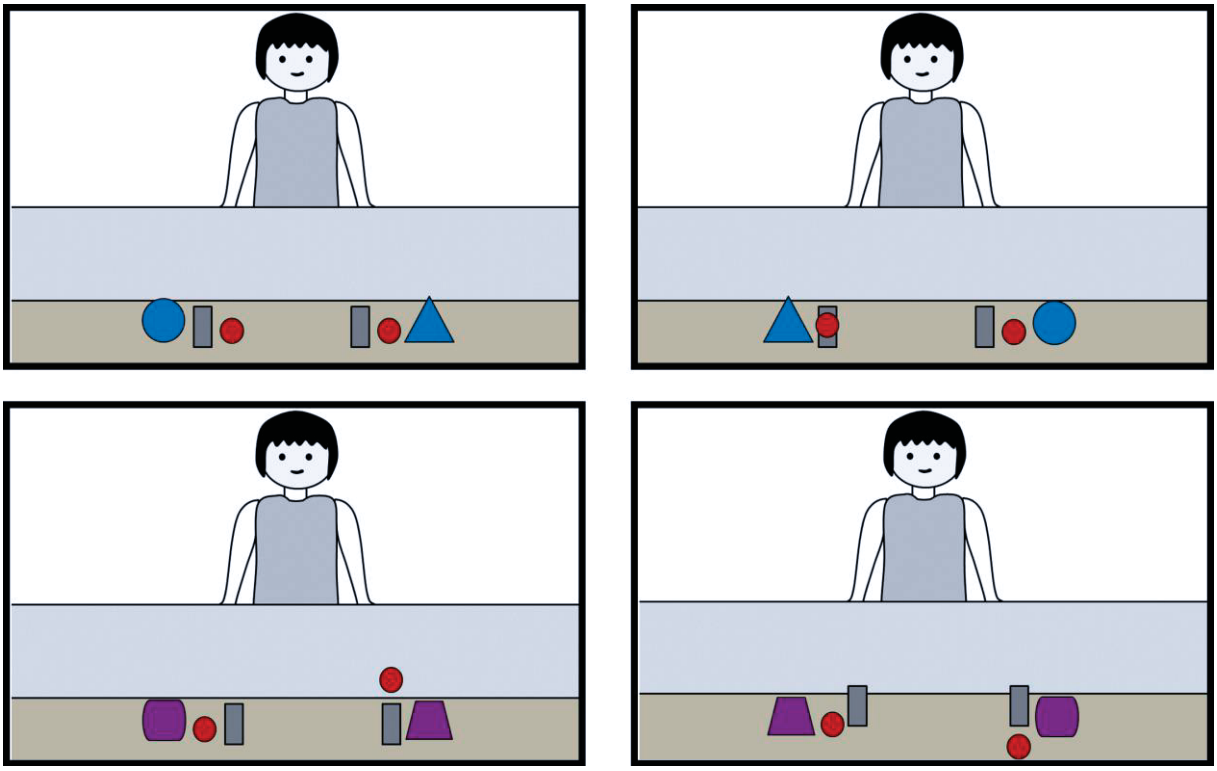

Figure 3. The four non-social control trials. The configuration and movements of shapes as well as the behavior of the helper resembled the sequences of the experimental trials. Googly eyes, arms and legs were removed and, in contrast to the experimental trials, the shapes did not enter and move towards the balls as in the experimental condition, to avoid an intentional interpretation. To avoid associations with the experimental trials, we showed the control trial to each participant at the beginning of each session, before the presentation of the experimental trials.

Figure 4

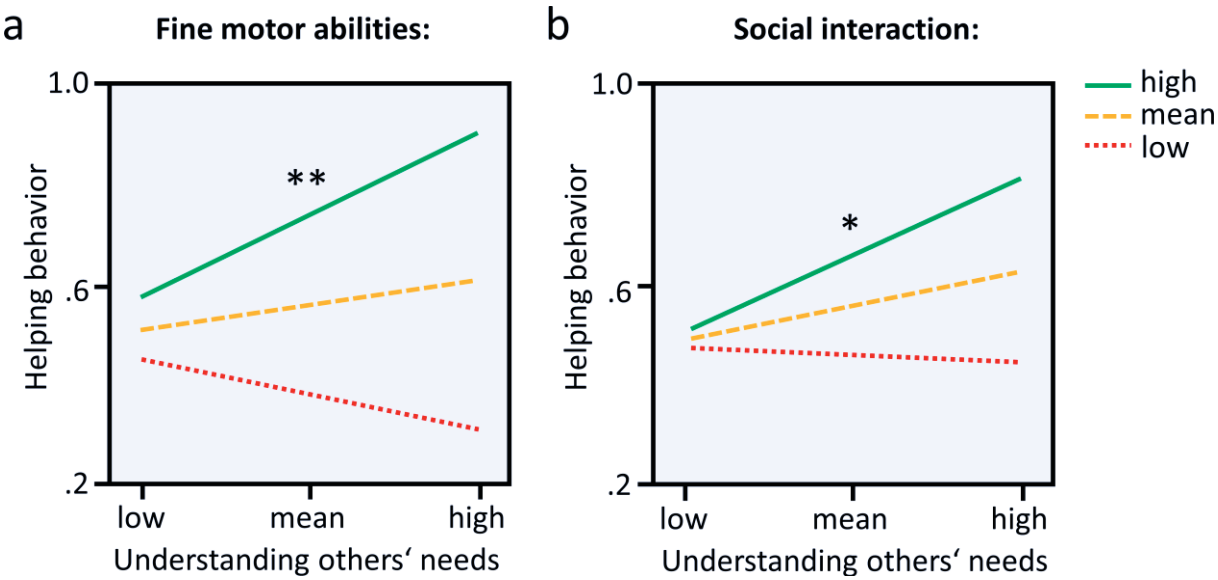

Figure 4. Simple slopes analyses of the moderation effects. The lines depict the conditional effects between infants understanding of others' needs and their helping behavior at different levels of the moderators, namely infants' fine motor abilities (a) and social interaction skills (b). Levels of the moderator and infants' understanding of others' needs correspond to plus 1 *SD* (high), the mean, and minus 1 *SD* (low) of the scores that were entered into the regression models. Infants understanding of others' needs was associated with their helping behavior at high levels of the moderator variables, * $p < .05$, ** $p < .01$.

Cultural Influences on Toddlers' Prosocial Behavior: How Maternal Task Assignment Relates to Helping Others

Moritz Köster[1,2], Lilia Cavalcante[3], Rafael Vera Cruz de Carvalho[4], Briseida Dôgo Resende[5], & Joscha Kärtner[1]

[1] Department of Developmental Psychology, University of Münster, Germany
[2] Department of Psychology, University of Osnabrück, Germany
[3] Institute of Applied Social Sciences, Federal University of Pará, Belém, Brazil
[4] Institute of Psychology, University of the State of Rio de Janeiro, Brazil
[5] Department of Experimental Psychology, University of São Paulo, Brazil

Corresponding author:
Moritz Köster
Fliednerstr. 21
48149 Münster
Germany
Tel.: +49 (0)251 8334206
E-mail: moritz.koester@uni-muenster.de

Acknowledgements:
We would like to thank Maria Lucia Seidl-de-Moura, Heidi Keller, Tatiana Afonso, Simone Silva, and Fernando Pontes for their organizational support and Chisato Fukuda, Alena Klier, Laura Martin, Luciana Vilhena, Bianca Reis, Jéssica Carvalho, and Timo Gnambs for their assistance with the data assessments, coding and analyses.

Abstract

This cross-cultural study investigates how maternal task assignment relates to toddlers' requested behavior and helping between 18-30 months. One hundred seven mother-child dyads were assessed in three different cultural contexts (rural Brazil, urban Germany, and urban Brazil). Brazilian mothers showed assertive scaffolding (serious and insistent requesting), while German mothers employed deliberate scaffolding (asking, pleading, and giving explanations). Assertive scaffolding related to toddlers' requested behavior in all samples. Importantly, assertive scaffolding was associated with toddlers' helping in rural Brazil, while mothers' deliberate scaffolding related to toddlers' helping behavior in urban Germany. These findings highlight the role of caregivers' socialization practices for the early ontogeny of helping behavior and suggest culture-specific developmental pathways along the lines of interpersonal responsibility and personal choice.

Keywords: helping behavior, task assignment, culture-specific developmental pathways

Cultural Influences on Toddlers' Prosocial Behavior: How Maternal Task Assignment Relates to Helping Others

Young children's engagement in daily tasks has been ascribed a key role in the development of prosocial behavior (Dahl, 2015; Hammond & Carpendale, 2015; Rheingold, 1982). Furthermore, anthropological studies suggest that the way in which caregivers involve their children in household chores differs markedly between cultural contexts, providing children with very different learning experiences (Ochs & Izquierdo, 2009; Whiting & Edwards, 1992). Building on these findings, the present study systematically investigated how mothers in three different cultural contexts assign tasks to their children and how this relates to requested behavior and helping behavior of 18- to 30-month-old toddlers. More specifically, the way in which mothers structure occasions for toddlers' social responsiveness may have important implications for the cultural roots of toddlers' socially responsive behavior and, possibly, the motivation underlying prosocial behavior.

In a former cross-cultural study, Callaghan et al. (2011) found that toddlers' helping behavior was similar for 18- and 24-month-olds across different cultural contexts. The authors interpreted their results as evidence for the idea that human natural prosocial tendencies are only modulated by socialization experiences beyond this age (see also, Warneken & Tomasello, 2006, 2009). However, the comparison of absolute levels of toddlers' helping behavior does not rule out possible influences of culture-specific socialization experiences *per se*. That is, although developmental outcomes may look similar in different cultural contexts, the learning processes and motivational factors underlying these developmental outcomes might differ (Keller and Kärtner, 2013). As a consequence, early helping behavior, even if at a similar level across cultures, might be associated with culture-specific learning experiences. Contrary to a late-emergence perspective, we propose that culture-specific socialization experiences influence toddlers' natural prosocial tendencies from early on.

More generally, former research has shown that several developmental attainments in the first and second year are sensitive to the cultural background in which they occur, including the 2-month shift (Kärtner, 2015), attachment (Keller, 2013), and self-recognition (Kärtner, Keller, Chaudhary, & Yovsi, 2012). Regarding toddlers' empathically motivated prosocial behavior, a cross-cultural study by Kärtner and colleagues (2010) found that comforting behavior in 19-month-olds depends on toddlers' sense of themselves as autonomous intentional agents (as indexed by mirror self-recognition) in Western urban middle-class families, but not in a non-Western context, indicating culture-specific mechanisms underlying early comforting behavior.

Concerning helping behavior, cross-cultural research suggests considerable variation in the way social responsiveness is conceptualized across cultures (Miller & Bersoff, 1992; Miller, Bersoff, & Harwood, 1990). According to US-American folk theories, helping behavior is only considered prosocial if it is shown deliberately, i.e., based on personal choice or guided by a value that has personal significance (Miller & Bersoff, 1992). In the case that helping behavior is requested, referred to as requested behavior in the following, prosocial behavior is typically discounted as obedience or conformity. Intuitions are very different for Hindu Indian children and adults. Already eight-year-old Hindu Indians ascribe a strong motivating force to obligations derived from interpersonal relationships and social norms. Importantly, for Hindu Indians, acting in accordance with social obligations does not discount prosociality, indicating a less clear distinction between the concepts of requested and prosocial behavior. Thus, there are profound cultural differences in the degree to which being responsive to others' requests and needs is interpreted: either as a matter of deliberate choice or interpersonal obligation.

As a consequence, there are cultural differences in the way individuals perceive situations in which other individuals require help (Miller, Bersoff, & Harwood, 1990). This has important implications for the motivation underlying prosocial behavior: For US-

Americans to count as prosocially motivated, helping others has to be self-referential, intrinsic and free of external constraints or enforcements. Thereby, prosocial behavior is unrelated to requested behavior in terms of underlying motivations. For Hindu Indians, being socially responsive to others who are either in need or request something are closely associated, since both are motivated by interpersonal obligations. Thereby, prosocial behavior and requested behavior should be related in terms of underlying motivations. Here, we address the question, how different concepts of helping behavior translate into parenting behavior and to what extent these socialization practices relate to toddlers' requested behavior and helping.

In many subsistence-based farming ecologies obedient behavior and the fulfillment of interpersonal responsibilities are primary socialization goals and are seen as key indicators of social competence and optimal development (Keller, 2007; Kärtner et al., 2012; Lancy's [2012] chore curriculum; Levine et al., 1994, Nsamenang, 1992). In these contexts, toddlers are typically expected to engage in daily tasks from early childhood on (Nsamenang, 1992) and are assigned more responsible tasks as they get older, such as sibling care (Whiting & Edwards, 1992) and domestic work (Ochs & Izquierdo, 2009). Many authors describe the socialization towards responsibility and the involvement in household chores as the cradle for prosocial behavior (Ochs & Izquierdo, 2009; Lancy, 2012). On the contrary, toddlers' interpersonal responsibility and the involvement in household chores are of lower significance in Western urban middle-class samples (Ochs & Izquierdo, 2009; Whiting & Whiting, 1975), where parents emphasize children's individuality and autonomy (Keller, 2007).

These cultural differences regarding concepts of helping behavior and ethnotheories on the role of task assignment for child development should have implications for the way in which parents scaffold task assignment and completion. In the present study, the ecosocial model of child development (Keller 2007; Keller & Kärtner, 2013) is used as a heuristic to systematize and interpret these cultural variations. According to this framework, cultural models (defined as shared meanings and practices) have evolved as adaptations to the

ecosocial context (i.e., the ecological and socio-structural constituents of the environment, such as the mode of subsistence, family composition, degree of formal education). In particular, the ecosocial model of development describes two prototypical ecosocial contexts, which give rise to specific cultural models (i.e., caregivers' socialization goals, ethnotheories, and parenting behavior): In relational ecosocial contexts, i.e., subsistence-based farming ecologies in non-Western societies with extended family systems and low levels of formal education, caregivers show a high emphasis on socialization goals associated with hierarchical relatedness, such as respect, obedience, and taking on responsibilities associated with social roles (Kärtner et al., 2008; Keller & Kärtner, 2013). Conversely, caregivers' from autonomous ecosocial contexts, i.e., urban middle-class families in Western societies that live as nuclear families and have high levels of formal education, emphasize socialization goals associated with psychological autonomy, such as individuality, independence, and personal choice (Kärtner et al., 2008; Keller & Kärtner, 2013). Notably, these cultural orientations correspond closely to the different conceptualizations of helping behavior and the cultural differences in task assignment outlined above, namely, being a matter of interpersonal responsibility or personal choice. With regard to culture-specific developmental pathways, it is assumed that caregivers' socialization practices act as the proximate mechanisms of cultural transmission: By providing the primary learning context for the interpretation of different situations and the role of the child within the social environment, caregivers shape toddlers' motivation and behavior from early childhood on (e.g., Kärtner, 2015; Keller, 2007; Levine et al. 1994).

Besides the two prototypical ecosocial contexts described here, there are many other ecosocial contexts that afford very different cultural models. In the present study, we chose one other often-studied context, namely, educated urban middle-class families from a non-Western society. In these contexts, cultural models are often composed of elements of both

prototypes described above and thus referred to as autonomous-relational (Kağitcibaşi, 2007; Keller, 2007).

The overarching goal of the present study was to investigate how maternal socialization practices during task assignment vary across cultures and how they relate to toddlers' requested behavior and helping in the three ecosocial contexts. Maternal scaffolding during task assignment and completion was assessed in a standardized situation, i.e., asking the toddler to put objects on a table. Furthermore, we evaluated toddlers' requested behavior in the same task and toddlers' helping behavior towards an experimenter who was unable to reach objects in a second task. Thus, helping behavior differed from requested behavior in two important ways: first, there was no explicit request to help but a situation that afforded spontaneous engagement, and, second, the recipient was not the mother of the child but an unfamiliar adult.

We hypothesized that caregivers' cultural models inform their scaffolding strategies during task assignment. In particular, we predicted that mothers in relational cultural contexts emphasize toddlers' interpersonal responsibility by assigning tasks in a serious and insistent manner (assertive scaffolding). We further predicted that mothers in autonomous cultural contexts emphasize toddlers' autonomy and personal choice by asking, pleading, and providing explanations when assigning tasks (deliberate scaffolding). We expected a combination of both scaffolding styles for the autonomous-relational context. Furthermore, we hypothesized that maternal scaffolding relates to toddlers' requested behavior and helping in culture-specific ways. More specifically, we predicted that in the relational cultural context, assertive scaffolding is associated with requested behavior and, due to the conceptual link between both types of behavior in this cultural context, also relates to toddlers' helping. Because the assignment of routine tasks is described as an important learning contexts of socially responsive behavior in these cultures, we hypothesized that toddlers' requested behavior in response to maternal requests mediates the relation between maternal scaffolding

and toddlers' help. In autonomous contexts we expected that maternal deliberate scaffolding is related to toddlers' prosocial behavior. That is, structuring being responsive to others' needs as a matter of personal choice may influence toddlers' interpretation of and motivation in situations affording helping behavior. Furthermore, we explored how the two types of scaffolding relate to requested behavior in the autonomous context. Since in autonomous-relational contexts cultural models often combine elements of both prototypes, we further explored how maternal scaffolding relates to toddlers' requested behavior and helping in one of these cultural contexts.

Method

Participants

We assessed 107 mother-child dyads, in three different cultural contexts, selected for their ecosocial profiles. Thirty-four families lived in small agricultural villages near Belém (Amazon region, rural Brazil, relational context), hereafter referred to as Belém, 38 were middle-class families from Münster (urban Germany, autonomous context), and 35 were middle to upper-middle class families from São Paulo (urban Brazil, autonomous-relational context). In villages near Belém, families were recruited in cooperation with local health offices. In Münster and São Paulo mothers were contacted via nursery schools, databases from the university, and private contacts of local research assistants. All complete data assessments were included in the analysis. Ten additional data assessments were not included in the analysis, because toddlers' were unwilling to participate (São Paulo: $n = 1$), nannies instead of mothers participated in the study (São Paulo: $n = 4$), or the first experimenter was male (Belém: $n = 5$). The study was approved by local ethic committees and informed written consent was obtained from all mothers.

Toddlers were 18 to 30 months old and there were no significant mean differences between samples ($M = 24.2$ months, $SD = 3.9$ in Belém, $M = 24.2$ months, $SD = 3.7$ in Münster, and $M = 23.1$ months, $SD = 3.6$ in São Paulo), $F(2, 104) = 0.87$, $p > .10$, $\eta_p^2 = 0.02$.

Furthermore, there were similar proportions of girls and boys in the three samples (50.0% girls in Belém, 55.3% girls in Münster, and 54.3% girls in São Paulo), $\chi^2 = .22$, $p > .10$. The primary caregiver of each child, referred to as mothers throughout the text, participated in the study. This was the mother in most families (98.1%), except for two grandmothers in Belém. Age of the mothers differed significantly between contexts, $F(2, 104) = 16.70$, $p < .001$, $\eta_p^2 = 0.24$. On average, mothers from Münster ($M = 33.6$ years, $SD = 4.8$) and São Paulo ($M = 31.8$ years, $SD = 6.3$) were older than those from Belém ($M = 25.1$ years, $SD = 8.2$), $t(70) = 5.45$, $p < .001$, $d = 1.28$, and $t(67) = 3.83$, $p < .001$, $d = 0.92$, respectively.

Agricultural villages in the Amazon region near Belém (more precisely, the villages of Boa Vista, Pacuquara, and St. Teresina), were settlements of around 50-300 families, living in simple houses made of wood or brick stone. Mothers were mainly housewives, while fathers were mostly occupied in the agricultural sector, e.g., the cultivation and processing of local plants. Material possessions were few. However, villages were connected to the power supply system, many households had a television and a few daily busses connected the villages to the urban region of Castanhal (approx. 30-60 minutes). Most children received basic school education at local schools. In contrast, Münster is an urban center in a postindustrial Western society and São Paolo a metropolitan city in a newly industrialized country. In both urban samples, families had a high level of formal education and most parents worked in jobs requiring a professional qualification.

The nuclear family was the dominant family type in the urban samples (Münster 94.7%; São Paulo 88.6%), while the home environment of toddlers from Belém showed more variability, i.e., living in extended families with the grandparents (38.2%), and or without their father (23.5%), $\chi^2 = 21.33$, $p < .001$. Across contexts, the majority of toddlers were the only child (Belém, 47.1%; Münster, 68.4%; São Paulo, 65.7%), $\chi^2 = 3.93$, $p > .10$. On average, household sizes were 4.4 ($SD = 1.3$) people per household in Belém, 3.3 ($SD = 0.9$) in Münster and 3.5 ($SD = 1.1$) in São Paulo, $F(2, 104) = 9.44$, $p < .001$ $\eta_p^2 = 0.15$, with higher

household sizes in Belém than in Münster and São Paulo, $t(70) = 4.07$, $p < .001$, $d = 0.99$, and, $t(67) = 3.13$, $p < .01$, $d = 0.75$. Regarding educational attainments, mothers in both urban samples had received more formal education (Münster, $M = 16.1$ years, $SD = 2.9$; São Paulo, $M = 16.5$ years, $SD = 1.9$) than those in rural villages near Belém ($M = 9.3$ years, $SD = 2.5$), $F(2, 104) = 91.00$, $p < .001$, $\eta_p^2 = 0.64$, with $t(70) = 10.53$, $p < .001$, $d = 2.51$, and, $t(67) = 13.47$, $p < .001$, $d = 3.25$, respectively.

Procedure and Coding

Two experimenters visited families at home for one experimental session. The first experimenter (E1), a local, female research assistant at all three sites, administered questionnaires and conducted the behavioral tasks, while the second experimenter (E2) prepared behavioral assessments and videotaped the behavior of mother and child during the tasks. Sessions started with the administration of questionnaires by E1, while E2 prepared the behavioral assessments. During a subsequent warm-up phase E1 and the child played with a standardized set of toys for about 10-15 minutes. The warm-up phase was followed by the behavioral assessments and ended with a socio-demographic questionnaire. Tasks analyzed in the present study were part of a more extensive data assessment.

Inter-rater agreement for behavioral measures was calculated between the first author and a research assistant for a random sample of 18 videos for each task. Cohen's kappa was used to quantify inter-rater agreements. To maximize objectivity, maternal scaffolding styles and toddlers' behavior were coded independently, by two different research assistants.

Socialization goals. To examine caregivers' cultural models, maternal autonomous and relational socialization goals were assessed using a modified version of the questionnaire by Keller (2007). The autonomous socialization goals scale refers to toddlers' self-confidence and assertiveness (eight items; e.g., during the first three years of life, children should develop a sense of self-esteem), while the relational socialization goals scale refers to toddlers' sociability and obedience (nine items; e.g., learn to behave in accordance with social norms).

To account for differences in reading skills and the familiarity with fine-graded responses between samples, questionnaires were administered as standardized interviews and a 4-point Likert scale was visualized with circles of different sizes (Cronbach's $\alpha > .76$, for both scales in all three contexts).

Maternal scaffolding. Maternal scaffolding during task assignment was assessed with a task adapted from former studies (e.g., Keller et al., 2004). Mothers were instructed to ask their child to pick up a cup and a pen, one after another, and to put them on a table. Specifically, mothers were told: "We are interested to find out if your child is already able to understand and follow simple instructions. Please ask your child to bring these objects over to the table. Please give the instruction in the same way that you would usually do, if you wanted your child to bring you something. Please do not directly pass over the cup to your child." E1 instructed the mother out of toddlers' earshot and without providing a model of what to say. E2 previously placed the objects at locations the child could easily see and access and assured that the table was easily accessible. The task was stopped when the child had fulfilled the requests or the mother stopped instructing her child. Maternal scaffolding in this task was evaluated by two scores representing the two strategies introduced above, namely assertive and deliberate scaffolding.

Assertive scaffolding. For mothers' assertive scaffolding, we analyzed maternal emphasis on toddlers' fulfillment of the task. We rated maternal scaffolding with regard to seriousness (indicated by the tone of the voice, facial expressions, and gestures) and insistence, if toddlers' showed hesitant or irrelevant behaviors (indicated by repeated requesting). Specifically, assertive scaffolding was rated on a scale from 0 to 3: toddlers' fulfillment of the task was either *very important* to the mother (3 points; i.e., serious requests and insistent repetition of requests), *rather important* (2 points; i.e., less serious or less insistent repetition of requests), *rather unimportant* (1 points; i.e., barely serious requests or very few repetitions of requests) or *unimportant* (0 points; i.e., no serious requesting and no

repetitions of requests. Overall, toddlers' compliance seemed irrelevant to the mother). Inter-rater agreement was high (κ = .91).

Deliberate scaffolding. For mothers' deliberate scaffolding, we defined a composite score that consisted of three categories that capitalize on personal choice and commitment to help, resulting in scale from 0 to 6: First, mothers were given 2 points if the first request was given as a *question* (only 1 point for a tag-question). Second, mothers were given 2 points if the first request was delivered as a *plea*, e.g., "Peter, could you please take the pen over there and put it on this table?" (only 1 point for the use of "please" in a statement, e.g., "Put the pen over there on this table, please!"). Third, mothers were given 2 points if they gave at least one *explanation for the request*, e.g., "I need the pen to write something". Here, statements like "Because I said so" were not included because they do not constitute logical reasons that may foster insight. Each of the three categories was given 0 to 2 points such that they equally contributed to the composite score. Raters showed high inter-rater agreement for the three categories (question, κ = .82; plea, κ = .87; explanation, κ = 1.00).

Requested behavior. We furthermore coded toddlers' responsiveness to maternal task assignment in the same task (see previous section). Thus, both measures capture different aspects of the same dyadic interaction. We rated whether toddlers followed maternal requests to put both objects on a table, and the promptness of toddlers' compliance. For each object, toddlers' requested behavior was rated on a scale from 0 to 3: *immediately* (3 points; i.e., complied immediately, kept attentional focus on the fulfillment of the task), *a little hesitantly* (2 points; i.e., did not help immediately or did not keep focused on the task continuously), *hesitantly* (1 point; i.e., only after the engagement in other activities or great efforts of the mother), or *not successfully* (0 points; i.e., the object was not put on the table). We computed the mean score across the two objects, resulting in a score from 0 to 3. Inter-rater agreement was good (κ = .71).

Helping behavior. Toddlers help was assessed in an out-of-reach task, adapted from Warneken and Tomasello (2006): E1 hanging up three towels using clothespins. For each towel the experimenter dropped one clothespin and reached for it unsuccessfully, grasping over the clothesline. While reaching, E1 kept her gaze on the clothespin (first 30s), before she alternated her gaze between clothespin and child (30s), and, finally, addressed the child by calling his or her name tree times (last 30s). If the child did not help, E1 picked up the clothespin and continued with the next towel. For each clothespin, toddlers' helping behavior was rated on a scale from 0 to 3 as *immediately* (3 points; i.e., the clothespin was picked up and handed over immediately), *a little hesitantly* (2 points; i.e. waiting a little while before helping), *hesitantly* (1 point; i.e. engagement in other activities before helping or keeping possession of the clothespin before passing it over), or *not successfully* (0 points; i.e. the clothespin was not picked up or given to E1). The mean scores of the three objects, resulting in a score from 0 to 3, were used for the analyses. Inter-rater agreement was very good (κ = .96).

Results

Cross-Cultural Differences in Maternal Socialization Goals, Maternal Scaffolding and Toddlers' Behavior

Cross-cultural differences in maternal socialization goals (SGs), maternal scaffolding and toddlers' behavior were analyzed using analyses of variance (ANOVAs) and post hoc *t*-tests. Reported effect sizes are partial eta squared η_p^2 for ANOVAs and Cohen's *d* for *t*-tests. Mean values and *SD*s are displayed in Table 1.

Maternal socialization goals revealed significant main effects for the factors Scale, $F(2, 104) = 7.95$, $p < .01$, $\eta_p^2 = 0.07$, and Culture, $F(2, 104) = 13.84$, $p < .001$, $\eta_p^2 = 0.21$, further explained by the interaction between both factors, $F(2, 104) = 92.47$, $p < .001$, $\eta_p^2 = 0.64$. Between contexts, mothers from Belém and São Paulo valued relational SGs significantly higher than mothers from Germany, $t(70) = 5.43$, $p < .001$, $d = 1.28$, and, $t(71) =$

7.04, $p < .001$, $d = 1.65$. Regarding autonomous SGs, mothers from the urban samples showed higher emphasis on autonomy than those from rural villages, $t(70) = 7.10$, $p < .001$, $d = 1.67$, and, $t(67) = 6.77$, $p < .001$, $d = 1.62$, for Münster and São Paulo, respectively. Within samples, mothers from Belém and São Paulo prioritized relational over autonomous SGs, $t(33) = 10.40$, $p < .001$, $d = 1.652$, and, $t(34) = 2.30$, $p < .05$, $d = 0.36$, while mothers from Münster put more emphasis on autonomous SGs, $t(37) = 7.97$, $p < .001$, $d = 1.27$. Altogether, these patterns of socialization goals fit very well with the cultural models expected in the three different ecosocial contexts.

Maternal behavior revealed significant differences between cultural groups for both, assertive, $F(2, 104) = 4.32$, $p < .05$, $\eta_p^2 = 0.08$, and deliberate scaffolding, $F(2, 104) = 92.62$, $p < .001$, $\eta_p^2 = 0.64$. Mothers' from Belém and São Paulo samples showed higher degrees of assertive scaffolding than German mothers, $t(70) = 2.98$, $p < .01$, $d = 0.71$, and, $t(71) = 2.01$, $p < .05$, $d = 0.48$. On the contrary, deliberate scaffolding was much higher in Münster than in Belém and São Paulo, with $t(70) = 12.18$, $p < .001$, $d = 2.91$, and, $t(71) = 9.17$, $p < .001$, $d = 2.19$. Furthermore, mothers from São Paulo showed higher deliberate scaffolding than those from rural Brazil, $t(67) = 3.08$, $p < .01$, $d = 0.75$, where this scaffolding style was almost absent. To substantiate the idea that cross-cultural variation in maternal scaffolding styles are related to maternal cultural models, i.e., their socialization goals, we entered maternal preference for autonomous over relational socialization goals (i.e., the difference between both measures) as a covariate into the one-factorial (culture) analyses of variance (van de Vijver & Leung, 1997). Compared to the results of the ANOVA reported above the main effects of culture on maternal scaffolding styles were reduced for assertive scaffolding, $F(2,103) = 1,623$, $p > .10$, $\eta_p^2 = 0.03$, and deliberate scaffolding, $F(2,103) = 32,803$, $p = .001$, $\eta_p^2 = 0.38$. Thus, maternal socialization goals explained more than half of the cross-cultural variation in assertive scaffolding and more than a third in of the large cross-cultural variation in deliberate scaffolding.

Toddlers' requested behavior differed between ecosocial contexts, $F(2, 104) = 5.75$, $p < .01$, $\eta_p^2 = 0.10$, with significantly higher levels of requested behavior in toddlers from Germany as compared to Belém and São Paulo, $t(70) = 2.76$, $p < .01$, $d = 0.65$, and, $t(71) = 2.94$, $p < .01$, $d = 0.70$, respectively. Toddlers' instrumental help towards E1 was at similar levels across samples, $F(2, 104) = 0.70$, $p > .10$, $\eta_p^2 = 0.01$.

We further tested whether behavioral measures of mother and child were correlated with toddlers' age and gender, maternal education, the number of siblings and family size. Toddlers' age was positively correlated with maternal deliberate scaffolding in Münster ($r = .40$, $p < .05$). Furthermore, toddlers' age was associated with higher levels of helping behavior in Belém ($r = .39$, $p < .05$) and São Paulo ($r = .37$, $p < .05$). This indicates that the level of prosocial behavior increased between 18-30 month in the Brazilian samples but not in the German sample. We thus controlled for toddlers' age in all further analyses. On the other hand, toddlers' gender, maternal education as well as the number of siblings and family size were not correlated with behavioral measures in any of the three contexts (all $p > .05$).

Relations between Maternal Scaffolding and Toddlers' Requested Behavior and Helping Behavior

Partial correlations, controlling for toddlers' age, were used to quantify the relations between behavioral measures of mother and child (see Table 2). In rural Brazil, maternal assertive scaffolding was correlated with both toddlers' requested behavior and helping behavior. Furthermore, requested behavior and helping correlated positively. Deliberate scaffolding was not significantly correlated with other behaviors. In urban Germany, maternal deliberate scaffolding was correlated with helping, but not with requested behavior. Maternal assertive scaffolding was related to toddlers' requested behavior ($p = .06$) but not to helping behavior. In São Paulo, maternal scaffolding was not related to toddlers' helping behavior. Like in both other samples, assertive scaffolding was correlated with requested behavior.

Furthermore, deliberate scaffolding correlated negatively with toddlers' requested behavior. Finally, in São Paulo maternal scaffolding styles were correlated negatively.

In addition, path analyses were used to estimate the direct, indirect and total effects of maternal scaffolding styles on toddlers' requested behavior and helping behavior, when considering all relevant variables simultaneously. One path analysis per context was conducted in IBM SPSS Amos 22 for the estimation of standardized path coefficients (direct effects), total effects, and indirect effects. Standardized residuals, controlling for toddlers' age, were used for all variables.

Figure 1 illustrates the results of the path analyses. In Belém, maternal assertive scaffolding predicted toddlers' requested behavior and helping. The path from toddlers' requested behavior to helping behavior was marginally significant. More specifically, while the total effect and the partial correlation between assertive scaffolding and toddlers' help was significant, the direct effect was non-significant in the path model, including requested behavior as a potential mediator. However, the indirect path from assertive scaffolding on toddlers help, which would indicate a mediation, also did not reach significance ($\beta_{ind} = .12$, $p > .10$). Hence, the significant relation between assertive scaffolding and toddlers' helping behavior is composed of both the direct and indirect effect (via requested behavior) that each are non-significant in itself. The regression model for the data from Münster confirmed the effects found in the correlation analysis: Maternal deliberate scaffolding was a significant predictor of toddlers' helping behavior. Furthermore, deliberate scaffolding did not relate to toddlers' requested behavior. As in the Belém sample, requested behavior was predicted by assertive scaffolding. In São Paulo, toddlers' helping behavior was not predicted by maternal scaffolding styles. Like in both other samples, maternal assertive scaffolding predicted toddlers' requested behavior. Also confirming the correlation analyses, maternal scaffolding styles were correlated negatively. However, contrary to the correlation analysis, deliberate scaffolding did not relate to toddlers' requested behavior. Thus, the negative correlation was

rather due to the negative relation between maternal scaffolding styles and the positive relation between assertive scaffolding and requested behavior and is not further discussed.

Furthermore, *z*-tests were used to test the cross-cultural differences in the relation between maternal scaffolding on toddlers' behavior between cultures (Paternoster, Brame, Mazerolle & Piquero, 1998). The relation between assertive scaffolding and toddlers' help was higher in Belém than in Münster, for the total effect, $z = 1.87$, $p = .06$, but not for the direct effect, $z = 1.33$, $p > .10$. Conversely, the relation between deliberate scaffolding and toddlers' help was higher in Münster compared to Belém, for the total effect and the direct effect, $z = 1.93$, $p = .05$, and, $z = 2.23$, $p < .05$, respectively. There were no differences in the relations between maternal scaffolding and helping between São Paulo and both other samples, all $z < .96$, all $p > 10$, or the relations between maternal scaffolding and toddlers' requested behavior between any of the three contexts, all $z < 1.46$, all $p > 10$.

Discussion

In line with our hypotheses, maternal scaffolding during task assignment differed between cultural contexts and was related to toddlers' requested behavior and helping behavior in culture-specific ways. As outlined in the following paragraphs, these findings support our assumption that socialization practices influence toddlers' natural predisposition to help others from early on and suggest culture-specific developmental pathways underlying early helping behavior.

Brazilian mothers showed high levels of assertive scaffolding, while deliberate scaffolding was relatively low in São Paulo and almost absent in Belém. Conversely, German mothers employed deliberate scaffolding strategies and lower levels of assertive scaffolding than Brazilian mothers. These cultural differences in maternal scaffolding during task assignment were partly explained by the different cultural models in these contexts, i.e., an emphasis on relational socialization goals in Brazilian samples and an emphasis on autonomous socialization goals in the German sample. Differences between socialization

goals and scaffolding styles were most pronounced between the samples from Belém and Münster. This is in line with former studies, showing that a high emphasis on toddlers' compliance is reflected in maternal socialization goals and parenting strategies (Keller, 2007; Nsamenang, 1992; Whiting & Whiting, 1975) in many subsistence-based ecologies, while toddlers' autonomy is emphasized and fostered in industrialized urban contexts (Kärtner et al., 2008; Keller & Kärtner, 2013).

In the present study, levels of requested behavior were higher in the German as compared to the Brazilian samples. This is contrary to former studies, reporting higher levels of requested help in subsistence-based ecologies as compared to urban, Western contexts (Keller et al., 2004; Whiting & Whiting, 1975). However, mean differences are often difficult to interpret in cross-cultural studies due to manifold cross-cultural and inter-individual differences in learning experiences. For this reason, the analysis in the present study focused on the correlations between scores. These are particularly informative, because they allow us to identify relevant learning experiences underlying toddlers' development: Analyses of the immediate relation between maternal scaffolding and toddlers' requested behavior revealed that, across cultural contexts, assertive scaffolding was associated with higher levels of requested behavior while maternal deliberate scaffolding was not related to toddlers' requested behavior. This is in line with the general finding that children are more responsive if this is emphasized and clearly communicated in the mother-child interaction (e.g., Ochs & Izquierdo, 2009; Nsamenang, 1992).

Toddlers' helping behavior was at similar levels across cultures, which supports the results of a former cross-cultural study (Callaghan et al., 2011). Interestingly, maternal scaffolding was related to toddlers' helping behavior in a culture-specific way: In the sample from rural Brazil, toddlers' helping behavior was significantly related to mothers' assertive scaffolding. Deliberate scaffolding strategies were very rare in this context and were not related to toddlers' help. In the urban middle-class sample from Münster, maternal deliberate

scaffolding was closely related to toddlers' helping behavior. These findings are in support of the assumption that caregivers' socialization practices build on toddlers' natural prosocial tendencies from early on (see also, Dunfield, Kuhlmeier, O'Connell, & Kelley, 2010; Hastings , Utendale, & Sullivan, 2007; Hay, 2009; Kärtner, Keller, & Chaudhary, 2010). However, the São Paulo sample revealed a less clear picture: While none of the scaffolding styles predicted toddlers' helping behavior, we found a significant negative correlation between assertive and deliberate scaffolding in this sample. This may indicate that the São Paulo sample is more heterogeneous concerning maternal socialization strategies, with some mothers being closer to the relational model and some mothers being closer to the autonomous cultural model. However, the investigation of subgroups would require larger sample sizes.

Overall, the present findings support the idea that maternal scaffolding during task assignment provides an important learning context for different forms of socially responsive behavior in different ecosocial contexts. With regard to toddlers' helping, we assume that the way in which caregivers structure the assignment of tasks fosters children's understanding of their own social role in situations in which another individual is in need (cf. Köster, Ohmer, Nguyen, & Kärtner, in press) and, as a consequence, their motivation in these situations. In particular, in relational cultural contexts, assertive scaffolding, emphasizing toddlers' compliance and responsibility, may foster an understanding of these situations in terms of interpersonal responsibilities. On the other hand, in autonomous cultural contexts, deliberate scaffolding may foster toddlers' ability to take into account the need of another individual and their personal choice in these situations. Thus, we interpret the culture-specific relations between maternal scaffolding and toddlers' helping behavior as a maturing cultural understanding and motivation along the lines of interpersonal responsibility or personal choice.

Concerning toddlers' requested behavior, assertive scaffolding was related to toddlers' immediate responsive behavior in all three contexts. In the rural Brazilian sample, the close association between assertive scaffolding and both forms of toddlers' responsive behavior support the more general idea that the motivations underling requested behavior and helping are closely related in relational contexts, namely being a matter of interpersonal responsibility. Because the assignment of routine tasks is ascribed a key role for toddlers' early prosocial development, we tested whether the relation between assertive scaffolding and helping behavior was mediated by toddlers' requested behavior. However, despite the close association between the three measures, this mediation effect was non-significant, possibly due to the relatively small sample size. Interestingly the Münster sample revealed very specific relations between maternal scaffolding and toddlers' behavior: While assertive parenting strategies were only related to toddlers' responsiveness, mothers' deliberate scaffolding was only related to toddlers' helping towards another individual. This pattern fits well with the general idea that requested behavior and helping are guided by different concepts in autonomous cultural contexts, i.e., being obedient or prosocial.

Generally, there are different possibilities in which maternal scaffolding styles during task assignment might relate to toddlers' helping behavior: either both scaffolding styles are effective in the sense that any socialization effort leads to more prosocial behavior or, as soon as deliberate scaffolding occurs, this may set the course for the further development of prosocial behavior along the line of personal choice. The results of the present study suggest the latter: while assertive scaffolding is associated with toddlers' requested behavior in direct mother-child interactions across cultures, the relations between assertive scaffolding and helping behavior disappear in contexts where mothers use deliberate scaffolding strategies. This suggests that, across cultural contexts, serious and insistent requesting directly motivates toddlers' behavior in situations in which mothers assign tasks directly, whereas toddlers' motivation to help, i.e., responsive behavior outside direct mother-child interaction, depends

on the way in which caregivers structure task assignment, namely primarily as an obligation or personal choice. Embedding the present findings in a broader context, the moderating role of culture may also be understood in terms of the different social norms and self-concepts in autonomous and relational ecosocial contexts (Keller, 2007). These guide the social interactions of caregivers and children in a variety of situations and may thus lead to culture-specific relations between maternal socialization strategies and toddlers' social development. In particular, maternal assertive scaffolding may affect toddlers' helping behavior in relational contexts, where toddlers' hierarchical status and social responsibility are emphasized in social interactions due to a relational conceptualization of the self, but not in autonomous contexts, where the caregivers emphasize individual needs and a development towards autonomy due to an autonomous self-concept.

The present study links ecosocial contexts to caregivers' cultural models, including socialization goals and parenting behavior. This is in line with the idea that cultural-specific beliefs and practices (including concepts of helping and helping routines) are adaptations to the ecological and social environment. In relational contexts mothers value relational over autonomous socialization goals, emphasizing toddlers' obedience, conformity with social norms and caring for others. The socialization towards these ends is thought to serve the fulfillment of communal goals and obligations associated with prescribed social roles (Keller & Kärtner, 2013). These cultural norms have functional relavance in subsistance-based ecologies, where caring for a large number of siblings, weak and elder people as well as the subsistence of the family (e.g., harvisting or fishing) has to be taken over by those familiy members who are capeable of doing so, already at an early age. The close relation between assertive scaffolding and toddlers' requested behavior and helping in rural Brazil support this assumption. Furthermore, high levels of requested behavior were observed in similar ecosocial contexts (Ochs & Izquierdo, 2009; Whiting & Edwards, 1992; Keller, 2004) and are assumed to index an internalization of these social norms (Ogunnaike & Houser, 2002). In

postmodern societies, with retirement plans, health care systems and smaller family sizes these social role obligations are less substantial for the survival of the family. In these environments, cultural practices revolve around independence and self-actualization which may be functional for later professional competences. Prosocial behavior, seen from this perspective, is conceptualized as an issue of personal choice (see also, Köster, Schuhmacher, & Kärtner, 2015; there are similar ideas concerning other key concepts, for instance, culture-specific conceptions of close relationships, see Rothbaum, Pott, Azuma, Miyake, & Weisz, 2000).

More generally, the possibility of different conceptualizations underlying prosocial behavior contributes to a theoretical debate that revolves around the question on the relation between requested behavior and helping behavior. While in the anthropological literature the conceptual link between both types of behavior is very close and requested behavior is often not discriminated from helping behavior (e.g., Whiting & Whiting, 1975; Lancy's [2012] chore-curriculum), there is less consensus in the psychological literature. Although many would conceive requested and prosocial behavior as opposites because following requests, i.e., being compliant or obedient, cannot, by definition, be prosocial, because it is not voluntary (e.g., Eisenberg, Fabes, & Spinrad, 2006), others' would treat requested behavior as one potential manifestation of a more general type of social responsiveness that later in ontogeny differentiates into a set of more fine-tuned responses, such as voluntary prosocial behavior, taking on responsibilities, etc. (e.g., Hay & Cook, 2007; Kochanska, 2002). The present study adds an interesting piece of the puzzle to this debate: Our cultural roots do not only seem to influence the way we conceptualize prosocial behavior in late childhood and beyond, but also our prosocial acts, from early childhood on.

It has to be noted that the results of the present study are correlational. Hence, the directional considerations regarding influences of maternal scaffolding and toddlers' behavior are based on theoretical grounds, i.e., caregivers' socialization practices having consequences

for child development. Thus, the present findings should be further substantiated applying longitudinal approaches. Furthermore, the measures of maternal scaffolding styles and toddlers' requested behavior stem from the same dyadic episode of maternal assignment of a daily task. Thus, one could argue that both maternal and toddlers' behavior in this task are rather dyadic than individual measures that characterize mothers' scaffolding strategy or toddlers' compliance in isolation. In particular, one may assume that the less compliant the child, the more assertive or insistent the mother would have to be. However, we found the opposite, namely a positive correlations between both measures, which does not suggest this confound. Regarding deliberate scaffolding, this measure was uncorrelated to toddlers' requested behavior, indicating that there was no interdependency between both measures. Nevertheless, it would be desirable for future studies to assess both maternal scaffolding and toddlers' requested behavior in independent tasks.

Conclusion

The present work further substantiates the key role of task assignment for early prosocial development and supports the idea of culture-specific developmental pathways underlying early helping behavior. Overall, the results support the assumption that structuring opportunities for responsive behavior as either an interpersonal responsibility or a matter of personal choice affects helping behavior and, possibly, underlying appraisal structures and motivational processes.

References

Callaghan, T., Moll, H., Rakoczy, H., Warneken, F., Liszkowski, U., Behne, T., & Tomasello, M. (2011). Early social cognition in three cultural contexts. *Monographs of the Society for Research in Child Development*, *76*, vii–viii, 1–142. doi:10.1111/j.1540-5834.2011.00603.x

Dahl, A. (2015). The developing social context of infant helping in two US samples. *Child Development, 86*, 1080-1093. doi:10.1111/cdev.12361

Dunfield, K., Kuhlmeier, V. A., O'Connell, L., & Kelley, E. (2011). Examining the diversity of prosocial behavior: Helping, sharing, and comforting in infancy. *Infancy, 16*, 227–247. doi: 10.1111/j.1532-7078.2010.00041.x

Eisenberg, N., Fabes, R. A., & Spinrad, T. L. (2006). Prosocial development. In N. Eisenberg, W. Damon & R. M. Lerner (Eds.), *Handbook of child psychology: Vol. 3, social, emotional, and personality development* (6th ed., pp. 646–718). Hoboken, NJ: John Wiley & Sons Inc.

Hammond, S. I., & Carpendale, J. I. (2015). Helping children help: the relation between maternal scaffolding and children's early help. *Social Development, 24*, 367-383.

Hastings, P. D., Utendale, W. T., & Sullivan, C. (2007). The socialization of prosocial behavior. In J. E. Grusec, & P. D. Hastings (Eds.), *Handbook of socialization: Theory and research* (pp. 638–664). New York: The Guilford Press.

Hay, D. F. (2009). The roots and branches of human altruism. *British Journal of Psychology, 100*, 473–479. doi: 10.1348/000712609X442096

Hay, D. F., & Cook, K. V. (2007). The transformation of prosocial behavior from infancy to childhood. In C. Brownell, & C.B. Kopp (Eds.), *Socioemotional development in the toddler years: Transitions and transformations* (pp. 100–131). New York: The Guilford Press.

Kağitçibaşi, Ç. (2007). *Family, self, and human development across countries. Theory and applications* (2nd ed.). Mahwah, NJ: Erlbaum.

Kärtner, J. (2015). The autonomous developmental pathway: The primacy of subjective mental states for human behavior and experience. *Child Development*, *86*, 1298–1309.

Kärtner, J., Keller, H., & Chaudhary, N. (2010). Cognitive and social influences on early prosocial behavior in two sociocultural contexts. *Developmental Psychology*, *46*, 905–14. doi:10.1037/a0019718

Kärtner, J., Keller, H., Chaudhary, N., & Yovsi, R. D. (2012). The development of mirror self-recognition in different sociocultural contexts. *Monographs of the Society for Research in Child Development*, *77*, vii–viii, 1–87.

Keller, H. (2007). *Cultures of infancy*. Mahwah, NJ: Erlbaum.

Keller, H. (2013). Attachment and Culture. *Journal of Cross-Cultural Psychology*, *44*, 175–194. doi:10.1177/0022022112472253

Keller, H., & Kärtner, J. (2013). Development–The cultural solution of universal developmental tasks. In M. J. Gelfand, C. Chiu, & Y. Hong (Eds.), *Advances in Culture and Psychology, Volume Three* (pp. 63–116). New York, NY: Oxford University Press. doi:10.1093/acprof:oso/9780199930449.003.0002

Keller, H., Yovsi, R., Borke, J., Kärtner, J., Jensen, H., & Papaligoura, Z. (2004). Developmental consequences of early parenting experiences: self-recognition and self-regulation in three cultural communities. *Child Development*, *75*, 1745–60. doi:10.1111/j.1467-8624.2004.00814.x

Kochanska, G. (2002). Mutually responsive orientation between mothers and their young children: A context for the early development of conscience. *Current Directions in Psychological Science*, *11*, 191–195.

Köster, M., Ohmer, X., Nguyen, T. D., & Kärtner, J. (in press). A cultural perspective on prosocial development. *Psychological Science.*

Köster, M., Schuhmacher, N., & Kärtner, J. (2015). A cultural perspective on prosocial development. *Human Ethology Bulletin, 30*, 71-82.

Lancy, D. F. (2012). The chore curriculum. In G. Spittler, & M. Bourdillion (Eds.), *Working and Learning Among Africa's Children.* (pp. 23–57), Berlin: Lit Verlag.

LeVine, R. A., Dixon, S., LeVine, S., Richman, A., Leiderman, P. H., Keefer, C. H., & Brazelton, T. B. (1994). *Child care and culture: Lessons from Africa.* New York, NY: Cambridge University Press.

Miller, J. G., & Bersoff, D. M. (1992). Culture and moral judgment: How are conflicts between justice and interpersonal responsibilities resolved? *Journal of Personality and Social Psychology, 62*, 541–554. doi: 10.1037/0022-3514.62.4.541

Miller, J. G., Bersoff, D. M., & Harwood, R. L. (1990). Perceptions of social responsibilities in India and in the United States: moral imperatives or personal decisions? *Journal of Personality and Social Psychology*, *58*, 33–47.

Nsamenang, B. A. (1992). Perceptions of parenting among the Nso of Cameroon. In B. S. Hewlett (Ed.), *Father–child relations: Cultural and biosocial contexts* (pp. 321–343). Hawthorne, NY: de Gruyter.

Ochs, E., & Izquierdo, C. (2009). Responsibility in childhood: Three developmental trajectories. *Ethos*, *37*, 391–413. doi:10.1111/j.1548-1352.2009.01066.x.392

Ogunnaike, O. A., & Houser, R. F. (2002). Yoruba toddlers' engagement in errands and cognitive performance on the Yoruba Mental Subscale. *International Journal of Behavioral Development*, *26*, 145–153. doi:10.1080/01650250042000708

Paternoster, R., Brame, R., Mazerolle, P., & Piquero, A. (1998). Using the correct statistical test for the equality of regression coefficients. *Criminology, 36*, 859–866.

Rheingold, H. (1982). Little children's participation in the work of adults, a nascent prosocial behavior. *Child Development*, *53*, 114–125.

Rothbaum, F., Pott, M., Azuma, H., Miyake, K., & Weisz, J. (2000). The development of close relationships in Japan and the United States: Paths of symbiotic harmony and generative tension. *Child Development, 71*, 1121–1142. doi:10.1111/1467-8624.00214

van de Vijver, F., & Leung, K. (1997). Methods and data analysis of cross-cultural research. Thousand Oaks, CA: Sage.

Warneken, F., & Tomasello, M. (2006). Altruistic helping in human infants and young chimpanzees. *Science (New York, N.Y.)*, *311*(5765), 1301–3. doi:10.1126/science.1121448

Warneken, F., & Tomasello, M. (2009). Varieties of altruism in children and chimpanzees. *Trends in Cognitive Sciences*, *13*, 397–402. doi:10.1016/j.tics.2009.06.008

Whiting, B., & Edwards, C. (1992). *Children of different worlds: The formation of social behavior*. Cambridge, MA: Harvard University Press.

Whiting, B. B., & Whiting, J. W. (1975). Children of six cultures: A psycho-cultural analysis. Cambridge, MA: Harvard University Press.

Table 1

Maternal Socialization Goals, Maternal Scaffolding Styles and Toddlers' Behavior.

	Belém	Münster	São Paulo	*p*
Maternal Socialization Goals				
Relational Socialization Goals	3.31 (.45)	2.67 (.54)	3.47 (.42)	***
Autonomous Socialization Goals	2.48 (.55)	3.30 (.43)	3.31 (.47)	***
Maternal Scaffolding Styles				
Assertive Scaffolding	2.38 (.65)	1.89 (.73)	2.25 (.82)	*
Deliberate Scaffolding	.35 (.69)	3.53 (1.37)	.97 (.95)	***
Toddlers' Behavior				
Requested Behavior	2.25 (.91)	2.76 (.65)	2.17 (1.04)	**
Helping Behavior	2.32 (1.05)	2.02 (1.22)	2.13 (1.02)	

Note. Means and *SD*s are displayed. *P*-values indicate the mean differences between cultural groups (results of univariate ANOVAs). * $p < .05$, ** $p < .01$, *** $p < .001$.

Table 2

Partial Correlations between Maternal Scaffolding Styles and Toddlers' Requested Behavior and Helping behavior.

	1	2	3	4
Villages near Belém				
1. Maternal Assertive Scaffolding	-			
2. Maternal Deliberate Scaffolding	-.24	-		
3. Toddlers' Requested Behavior	.45**	-.17	-	
4. Toddlers' Helping Behavior	.40*	-.17	.41*	-
Münster				
1. Maternal Assertive Scaffolding	-			
2. Maternal Deliberate Scaffolding	.00	-		
3. Toddlers' Requested Behavior	.31(*)	-.03	-	
4. Toddlers' Helping Behavior	-.03	.40*	.03	-
São Paulo				
1. Maternal Assertive Scaffolding	-			
2. Maternal Deliberate Scaffolding	-.51**	-		
3. Toddlers' Requested Behavior	.60***	-.36*	-	
4. Toddlers' Helping Behavior	.06	.11	-.07	-

Note. All values indicate partial correlations *pr*. Age of the toddler was partialled out of all variables. (*) $p = .06$, * $p < .05$, ** $p < .01$, *** $p < .001$.

Figure 1

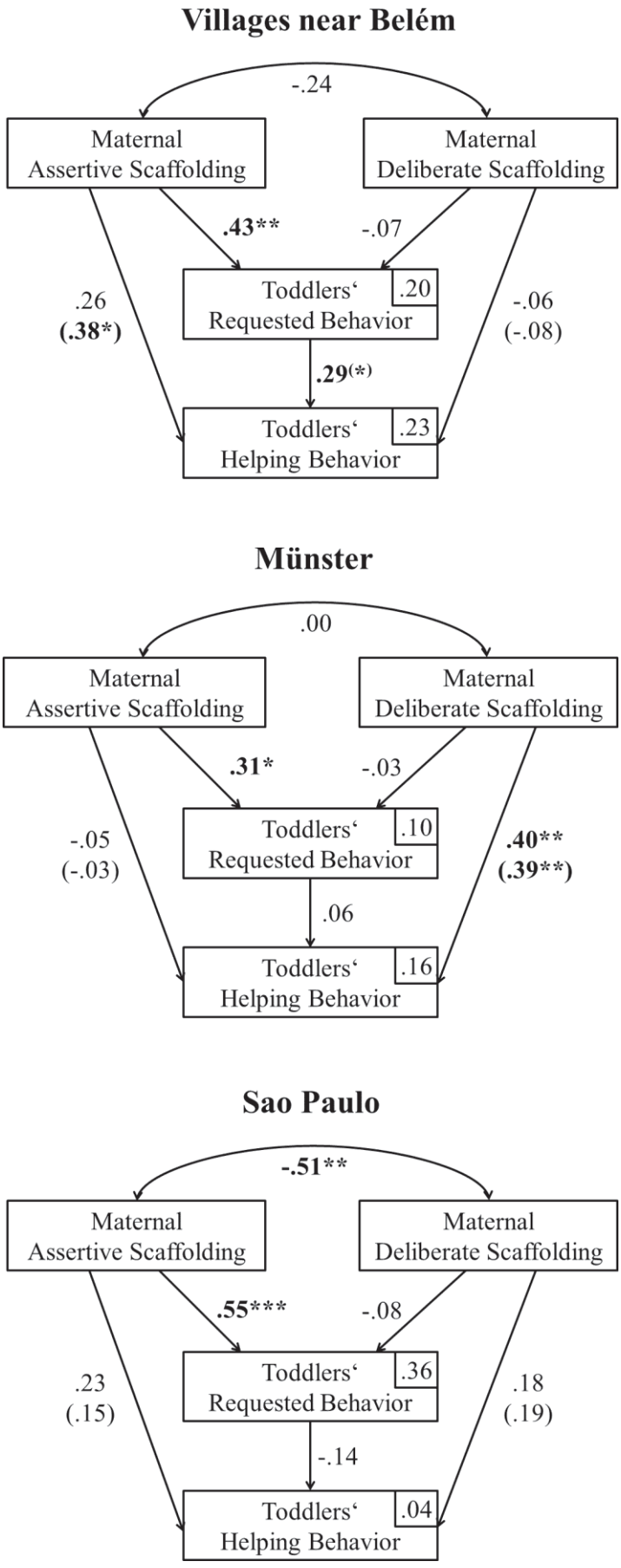
Villages near Belém
-.24
Maternal Assertive Scaffolding
Maternal Deliberate Scaffolding
.43**
-.07
.26
(.38*)
Toddlers' Requested Behavior
.20
-.06
(-.08)
.29(*)
Toddlers' Helping Behavior
.23
Münster
.00
Maternal Assertive Scaffolding
Maternal Deliberate Scaffolding
.31*
-.03
-.05
(-.03)
Toddlers' Requested Behavior
.10
.40**
(.39**)
.06
Toddlers' Helping Behavior
.16
Sao Paulo
-.51**
Maternal Assertive Scaffolding
Maternal Deliberate Scaffolding
.55***
-.08
.23
(.15)
Toddlers' Requested Behavior
.36
.18
(.19)
-.14
Toddlers' Helping Behavior
.04

Figure 1. Path analyses of maternal scaffolding styles and toddlers' requested behavior and helping behavior. Paths are labeled with standardized direct β and total effects β_{tot} in parentheses. Relevant regression weights are bold faced. Dependent variables are tagged with the corresponding squared multiple correlation coefficient R^2. Note that standardized residuals, controlled for age and gender, were used for all variables and error terms were included for the dependent variables. $^{(*)}$ $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$.

Part 3:

Appendix

Declaration by Doctoral Candidate
of Own Contribution to Presented Academic Manuscripts with Two or More Authors
(Cumulative Dissertation)

Name of Doctoral Candidate: Moritz Köster

Title of Dissertation: Cognitive and Motivational Underpinnings of Early Helping Behavior

Academic Manuscript 1

Title	Infants Understand Others' Needs		
Autor(s)	Moritz Köster, Xenia Ohmer, Thanh Dung Nguyen, Joscha Kärtner		
Journal	Psychological Science		
Publication status:	not yet submitted		
	submitted		
	in review		
	in revision		
	accepted		
	published	X	Year of publication: 2016

Description of your own contribution, when authorship is joint:

M. Köster and J. Kärtner designed the study and wrote the manuscript. M. Köster, X. Ohmer, and T. D. Nguyen designed the stimuli and conducted the study. M. Köster and X. Ohmer analyzed the data. J. Kärtner supervised the research.

Academic Manuscript 2

Title	From thinking to acting prosocial: Infants help to benefit others		
Autor(s)	Moritz Köster, Shoji Itakura, Joscha Kärtner		
Journal	Proceedings of the National Academy of Sciences		
Publication status:	not yet submitted		
	submitted	X	
	in review		
	in revision		
	accepted		
	published		Year of publication:

Description of your own contribution, when authorship is joint:

M. Köster and J. Kärtner designed the study and wrote the manuscript. M. Köster and S. Itakura conducted the study. M. Köster analyzed the data. J. Kärtner and S. Itakura supervised the research.

Academic Manuscript 3

Title	Cultural influences on toddlers' prosocial behavior: How maternal task assignment relates to helping others		
Autor(s)	Moritz Köster, Lilia Cavalcante, Rafael Carvalho, Briseda Dogo Resende, Joscha Kärtner		
Journal	Child Development		
Publication status:	not yet submitted		
	submitted		
	in review		
	in revision		
	accepted	X	
	published		Year of publication:

Description of your own contribution, when authorship is joint:

M. Köster and J. Kärtner designed the study and wrote the manuscript. M. Köster, L. Cavalcante, R. Carvalho and B. D. Resende conducted the study. M. Köster analyzed the data. J. Kärtner supervised the research.

Place, Date

Signature of doctoral candidate