

ORIGINAL ARTICLE

How being observed influences preschoolers' emotions following (less) deserving help

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Abstract

Children sometimes show positive emotions in response to seeing others being helped, yet it remains poorly understood whether there is a strategic value to such emotional expressions. Here, we investigated the influence seeing a peer receive deserving help or not on children's emotions, which were assessed while the peer was present or not. To measure children's emotional expression, we used a motion depth sensor imaging camera, which recorded children's body posture. Five-year-old children ($N = 122$) worked on a task which yielded greater rewards for them compared to their peer, rendering the peer to be in greater need of help. An adult—who was unaware of the different levels of neediness—then either helped the child who had a lesser need for help (less deserving outcome) or helped the needier peer (deserving outcome). Overall, both children showed a lowered body posture, a more negative emotional expression, after not being helped and an elevated body posture, a more positive emotional expression, after being helped. Seeing their peer (less deservedly) not receive help, and to a lesser extent being observed, blunted children's otherwise positive emotions in response to receiving help. These results are discussed in the broader theoretical context of how children's emotions sometimes reflect their commitment to cooperative relationships with peers.

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KEYWORDS

body posture, kinect, positive emotion, reputation, social comparison

1 | INTRODUCTION

Emotions play a pivotal role in motivating and maintaining children's prosociality (Eisenberg et al., 2016; Malti & Dys, 2018). For instance, sympathy for those who have been harmed increases children's comforting (Eisenberg & Miller, 1987; Malti et al., 2009; Vaish et al., 2009; Zahn-Waxler et al., 1992) and children show positive emotions when helping and giving to others (Aknin et al., 2012, 2015, 2018; Hepach et al., 2017; Lennon & Eisenberg, 1987; Song et al., 2020; Wu et al., 2017). These positive emotions appear to provide a proximate incentive for children to forego their immediate self-interest, and instead invest in their cooperative partners (Aknin et al., 2012), as well as maintain their relationships with peers, for example, by signaling interest in cooperative interactions (Marcus, 1986).

A less explored question concerns the function of these positive emotions. According to Fessler and Haley (2003), in cooperative settings, emotions sometimes serve strategic ends. For instance, this might be the case for the positive emotion of elevation, an emotion originally described by Haidt and colleagues (e.g., Algoe & Haidt, 2009; Haidt, 2003a, 2003b), and experienced in response to seeing the exemplary actions of prosocial others (Algoe & Haidt, 2009; Fessler et al., 2019; Haidt, 2003a, 2003b; Schnall et al., 2010). In adults, elevation has been found to cause heartwarming feelings (metaphorically), physical sensations, such as experiencing "warmth in ones' chest" or "tears in one's eyes," feelings of being "inspired" or "uplifted" and a desire to be prosocial (Algoe & Haidt, 2009; Schnall et al., 2010; see Fessler et al., 2019 for details). In the current study, we investigated the influence of seeing a needy peer receiving deserving help and being observed by a peer on preschooler's emotional responses in a cooperative context.

In most studies investigating the link between children's positive emotions and their prosocial behavior, children were given an opportunity to share with or help a social partner and their emotion was measured before or thereafter. These studies have found that 2- to 5-year-old children express positive emotions, that is, a higher level of happiness, as assessed by raters, while sharing a reward with a puppet (Aknin et al., 2012, 2015; Song et al., 2020). This response has been found to emerge in children from two Western cultures (the United States and the Netherlands; Aknin et al., 2012; Song et al., 2020), and in children from a rural small-scale society (Aknin et al., 2015). In a different paradigm, toddlers from Germany expressed an elevated body posture after helping a needy adult (Hepach et al., 2017). In a naturalistic peer setting, children also expressed positive emotion in anticipation of and after spontaneous, but not requested, prosocial behavior (Lennon & Eisenberg, 1987). In summary, young children have been found to express positive emotions via general positive affect (for instance through increased smiling or an elevated body posture) when seeing others receive help (Aknin et al., 2012; Hepach et al., 2017; Lennon & Eisenberg, 1987). In these contexts, children's positive emotions can serve a prosocial function in so far as they positively motivate and reinforce children's future prosociality (Aknin et al., 2018; see also Vaish & Hepach, 2019).

One account has further proposed that children's positive emotions in cooperative interactions result from children wanting to see others' needs fulfilled (Hepach, 2017; Hepach et al., 2012, 2016). In support of this view, in a series of studies, toddlers showed increased physiological arousal (as measured via an increase in their pupil dilation), when they saw another person in need of help. Two-year-old children's physiological arousal subsided similarly regardless of whether they or another adult provided help, while it remained high if the persons' need remained unfulfilled (Hepach et al., 2012, 2016). The conclusion from this line of work is that toddlers are not only motivated to receive external recognition for their helping yet are satisfied when seeing someone else's need be fulfilled irrespective of who helped the person in need (Hepach, 2017). It is important to note that a reduction in pupil dilation does not per se indicate a positive or negative emotion, as it simply indicates a reduction in arousal (Sirois & Brisson, 2014). An additional study

found that observing prosocial actions (helping) as compared to antisocial actions (hindering) induced a positive emotion in 2-year-olds (Steckler et al., 2018).

Thus, a growing body of work suggests that toddlers' emotional responses when viewing others receive help indicate children's underlying concern with others' needs (see Köster & Kärtner, 2019 for a review). In a separate line of work, preschoolers' sharing has been found to be sensitive to others' needs, suggesting that a nascent sense of others' deservingness influences children's prosocial motivation. For instance, preschoolers by around the age of four to five, share more resources with needy than non-needy recipients (Li et al., 2014; Malti et al., 2016; Paulus, 2014; Rizzo & Killen, 2016), a tendency that increases in school-aged children (Malti et al., 2016; Paulus, 2014; Rizzo & Killen, 2016; Sierksma & Shutts, 2021). Indeed, during preschool age, children's needs-based resource distribution remains constrained by self-serving biases (Malti et al., 2016). In a helping context, preschool children also sometimes shared food with a hungry child (even when their peers modeled anti-social behavior; Engemann et al., 2016). The underlying explanation for children's prosocial motivation in such contexts is sympathy aroused by seeing a person in need (Malti et al., 2016).

More recently, Hepach and Tomasello (2020) investigated the influence of a peer's need on preschoolers' emotional response in a cooperative context to shed light on the mechanisms underlying young children's needs-based helping. In this study, 4-year-old children expressed a positive emotion (increasingly elevated body posture, i.e., chest height) when they saw a peer with a greater need than themselves receive the help they deserve (even if they were not helped themselves). Similarly, the needy peer expressed a positive emotion when receiving deserving help. On the other hand, when their needy peer was not helped, while they were (i.e., when the help was less deserving), children expressed a less positive emotion (increasingly lowered body posture). Such a response may be motivated by the sense that others should receive the help they need (Hepach, 2017; Hepach et al., 2012, 2016), and a nascent sense of others' deservingness as it is expressed in children's resource distribution (Malti et al., 2016; see also Kanngiesser & Warneken, 2012 for the influence of merit). Importantly, considering others' needs requires children to compare their *relative* deservingness to that of their peers, and therefore the capacity for social comparison, as it is expressed, for instance, in children's concern for fairness (e.g., Blake & McAuliffe, 2011; LoBue et al., 2011). In summary, others' needs influence children's prosocial motivation in toddlerhood, and during preschool age. A presumed mechanism underlying children's prosocial motivation towards needy others is sympathy (Malti et al., 2009, 2016; Vaish et al., 2009), which has been defined as an emotion "stemming from other's emotional state or condition that is not identical to the other's emotion but consists of feelings of sorrow or concern for another's welfare" (p. 91/92; Eisenberg & Miller, 1987). Furthermore, children's prosocial motivation may be the result of anticipating positive emotions after seeing others' needs be fulfilled (Hepach & Tomasello, 2020). The latter emotion may be similar to elevation, an uplifting emotion adults experience while seeing prosocial actions (Fessler et al., 2019; Haidt, 2003a, 2003b; Schnall et al., 2010).

1.1 | The influence of being observed

A question that has received little attention concerns the role of being observed by their cooperative partners on young children's emotional response to seeing others receive help. Emotions fulfill both intrapersonal and interpersonal functions (Frijda & Mesquita, 1994; Keltner & Haidt, 1999). That is, emotions influence behaviors as both feelings, as well emotion displays that communicate information to observers. For instance, transgressors can signal appeasement and remorse through the display of shame or guilt, as well as a concern for group norms by expressing embarrassment (Keltner & Harker, 1998). Emotion displays that signal the transgressors' remorse (including apologies) elicit young children's own forgiveness, and the expectation that third-parties will forgive them (Vaish et al., 2011). Similarly, a positive emotion in response to seeing others receive help could signal interest in maintaining others' welfare (Marcus, 1986; Stellar et al., 2017). Such an expression of interest in others' welfare may be—in part—strategically motivated by a desire to appear prosocially motivated to observers (Fessler & Haley, 2003). The reputational benefits resulting from expressing positive emotions when seeing others receive help are theorized to be

twofold by Fessler and Haley (2003): first expressing a positive emotional response to seeing others receive benefits could make one appear prosocially motivated to observers or one's cooperative partners, and hence increase the likelihood of being recruited as a partner in future cooperative interactions. Second, the actual experience of positive feelings in reputation-relevant contexts could increase prosocial behavior itself (e.g., Schnall et al., 2010) and thereby lead to a prosocial reputation. Despite the presumed reputational benefits of expressing positive feelings when others are watching, studies to date have not investigated whether people express positive emotions in response to seeing prosocial actions when doing so could lead to a prosocial reputation. Even less is known about whether already young children express positive emotions to enhance their reputation.

Preschoolers can use their prosocial behaviors for strategic ends, for instance by sharing more resources with others while they are being watched or when they expect their behavior to become public (Engelmann et al., 2012, 2013; Leimgruber et al., 2012; Rapp et al., 2019; Yazdi et al., 2020). It may be that young children express positive emotions in cooperative contexts out of a similar (functionally) strategic motive to appear prosocially motivated to their cooperative peer partners. Here we refer to preschoolers' reputation management as "functionally" strategic to indicate that we do not assume children before school-age to be explicitly aware of the strategic advantage resulting from expressing positive emotions in public contexts (see also Engelmann & Rapp, 2018).

1.2 | The current study

In the current study, we investigated the influence of being observed by their peer partner on 5-year-old children's emotional expression in response to receiving (less deserving) help and seeing their peer receive (deserving) help. We chose 5-year-old children in this study, because we expected children by this age to be sensitive to being observed by their peer, given that reputational concerns influence children's prosocial behavior at this age (Engelmann & Rapp, 2018). Dyads of 5-year-olds were engaged in a sticker-collecting game where we manipulated which child was relatively more needy (the peer) than the other (the focal child) over successive turns of the game. Following the manipulation of need, the focal child viewed either a deserving outcome (the peer is helped, and they are not helped) or a less deserving outcome (they are helped, and the peer is not helped). We predicted that focal children at 5 years of age, like younger children in a prior study (Hepach & Tomasello, 2020), would respond with a positive emotion (increasingly elevated upper body posture) to seeing the peer receive deserving help. The main research objective of the current study was to shed light on the influence of being observed on children's emotions following deserving and less deserving helping events. Based on findings showing that children, by the age of five, begin to manage their reputation (Engelmann & Rapp, 2018), we systematically varied whether children were observed by their peer (or not), an experimental manipulation that was not included in prior work with younger children (e.g., see Hepach & Tomasello, 2020).

Our main preregistered research questions were as follows:

1. Does the focal child express a positive emotion upon seeing the peer receive deserving help?
2. Is the focal child's positive emotion more pronounced while being observed?

In addition, to conceptually replicate the results of Hepach and Tomasello (2020), we asked, if both the peer and the focal child were sensitive to the outcome (whether or not they were helped) as well as to each other's' relative deservingness. Thus, our third, not preregistered, research question was:

3. Does children's emotional response vary as a function of both perceived need and received help?

We measured children's emotions using a motion depth sensor imaging camera (the Microsoft *Kinect*), which allowed us to quantify the change in children's body posture automatically and objectively (Hepach et al., 2017, 2015; Hepach & Tomasello, 2020). The body posture outcome measures have been partly validated as indications of positive

and negative emotion. For instance, 2-year-old children's body posture (chest height and to a lesser extent hip height) was elevated when helping others reach their goals or achieving a positive outcome for themselves (Hepach et al., 2017). In addition, a recent study found that 5-, and, to a lesser extent, 4-year-olds, expressed negative emotions via a lowered upper body posture (chest expansion; see below for details on our **Measures**) when they fail to help others (Gerdemann et al., [under review](#)).

2 | METHOD

This study was pre-registered at aspredicted.org (see <https://aspredicted.org/j884z.pdf>).

2.1 | Participants

Children participated in same-sex dyads, and testing took place at children's preschool. We aimed for a sample size of $N = 64$ focal children (i.e., we planned to test $N = 64$ dyads). The final sample size used in the statistical analyses included $N = 65$ focal children, and $N = 57$ peers (Total $N = 122$ based on 74 dyads; mean age: 5 years, 8 months, and 22 days; standard deviation: 2 months and 28 days; range: 5 years, 3 months and 29 days to 6 months years, 3 months, and 25 days; 50 girls; see Table S3).

Since our main hypothesis focused on the emotional response of the focal child, we tested an additional dyad, if no usable body posture data was provided by the focal child ($N = 15$ dyads). Whether usable body posture data was available was determined by a pre-defined pre-processing script developed by Hepach et al. (2017). No skeleton could be mapped by the pre-processing script, for instance, if children were not walking upright (if they were crouching) or if children walked too fast and only few video frames could be recorded (if their feet were not crossed).

Additionally, data from the entire dyad was excluded from the analyses, if children told the second experimenter (E2), who was supposed to be blind to the imbalance in need between the two children prior to helping one child, which child was more in need of help ($N = 3$ dyads); there was an error in the apparatus (children were not in need of help, because they were able to access a final container independent of the help of an experimenter; $N = 3$ dyads); due to experimenter error ($N = 3$ dyads) and due to an improvement to the observed condition after data from four dyads was collected in the main sample ($N = 4$ dyads; see Table S1 for details). Note that the latter exclusion reason simply meant that we decided to "start over" testing the observed condition, as we noted that a part of the experimenters' text may not be suitable for our research question, which we did not notice during piloting. However, we report this exclusion reason here for the sake of full transparency. Further, $N = 10$ dyads were excluded due to equipment (Kinect or Laptop) failure (e.g., the technology broke or failed to record data during the entire testing session). In summary, to reach our sample size of $N = 64$ focal children, we planned to test an additional total of $N = 38$ dyads, for which data from the focal child (or the entire dyad) was excluded. However, additional $N = 39$ dyads were tested. One additional dyad was tested to finish a day of data collection at the preschools, resulting in the sample size of $N = 65$ focal children.

Additional $N = 23$ children with the role of the peer provided no usable body posture data, as determined by the same pre-processing script that was used for the body posture data provided by the focal child (Hepach et al., 2017).

Note that if the pre-processing steps resulted in usable data for only one child in the dyad, the data provided by that child were nonetheless used in the statistical analyses. We only tested an additional dyad, if the focal child did not provide body posture data ($N = 15$; see Table S1 and Table S2 for details). This rate of exclusion due to data loss (~32% of children were excluded due to providing no usable data or equipment failure) is comparable to other studies using physiological (e.g., neurophysiological) measures (e.g., Cowell et al., 2019).

Children were recruited from a database of families who volunteered to participate in developmental studies. Approximately 85% of the population from which the sample was drawn is of German origin, and the average household income of the city's residents was 1891€ in 2019.

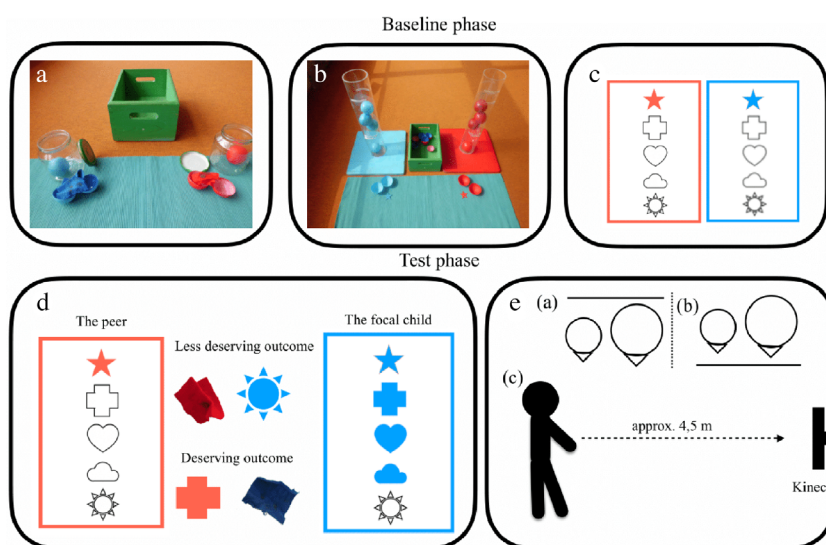


FIGURE 1 Key phases of the procedure. (a) Children first cleaned up some “Old Rags” and placed them in small trash bins (one for each child) on the other side of the room next to the Kinect. During this phase, four baseline recordings of both children’s body posture were taken with the Kinect camera. (b) Then, each child received a uniquely colored cylinder with five containers inside. In the first container, there was one sticker for each child. (c) Children could place the first sticker on their sticker sheet on the other side of the room. At this point, no child is relatively more needy. (d) After several turns of opening the containers, the peer has only one sticker (needs 4; red sticker sheet) while the focal child has four stickers (needs 1; blue sticker sheet [which color assignment resulted in the child’s role as the focal child was counterbalanced across dyads]). In the less deserving outcome context, E2 gives the peer a rag while the focal child is given a sticker. In the deserving outcome context, E2 gives the peer a sticker while the focal child receives a rag. (e) After the manipulation of outcome context, the peer and E2 either sit (a) in front of the occluder (observed condition) or (b) behind the occluder (unobserved condition), (c) while the focal child walks towards the Kinect to place her sticker/rag on her sticker sheet/in her trash bin. At this point the test measure of the focal child’s body posture is taken

2.2 | Design and materials

Dyads of children were randomly assigned to a condition, and children were randomly assigned to their role (either focal child or peer) within the dyad. The factors outcome context and observation were crossed in a 2×2 -design resulting in the four experimental conditions: deserving outcome—observed, deserving outcome—unobserved, less deserving outcome—observed, less deserving outcome—unobserved.

Materials included two large transparent cylinders (one red one blue; for each child), which held four round containers (see Figure 1b). In addition, each child received a small trash box (one red and one blue) and a sticker sheet with space for five stickers, again either red or blue. There were small pieces of red and blue cloth (“rags”) which could be placed in the trash box. The stickers and rags were placed in round hollow containers that were also red or blue. On one side of the room there was an occluder that was constructed of a green tent which was taped with black opaque tape on one inside wall (see Figure S1). A Kinect camera was placed on the side of the sticker sheets to record children’s movements, and the study session was additionally recorded by a separate video camera.

2.3 | Procedure

The study was run by two female experimenters. Before children entered the room, E2 started the video cameras. Then, E2 sat in a corner of the room, where she operated the Kinect camera via a laptop. E2 did not interact with children until the final phase of the study.

2.3.1 | Baseline phase

Initially, children in the unobserved condition, were introduced to the occluder (referred to as the “black wall”). Children and E1 walked behind the occluder and, while sitting behind it, children were told that it was not possible to see anything that is going on outside. To demonstrate that this was true, E1 called E2, who started walking audibly in front of the occluder. While E2 walked in front of the occluder, E1 said: “We really don’t see anything that goes on in front of the black wall, do we?” and told children they would meet behind the occluder at the end of the game. In the observed condition, the actions were similar, only that E1 pointed at some cushions in front of the occluder and only told children that they would meet there at the end of the game. E1 explained the instructions regarding the “black wall” slowly and clearly to ensure children’s understanding of the whether they could be observed from behind the occluder. She did not point out to the fact that it would be possible to observe everything from in front of the occluder to avoid inadvertently eliciting embarrassment for being the center of others’ attention in the observed condition (e.g., Lewis et al., 1989).

Next, E1 introduced children to the sticker-collecting game. E1 showed children a small table in front of the *Kinect* where two sticker sheets and two trash boxes were placed. She explained that each child would receive a sticker sheet to collect stickers that are hidden in containers, and that sometimes there are old rags in the containers as well. She then explained that the rags need to be placed in the trash boxes. Throughout her instructions regarding the sticker sheets, and trash boxes, E1 spoke slowly and clearly and attended to informal cues that children understood her instructions (e.g., by nodding or saying “OK”) before moving on. Which sticker sheet color resulted in children having the role of the focal child was counterbalanced across dyads. Random assignment to the role of the focal child or the peer was accomplished by random assignment to a sticker sheet color.

Next, E1 pointed to some rags (two red and two blue rags) on the floor on the side opposite the *Kinect*. E1 told children that they first needed to clean up the rags, by placing them in the trash bins on the other side of the room. E1 made sure that the children walked to the trash (and the *Kinect*) twice (baseline measures 1 & 2).

After the children finished cleaning up the rags, E1 showed the children two jars (one for each child) with two round containers in each (Figure 1a). She handed the jars over to the children and let them try to open them unassisted. In case they could not open the jars, she offered her help. The first container revealed a rag for each child. Children were again asked to place the rags in their container one at a time (baseline measure 3). The same procedure was repeated for the second container in the jar (baseline measure 4). Throughout the baseline phase children walked towards the *Kinect* separately (always beginning with peer) to reduce the likelihood that children might mirror each other’s body posture, while walking simultaneously side-by-side.

2.3.2 | Test phase

Now, E1 placed two uniquely colored cylinders in front of the children. E1 explained to children that they could open them to see if each contained a sticker. In their first container, each child found a sticker and placed it on their sticker sheet (Figure 1c).

After children found their first sticker, E1 let children continue open the containers to collect stickers while she pretended to read a large newspaper. Then, the first experimental manipulation took place. While one child found only “old rags” in the next three containers (the peer), the other child was “lucky” and found one sticker after another (focal child). After several rounds of opening the containers, the final container of each tube could not be reached by the children due to a fixed slider. Once children asked E1 for help, E1 asked children to report their progress in collecting stickers. To prompt social comparison between the two children, E1 said: “*I see, you [focal child] have already collected quite a lot of stickers—1, 2, 3, 4. And you [peer] have only collected one sticker. That is too bad. You have fewer than [focal child]. Well, let’s look in those cylinders again [peer], I’m sure there is another sticker in there for you.*”

At this point, E1 faked an incoming call, and then told children that she urgently had to leave. She went to the door of the room and made an ambitious fleeting gesture in the direction of the children while she faced E2 and said to her:

"Can you look into one of the cylinders to help him/her? He/She still needs stickers. The other cylinder you can move away." E1 then left the room. E1's instructions regarding whom to help were intentionally left ambiguous, as they were not sufficient to identify which child needed help (Hepach & Tomasello, 2020). At this point, we expected E2 appeared naïve with regards to which child was relatively more needy, so that children would not focus on whether E2 had nice or mean intentions when deciding whom to help.

The second experimental manipulation took place at this point. In the deserving outcome context, E2 placed the cylinder of the focal child off to the side. When E2 opened the final container, in the deserving outcome context, the focal child received a rag, while the peer received a sticker. In the less deserving outcome context, E2 placed the peer's cylinder off to the side. The final container revealed a sticker for the focal child, and a rag for the peer in the less deserving outcome context (see Figure 1d). Unlike in prior containers, each of which contained either one sticker or one rag, the final container always revealed both a sticker and a rag (one object for each child in the dyad). The final container revealed two objects to provide each child with an opportunity to walk towards the other side of the room (to drop off their sticker or rag), thus allowing us to take a final body posture measurement.

Following the manipulation of the outcome context, the third experimental manipulation took place, which only affected the focal child. In the observed condition, the peer was instructed to sit down on the cushions in front of the occluder after placing her sticker/rag on her sticker sheet/in her trash box, so that the focal child could be observed. In the unobserved condition, on the other hand, the peer was told to sit down behind the occluder, so that the focal child could not be seen.

In both conditions, E2 told the focal child that she could place her sticker/rag on her sticker sheet/in her trash box once E2 told him or her to do so. In the unobserved condition, the focal child was reminded that it would not be possible to see anything that goes on in front of the "black wall" from behind the occluder to ensure that focal children remembered that they could not be seen while carrying their sticker/rag to the other side of the room. Explicitly telling children whether they are being observed and evaluated is comparable to the instructions in previous studies on the development of reputational concerns (see also Engelmann et al., 2012; Yazdi et al., 2020). Otherwise, the instructions for the focal child were the same in the observed and unobserved conditions. In both conditions, once E2 ensured that focal children understood her instructions, E2 joined the peer either in front of (observed condition) or behind (unobserved condition) the occluder, and then told the focal child that she could walk toward the sticker sheet/trash box now (see Figure 1e). Because of the additional instructions, some time passed between the second experimental manipulation (outcome context), and the time point of the focal child's body posture measurement. We ensured that this time was of approximately equal duration (since the verbal instructions of E2 were of approximately equal length) in both the observed and in the unobserved conditions, as well as following both outcome contexts.

2.4 | Body posture analyses

We measured children's body posture several times during the study using a Microsoft *Kinect* camera. The *Kinect* provides the location of x-, y-, and z-coordinates of 20 skeletal points for each recorded sequence (see Figure 2). The processed data comprised body posture data along 20 increments of children's distance from the *Kinect* camera (see <https://osf.io/evnum/> for preprocessing steps).

2.4.1 | Measures

We report analyses for three dependent measures:

1. The change in chest height (the change in the y-value of the chest center data point, preregistered)
2. The change in hip height (the change in the y-value of the hip center data point, preregistered)
3. The change in chest expansion (change in chest height minus change in hip height; not preregistered)

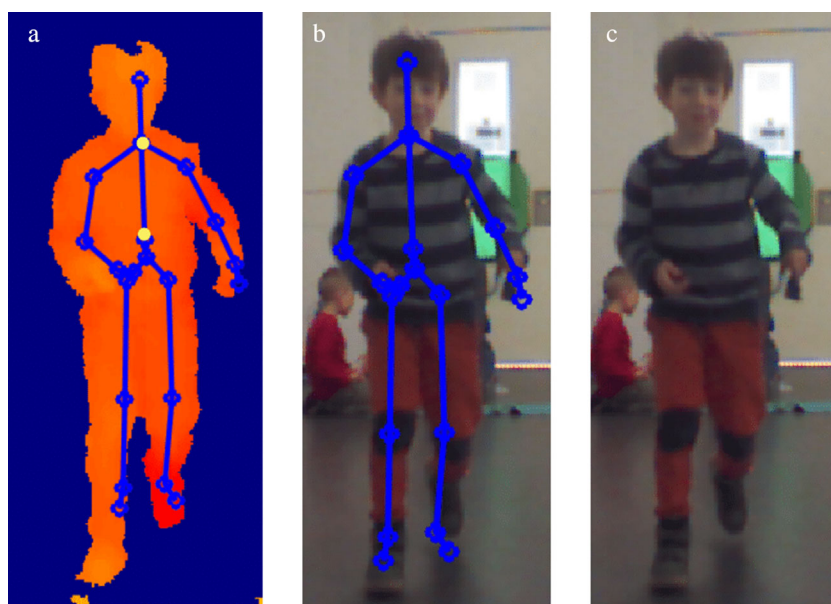


FIGURE 2 An illustration of the images provided by the Kinect (baseline trial). (a) Depth image with tracked skeletal points. (b) Color image with the skeletal data mapped onto it. (c) Color images of the child walking towards the Kinect. The chest and hip center data points are marked in yellow on (a)

Our first analysis focused on the change in children's chest height. An elevation in children's chest height generally has been found to reflect positive emotions and a reduction in height has been found to reflect negative emotions (Hepach et al., 2017, 2015; Hepach & Tomasello, 2020). A control analysis focused on the change in children's hip height to address whether changes in children's chest height are specific to children's upper body posture. We included the additional exploratory analysis on the change in children's chest expansion based on recent results that showed this to be a more robust measure of changes in upper body posture *expansion* (Gerdemann et al., [under review](#)).

We focused on changes in children's body posture here, because this approach is based on an efficient and automated method to measure emotional valence in children as young as the age of two (Hepach et al., 2017), and the age of four (Hepach & Tomasello, 2020), as well as in adults (von Suchodoletz & Hepach, 2021). In young children the postural changes documented by this approach have been shown to parallel changes in the number of smiles and overall positive affect—as rated by adult coders (Hepach et al., 2017). In contrast to measuring emotion valence via children's facial expressions (see Aknin et al., 2012, 2015) or overall expressiveness (see e.g., Heckhausen, 1987)—which relies on extensive manual coding of video recordings—our body posture analyses are based on automated processing scripts.

2.5 | Statistical analyses

Analyses were conducted in R Studio (Version 1.3.1093, R Core Team, 2020) and using the R-package *lme4* (Version 1.43.17, Bates et al., 2015).

2.5.1 | The focal child's change in posture in response to seeing deserving and undeserving outcomes depending on observation (preregistered confirmatory analyses)

We tested the influence of being observed and of the deservingness of the outcome on changes in the focal child's body posture using linear mixed models (Baayen, 2008). Following our preregistration, this analysis only included the

data provided by focal children ($N = 65$). We predicted that the focal child's posture would be elevated in the deserving compared to the less deserving outcome context, and that this effect would be more pronounced when children are being observed by their peer. We tested the overall influence of our predictors of interest using a likelihood-ratio test comparing a full model that included the three-way interaction of the factors outcome context, time-distance (from the *Kinect*), and observation to a reduced model that lacked these factors (Dobson, 2002). Both the full and the reduced models included age and gender. We then tested the individual effects of the three-way interaction of outcome context, observation, and time-distance, as well as the two-way interaction of outcome context and observation. The models included a random intercept for subject, as well as a random slope for time-distance on subject. In summary, we fitted both models for each of the three dependent measures.

Examining the three-way interaction with time-distance, alongside the two-way interaction is comparable to previous work using the same technology (Hepach et al., 2017). The predictor variable time-distance indicates children's distance from the *Kinect* camera. Smaller values, that is, indicating how much distance was covered as children walked toward the *Kinect*, reflect a larger distance from the *Kinect*. We examined interaction effects including time-distance to clarify whether children's body posture is overall elevated (no interaction effect including time-distance) or whether it changes as children walk towards the *Kinect* (interaction effect including time-distance). In the current study this latter effect could be due to children noticing the observing peer as they walk across the room. Moreover, by examining effects of time-distance, our aim was to conceptually replicate previous findings which showed an interaction effect of need, help and time-distance (Hepach & Tomasello, 2020). Thus, in contrast to merely examining the average change in body posture, examining the effects of time-distance allowed us to draw conclusions about the time course of children's emotional response.

2.5.2 | Both children's change in posture in response to receiving help or not (exploratory analyses)

To investigate whether receiving help (was the respective child helped or not) and the level of need (the peer: greater need for help; the focal child: lesser need for help) influenced both children's change in body posture, we fitted additional linear mixed models (Baayen, 2008) that included the body posture data provided by both the peer and the focal child ($N = 122$). This allowed us to examine the two-way interaction of need and help, as well as the three-way interaction of need, help and time-distance on the change in both children's body posture. Observation, gender, and age were included as control predictors, and the models included random intercepts of subject and dyad, as well as random slopes of time-distance on subject and on dyad.

As an overall measure of model fit, we report R^2 for the respective full model calculated using the equation proposed by Nakagawa and Schielzeth (2013) with the R-package MuMIn (Multi-Model Inference, Version 1.43.17, Bartón, 2020). The data and analysis scripts associated with the present study can be accessed via the following link: <https://osf.io/evnum/>.

3 | RESULTS

3.1 | The focal child's change in posture in response to seeing deserving and less deserving outcomes depending on observation (preregistered confirmatory analyses)

3.1.1 | Change in chest height

Our initial analysis on the change in the focal child's chest height revealed a marginally better fit for a model that included the combined effect of outcome context, observation, and time-distance compared to a model lacking these

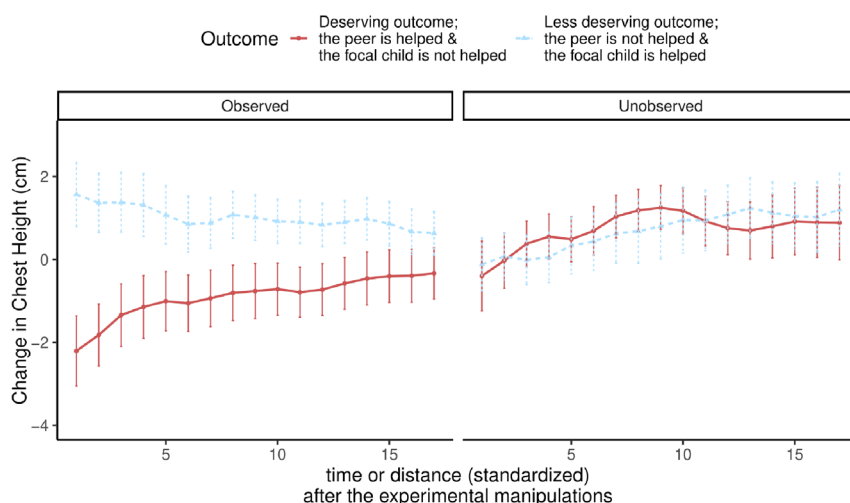


FIGURE 3 The focal child's change in chest height depending on outcome context, observation, and time-distance (standardized) from the Kinect. This figure illustrates the overall influence of outcome context, observation and time-distance on the focal child's change in chest height, as well as the statistically significant two-way interaction of outcome context and time-distance on the focal child's change in chest height in the observed condition. In the unobserved condition, there were no clear effects of the factors outcome context or time-distance on the focal child's change in chest height. In the unobserved condition, there were no clear effects of the factors outcome context or time-distance on the focal child's change in chest height. Error bars represent ± 1 standard error

factors, $\chi^2(7) = 13.46, p = .062, R^2$ (marginal) = .11. A post-hoc power analysis based on 10,000 simulations and conducted with the R-package *simr* (Green & MacLeod, 2016) revealed that sufficient power (equal to or greater than $1 - \beta = .8$) was achieved to detect effects of the observed magnitude with the sample size of $N = 65, 1 - \beta = .8, 95\% \text{ CI} [.79, .81]$. Dropping the individual effects from the models revealed a trend towards a two-way interaction of observation and outcome context, $\chi^2(1) = 3.15, p = .076$ (Table S5), and no clear effect of the three-way interaction of observation, outcome context and time-distance, $\chi^2(1) = 2.45, p = .118$ (Table S4), on the change in the focal child's change in chest height.

3.1.2 | Exploratory analyses

To follow up on the moderate overall influence of our predictor variables of interest on the change in the focal child's chest height, we ran two additional, non-preregistered analyses. These analyses were conducted for the observed and unobserved conditions separately. In the observed condition, these analyses revealed a two-way interaction of outcome context and time-distance, $\chi^2(1) = 4.81, p = .028$ (Table S6). In the observed condition, the focal child's chest height was overall lower but increased as they walked towards the Kinect in the deserving outcome context (when the focal child was not helped, but the peer was; see Figure 3, left panel). In addition, the focal child's chest height was overall higher but decreased while walking towards the Kinect in the less deserving outcome context (when the focal child was helped, but the peer was not).

In the unobserved condition, on the other hand, there was no interaction of outcome context and time-distance, $\chi^2(1) = .14, p = .708$, nor a main effect of outcome context, $\chi^2(1) = .13, p = .717$, that influenced the focal child's change in chest height (see Figure 3, right panel). The effect of time-distance was not clearly relevant in the model predicting the focal child's change in chest height in the unobserved condition, $\chi^2(1) = 2.52, p = .112$ (Table S7).

3.1.3 | Change in chest expansion

We further explored the nature of the changes in the focal child's chest height, by examining children's change in chest expansion (children's change in chest height corrected for the change in their hip height). There was no clear influence of outcome context, time-distance, and observation on the focal child's change in chest expansion, $\chi^2(7) = 5.66, p = .58$ (see Supplementary Information [SI], S2.1.). Taken together, these results suggest that the changes in the focal child's chest height were partially explained by changes in the focal child's overall body posture (e.g., jumping) rather than being specific to the upper body changing.

3.2 | Both children's change in posture in response to seeing deserving and less deserving outcomes (exploratory analyses)

3.2.1 | Change in chest height

Next, we tested whether removing the effects of time-distance, help (was the child helped or not) and need (focal child or peer), as well all two- and three-way interactions of these factors resulted in a reduction in model fit in a model predicting both the peer's and the focal child's change in chest height. This comparison indicated a better fit of the full model, $\chi^2(7) = 17.91, p = .012, R^2(\text{marginal}) = .11$. A post-hoc power analysis based on 10,000 simulation and conducted with the R-package *simr* (Green & MacLeod, 2016) revealed that sufficient power was achieved to detect effects of the observed magnitude with the sample size of $N = 122, 1 - \beta = .91, 95\% \text{ CI } [.91, .92]$.

We then examined the effects of the individual predictors of interest. The analysis revealed a two-way interaction of help and need, $\chi^2(1) = 4.65, p = .031$ (see Figure 4 and Table S9). There was no three-way interaction of help, need and time-distance, $\chi^2(1) = .01, p = .937$ (Table S8). While both the focal child, and the peer expressed an elevated chest height in response to being helped, this effect was stronger for the peer than for the focal child.

3.2.2 | Change in chest expansion

To clarify the nature of the change in children's body posture, a control analysis was conducted on both the peer's and the focal child's change in chest expansion. Removing the influence of time-distance, help and need, as well all two- and three-way interactions of these factors did not suggest a better fit for the full model predicting children's change in chest expansion, $\chi^2(7) = 8.12, p = .322$ (see SI, S2.2.). There was, however, a marginally significant overall effect of help, $\chi^2(1) = 3.55, p = .059$, on the change in children's chest expansion. Children who were helped showed a moderately more expanded chest than children who were not helped.

Taken together, the results suggest that only the influence of receiving help was apparent in both children's change in chest height and chest expansion, suggesting that children who were helped walked more elevated overall and, specifically, showed a more expanded upper body posture than children who were not helped. On the other hand, the influence of need was only apparent in children's change in chest height, suggesting that this effect is explained by the change in children's lower body posture.

4 | GENERAL DISCUSSION

Here we predicted that the children (the focal child in our study) would express a positive emotion when seeing a peer get the help they deserve, and that this response would be moderated by being observed. The latter prediction was based on the theoretical view that positive emotions in cooperative interactions can forge and maintain cooperative

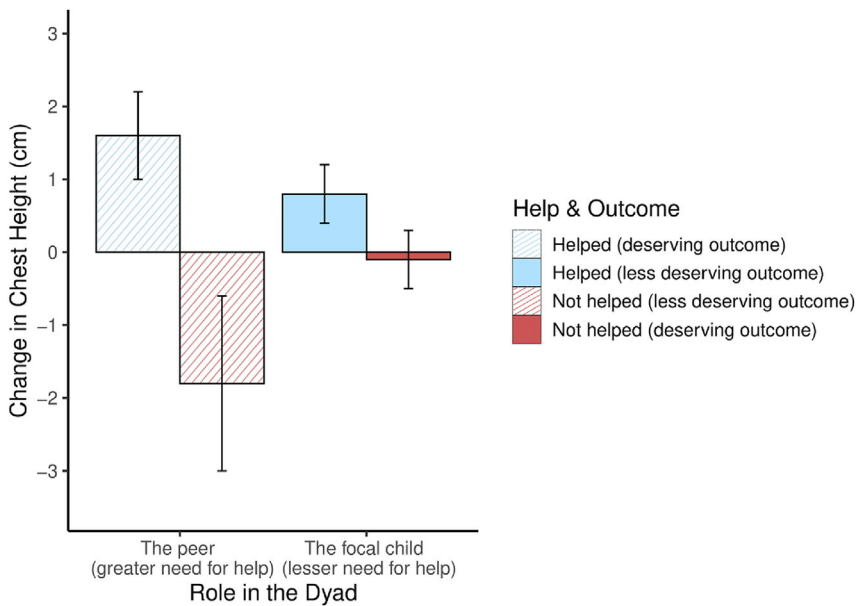


FIGURE 4 The peer's ($N = 57$) and the focal child's ($N = 65$) average change in chest height depending on outcome context and whether children were helped. In contrast to Figure 3, in this figure the focal child's change in chest height is plotted next to that of the peer. In addition, for both children the data are collapsed across both levels of observation and averaged across increments of time-distance. This figure illustrates the statistically significant influence of the two-way interaction of need and help on both children's change in chest height. Error bars represent ± 1 standard error

bonds (Stellar et al., 2017). Indeed, expressing a positive emotion in response to seeing others be helped could enhance the reputation of the person expressing that emotion and thereby increase the likelihood that others will engage in cooperative interactions with the expresser in future encounters (Fessler & Haley, 2003). Our findings provide three key insights. First, the focal child did not respond with a clearly positive emotion to seeing their peer receive the help they deserve. Rather we found that the focal child's body posture was lowered when they were not helped themselves (in the deserving outcome context) compared to when they were helped (in the less deserving outcome context) in the observed condition when their expression was visible to the peer. On the other hand, both outcomes resulted in a similar emotional response in the unobserved condition when the peer could not see their emotional expression. Second, in addition to the focal child's posture being elevated overall in the less deserving outcome context, when the focal child was helped, children's chest height did decrease in the less deserving outcome context of the observed condition as they walked past their peer. This effect was small but could suggest that children's emotional response served a strategic function to appease the observing peer.

The third key finding is that children (the peer) expressed most postural elevation in response to receiving help (when help was deserved). By contrast, receiving *less deserving* help appears to have blunted the focal child's otherwise positive emotion. In so far, our results for the focal child align with previous investigations on children's sharing behavior (e.g., Malti et al., 2016), which showed that preschool children's sharing remains constrained by self-serving biases, although it is influenced by others' deservingness and needs (see also Kanngiesser & Warneken, 2012). Thus, we find pluralistic motives that arguably function in concert to motivate cooperation and to safeguard against exploitation. Children appear to have viewed the game as being competitive thus expressing, in absolute terms, positive emotions when they were helped and negative emotions when they were not—even when being helped came at a cost to the peer (see also LoBue et al., 2011). At the same time, and in relative terms, children's positive emotions (in response

to being helped) and negative emotions (in response to not being helped) were overall blunted when the help they received was less deserving (and not receiving help was the deserving outcome).

In contrast to our main prediction, we only found a limited effect of being observed on children's emotional response. Specifically, the overall full-reduced model comparison for our main analysis on the influence of being observed on the focal child's emotional response did not reach statistical significance. However, the model fit for this analysis was both similar to that of previous studies using the same technology (Hepach et al., 2017; von Suchdeletz & Hepach, 2021) and similar to our second exploratory analysis on both the focal child's and the peer's emotional response. Moreover, a follow-up analysis showed that while children's (the focal child's) emotions were initially positive to receiving help (while their peer did not) they became more negative in the observed condition. This decrease in the focal child's posture in response to being less deservedly helped was not apparent in the unobserved condition. One interpretation of this effect is that it resulted from focal children adjusting their expression of positive emotion in response to receiving less deserving help when doing so could serve strategic ends. Such an interpretation would imply that part of children's emotional response is motivated by a desire to appear prosocially motivated to a peer audience. In past work, 5-year-old children have been found to behave more prosocially when others (including their peers) are watching (Engelmann et al., 2012, 2013; Leimgruber et al., 2012; Yazdi et al., 2020). Similarly, focal children here may have adjusted their emotional response to communicate their interest in maintaining cooperative interactions with their peer and signal their commitment to future costly cooperation (Marcus, 1986), as well as appease their peer (who was not helped). Despite these moderate influences of being observed on the focal child's emotional response, children's posture, overall, was not strongly affected by the experimental manipulation of being observed. Future research will need to further address the extent to which children's emotions are moderated by the presence of peers and in turn reflect children's motivation to appease others.

Importantly, the moderate influence of being observed on children's emotional response does not necessarily result from children's explicit awareness of the strategic value of their emotional expression. In fact, in a recent review Engelmann and Rapp (2018) argued that preschoolers do not yet engage in so-called explicit reputation management, which the authors argued does not emerge until children are school-aged. Thus, by the age of eight to nine, children explicitly understand when others' generosity is influenced by ulterior motives (Heyman et al., 2014). In addition, children by this age can understand that emotions are sometimes intentionally altered to create a positive impression (e.g., by pretending to be happy about an ugly gift; Banerjee & Yuill, 1999). Instead, children's emotional response in the observed setting of the current study may arise from an implicit sensitivity to being observed (and evaluated) by an audience, which may also underlie preschool children's early emerging increased sharing with peers when their reputation is at stake (i.e., when they are being watched or when they expect their behavior to become public; Engelmann et al., 2012, 2013; Leimgruber et al., 2012; Rapp et al., 2019; Yazdi et al., 2020). Such an implicit sensitivity to being observed and evaluated may provide a foundation for the later emerging explicit awareness of strategic prosociality.

In addition, our findings show both receiving help, and, to a lesser extent, perceived need, influenced children's emotional response. This finding is consistent with those of Hepach and Tomasello (2020), although the focal child's emotion was not as positive as predicted based on this prior study. In Hepach and Tomasello (2020), 4-year-old children showed an (increasingly) elevated chest height in response to seeing a deserving outcome regardless of whether they benefitted from it or not. Here, by contrast, only the peer—who benefitted from the deserving outcome—expressed a clearly positive emotion (elevated chest height) in response to receiving deserving help. On the other hand, in Hepach and Tomasello (2020), receiving help oneself appears to have influenced 4-year-olds' body posture to a lesser extent than in the present investigation. This discrepancy may be due to methodological difference between the two studies. In the current study children did not walk simultaneously, side-by-side, during the baseline and test measures of body posture. The reason for having children walk separately in the current study was primarily a pragmatic one, as children's body posture could be processed more efficiently if they provided body posture data separately. Second, we wanted to isolate children's emotional response to prevent emotional contagion between the children within the dyad. Emotional contagion can occur when children do not cognitively differentiate between their own and others' feelings (Bischof-Köhler, 1991; Hoffman, 1982). Indeed, in Hepach and Tomasello (2020), there was an association between the

focal child's and the peer's change in body posture within the dyad suggesting that some positive emotion might have "spilled over" from the peer to the focal child causing both children in the dyad to show positive emotion in response to the deserving outcome. A second reason why the focal child's emotion following the deserving outcome in the current study may not have been as positive as predicted may be due to the age of children tested. Five-year-old children might increasingly engage in competitive social comparisons with peers (e.g., Warneken et al., 2019). The experimental manipulation of outcome context, in which one child was always helped at the expense of the other, may have caused a less other-oriented, and more self-focused emotion in the older age group of children in the current study.

Nevertheless, central aspects of the findings of Hepach and Tomasello (2020) were supported by the present investigation. Specifically, in the observed condition of the present study, paralleling Hepach and Tomasello (2020), the focal child (with a lesser need) expressed an increasingly elevated chest height in response to seeing deserving help and an increasingly decreased chest height in response to seeing less deserving help in the observed condition. However, and in contrast to the findings with 4-year-old children (see Hepach & Tomasello, 2020), despite the focal child's relative increase in chest height in the deserving outcome context of the observed condition, children's overall posture was lowered compared to baseline. This suggests an overall reduction in chest height. Furthermore, while the focal child's chest height decreased in the less deserving outcome context, their posture was overall elevated compared to baseline. One key difference then between the current results and those documented in younger children is thus that our findings suggest pluralistic motivations (both self- and other-regarding) that play a role in older children's response to seeing a peer receive deserving help. Therefore, in the current study, the main source of emotion appears to have resulted from whether children were helped themselves while the time-course of their postural change—recorded as children walked towards the other side of the room—paralleled that seen in younger children (see Hepach & Tomasello, 2020).

A further finding of the current study is that the results for children's change in chest height were partially explained by children's lower body posture. Previous work had found that 2-year-old children's chest height was elevated in response to fulfilling their own goal and helping others compared to when no need is fulfilled (Hepach et al., 2017). Children in this prior study also showed more smiles when helping someone fulfill their goal (in Study 1), thus suggesting that changes in chest height are reflective of the overall valence of children's emotional response. A more recent investigation found clearer effects related to emotion valence on children's change in chest expansion (Gerde mann et al., *under review*). Taken together, thus, our results suggests that the most robust effect on children's overall posture resulted from whether they were helped—this effect was present for both children's change in chest height and chest expansion—while children likely expressed additional nuances of emotion through their change in chest height (i.e., through elevating or slumping their entire body posture).

A further question relates to the kinds of emotions that were expressed by young children. Both research on sympathy, and elevation served as a basis for the present study. Previous studies on the expression of sympathy and related emotions have primarily focused on the elicitation of negatively valenced emotions resulting from others' perceived need or distress (Batson et al., 1981; Hoffman, 2000; Malti et al., 2009; Vaish et al., 2009; Zahn-Waxler et al., 1992). Our results for the focal child (the less positive emotion when receiving help relative to the peer) may resemble such a moderately negative emotion in response to seeing others' plight. Moreover, this emotional response appears to have been influenced by whether children were observed, given the focal child's increasingly negative emotional response following less deserving help in the observed condition. Yet while sympathy and related emotions have been argued play a crucial role in young children's prosocial motivation (e.g., Eisenberg & Miller, 1987; Malti et al., 2009; Vaish et al., 2009), more positive emotions, similarly, have been found to precede or follow from prosocial actions, and therefore likely play a role in motivating prosociality in early childhood as well (Aknin et al., 2012, 2018; Hepach et al., 2017; Lennon & Eisenberg, 1987). The focal child's more positive emotional response (relative to the peer) when not receiving help in the current study may resemble elevation, an emotion caused by seeing others' good fortune, as well the exemplary actions of prosocial others (Fessler et al., 2019; Haidt, 2003a, 2003b; Schnall et al., 2010). To summarize, both of these emotions—sympathy and elevation—appear to fulfill the function to focus attention away from one's

own needs towards those of others (Stellar et al., 2017), and thereby serve as commitment devices that motivate the maintenance of functional cooperative relationships with peers (Frank, 1988).

It appears less likely that emotions like guilt played a substantial role the focal child's (less positive) emotional response to being helped, as focal children did not cause the less deserving outcome themselves. Perceived causal responsibility for harm to others has been argued to be a critical antecedent to the elicitation of self-conscious emotions, such as guilt (Vaish et al., 2016).

It is, moreover, possible that children's emotional responses to seeing others receive help derive from cognitive scripts on the way in which needs should be responded to that are established in the context of caregiver-child interactions (e.g., T. E. A. Waters & Roisman, 2019). These early caregiver-related experiences may shape the expectation to receive help oneself when in need, which causes an alleviation of the child's own distress. In turn, these experiences may inform children's emotional responses to others' perceived distress or need (e.g., H. S. Waters et al., 2021). In addition, children's emotions in cooperative settings, similar to the one we presented children with, may be informed by cooperatively playing with social partners, activities that have been found to influence children's prosocial motivation as well (e.g., Toppe et al., 2019). Future work could examine the role of parental caregiving experiences, as well as of prior cooperative interactions with peers, on children's expression of positive emotions when seeing others receive help.

4.1 | Limitations and future directions

We note that in the present study, the influence of being observed on children's expression of positive emotion was tested in a context which peers may have viewed as being competitive. Our aim in having both children be at least moderately needy at the end of the study, when one child was helped and no child had already completed their sticker sheet by that time, was to ensure that children would focus on each other's *relative* deservingness. We, therefore, opted for an experimental design that allowed us to integrate both children's capacity for social comparison (Blake & McAuliffe, 2011; LoBue et al., 2011) as well as their concern for others' needs (Hepach, 2017; Köster et al., 2019). Importantly, our study did not explicitly prompt a competition between the two children, and a direct comparison of each child's progress was not prompted until immediately before the final helping event. Thus, children were, for most of the study, completing their sticker sheets in parallel rather than being prompted to compare their progress (which children, however, may have sometimes done regardless of prompts by the experimenter). For future work, it would be interesting to assess children's responses to seeing their peers receive deserving help without an opportunity for competition between the two children to arise. For instance, the influence of being observed on the focal child's emotional responses could be assessed after the focal child's needs are already met. Such a setting could address a separate research question regarding the role of implicit reputational concerns in children's expression of positive emotions in response to seeing peers receive help from the perspective of a neutral third-party observer.

Furthermore, in the current experimental paradigm we chose to focus children's attention on the outcome of the experimenter's actions rather than on her intentions. We made every effort to ensure that E2's choice of which child to help would appear random to children and uninformed of their actual needs. For instance, when E1 left the room, her instructions as to which child still needed help were ambiguous. Thus, why a particular child was helped rather than the other could well have been perceived as a matter of luck by children in the current study. Varying the experimenter's intentions would add another layer of complexity to the experimental design because children's emotions may then be influenced both by the experimenter's intention and by the outcome. In fact, an interesting question for future research relates to whether children would show different emotions if the experimenter had intended to help the needier peer but failed or vice versa (see Dunfield & Kuhlmeier, 2010; Vaish et al., 2010 for similar paradigms).

A further question relates to how the presence of different audiences might impact children's emotional response. Since our aim with this study was to examine whether children would signal their emotions to their peer partner, who

was or was not helped, we designed a task in which the peer, who was affected by the outcome contexts, was watching (see also Leimgruber et al., 2012; McAuliffe et al., 2020 for similar studies). To explore whether children specifically aimed to appease the peer via their emotional response, future studies could vary whether children are being watched by neutral peers who are not affected by the outcome (Engelmann et al., 2012), adult observers (Yazdi et al., 2020), or their parents (Jones et al., 1991). This would shed light on whether children aimed to maintain their cooperative relationship with their peer partner via their emotional response as opposed to generally attempting to manage their reputation in the presence of an audience. In addition, testing children's expression of emotions in the presence of their parents may illuminate how perceived parental expectations shape children's expression of emotions in cooperative contexts. Indeed, parental socialization goals have already been found to affect the development of prosocial behaviors (e.g., Giner Torrens & Kärtner, 2017), yet little is known regarding the influence of parental socialization practices on young children's emotional responses in cooperative settings.

5 | CONCLUSION

In previous studies on children's positive emotions following others being helped (or not) the recipient peer (Hepach & Tomasello, 2020; Lennon & Eisenberg, 1987) or puppet (Aknin et al., 2012) could observe children's emotional reaction. In the current study, we found that children primarily expressed positive emotions (postural elevation) in response to being helped themselves. Yet, importantly, children's emotional response after seeing their peer (less deservedly) not receive help was partially affected by whether their cooperative peer partner could see their emotional expression. Thus, children expressed increasingly negative emotions after their peer did not receive help while the peer was watching. This effect differed from that in the unobserved condition, in which the peer could not see children's emotional expression. This suggests that children's expressed emotions, in part, fulfill the function to signal their interest in and commitment to maintaining cooperative relationships. In conclusion, our results provide an indication for the notion that children's emotions may serve to appease others, but more research is needed to further examine the strategic function of children's expressed cooperative emotions.

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CONFLICTS OF INTEREST

None to declare.

ETHICS APPROVAL STATEMENT

This research was conducted in accordance with the guidelines for ethics in human research such as those published by the American Psychological Association or the British Psychological Association and approved by the institutional review board of the medical faculty of Leipzig University (IRB number: 169/17).

AUTHOR CONTRIBUTIONS

S. C. G., R. B. and R. H. designed the studies. R. B. collected the data. S.C.G. analyzed the data and wrote the first draft of the manuscript. All authors commented on and edited the manuscript.

DATA AVAILABILITY STATEMENT

The main analyses for research questions 1 and 2 were preregistered at Aspredicted.org (<https://aspredicted.org/j884z.pdf>). The analysis for research question 3 was not preregistered. Data and analysis script are available through the OSF (<https://osf.io/evnum/>).

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