The Role of Peers and Siblings in Toddlers' Developing Understanding of Incompatible Desires

Nils Schuhmacher and Joscha Kärtner, *University of Münster*

Abstract

According to previous research, social experiences with other children might explain why three-year-olds are already quite proficient in understanding desires but not beliefs as subjective mental states. This study investigated toddlers' (N = 50) developing subjective understanding of incompatible desires around the age of 3 years (M = 35.5 months) and the associated social factors (i.e., family demographics, peer, and sibling variables). Results indicated a developmental sequence from understanding desires to understanding desire-dependent emotions with an unexpected positivity bias in toddlers' prediction of own emotions. A hierarchical regression model revealed that specific social factors (i.e., reported quality of peer interactions and day care attendance) individually contributed to explaining the variance in children's desire-reasoning skills. Findings are interpreted as supporting a belief–desire asymmetry, and specific social experiences, such as positive peer interactions and desire conflicts, may promote toddlers' understanding of incompatible desires as subjective mental states.

Keywords: toddlers; incompatible desires; emotion and desire prediction; social influence; day care; peers; siblings

Introduction

Understanding desires is vitally important for social interaction in a host of contexts. Generally, desires provide a basis for planning and explaining one's own and others' behavior in everyday life. Together with the understanding of epistemic states (i.e., beliefs), they provide the foundation of belief–desire psychology (Bartsch & Wellman, 1995) or so-called 'folk psychology'.

During the first 18 months of life, toddlers come to understand others' goals and intentions (e.g., Tomasello, Carpenter, Call, Behne, & Moll, 2005). Later on, two-year-old to three-year-old children seem to increasingly understand desires and goals as being truly subjective, and they are said to become simple 'desire theorists'; that is, to have a mental representation of their own and others' desires, and to be able to use their understanding of others' volitions (i.e., wishes or preferences)

as theoretical terms to predict behavior and the emotional consequences of actions (Wellman, 1990). Once three-year-olds have acquired these 'desire-reasoning' skills, they begin to predict others' behavior on the basis of epistemic states, that is, others' knowledge and beliefs about the world (Perner, 1991; Wellman, 1990; Wellman & Liu, 2004). In contrast to infants' and toddlers' implicit and potentially innate false-belief understanding (see Baillargeon, Scott, & He, 2010, for a review), explicit belief–desire reasoning abilities become more flexible in three-year-olds to four-year-olds. For example, their reflective false-belief understanding allows them to verbally predict others' behavior or emotions and to flexibly organize their own behavior in diverse social interactions in line with own and others' beliefs and desires (Apperly & Butterfill, 2009).

Traditional ToM research posits an asymmetry between the onset of children's subjective understanding of desires versus beliefs: Children come to understand desires as subjective mental states at about 3 years of age and thus, ontogenetically, 1 year before they recognize beliefs as truly subjective attitudes, the so-called asymmetry assumption. As mentioned above, this is supported empirically by three-year-olds' competencies in predicting behavior and emotional reactions on the basis of other agents' desires and action outcomes (Bartsch & Wellman, 1995; Wellman & Woolley, 1990). The current study proposes yet another and new approach to the asymmetry debate, namely to identify whether there is a structurally equivalent progression in toddlers' desire- and belief-reasoning skills: We expect a sequence from the subjective understanding of desires to the understanding of desire-dependent emotions in three-year-olds that is equivalent to, but ontogenetically earlier than the progression from belief to belief-emotion understanding in four-year-olds (i.e., three-year olds' understanding of desires precedes their understanding of desire-dependent emotions).

Previous studies did not aim at identifying such a progression in toddlers' desire understanding. For instance, the classic ToM scale by Wellman and Liu (2004) yielded a progression from understanding false beliefs to understanding belief-dependent emotional consequences in four-year-olds; that is, children could solve a belief emotion item (how a person will feel, given a belief that is mistaken) only after they have solved all earlier items (e.g., explicit false belief). However, the scale does not specify a progression from desire understanding to the understanding of the emotional consequences of desires in three-year-olds, because it does not provide a desire-emotion item (how a person will feel, given an (un)fulfilled desire), which is necessary for tapping such a progression. Findings of another study suggest that many older two-year-olds are already at a ceiling in predicting both desire-dependent actions and corresponding emotional outcomes (Wellman & Woolley, 1990). At first sight, this seems to contrast with the proposed progression assumption. However these authors used simple third person compatible desire tasks (i.e., asking children whether an actor in a picture story would perseverate in searching for an object if her desire was still unattained and would be happy if she was to find the desired object, but otherwise be sad). Such tasks have been criticized for assessing an objective but not a subjective desire understanding (Perner, Zauner, & Sprung, 2005). The core argument is that to show that children understand desires as truly subjective mental states, they need to act in response to incompatible or conflicting desires (e.g., two actors' mutually exclusive desires directed toward the same object at the same time). For compatible desire tasks it is enough to have an objective desire understanding, namely that agents show

goal-directed behavior toward preferred objects and are happy when they receive them (see also Supplements).

In two recent studies, Rakoczy (2010) and Rakoczy, Warneken, and Tomasello (2007) explicitly addressed three-year-olds' subjective understanding of incompatible desires and corresponding affective responses. These studies used a first-person incompatible desire task: A hand puppet and the child are arguing about which of two stickers should go into a shared booklet. Finally, a so-called 'chance' machine decides which sticker to put into the booklet. During the task, children have to predict which outcome they want themselves and which outcome the puppet desires. In addition, children should predict the corresponding emotional consequences. Results showed that most three-year-olds were able to correctly predict their own and the puppet's desire, but they were unable to solve a standard false-belief task correctly, which supports an asymmetry assumption. Moreover, these authors found that toddlers were far from perfect in predicting emotional consequences, although they were very proficient in correctly predicting others' desires. However, the latter studies did not provide any statistical evidence that would determine children's developmental sequencing from understanding desires to desire-dependent emotions at an individual level.

Hence, this study aims to investigate more thoroughly the relation between children's desire understanding and their prediction of emotional consequences applying a first-person incompatible desire task that assesses toddlers' subjective desire reasoning skills. Uncovering the developmental sequence of these skills (i.e., desire understanding precedes correct emotion prediction) would further strengthen an asymmetry hypothesis and add an important step in the ontogenetic sequence of toddlers' ToM development.

The Role of Peers and Siblings in Toddlers' Subjective Understanding of Desires

In this section, we focus on two pivotal social factors associated with children's understanding of the subjectivity of own and others' desires: namely (older) siblings and peer interactions during extrafamilial care. Previously, it has been argued that pragmatic and experiential aspects might account for three-year-olds' understanding of incompatible desires, that is, their experiences of both cooperative activities and conflicts with peers (Rakoczy et al., 2007). In line with this assumption, there are three related arguments regarding why peers and siblings play a key role in children's developing understanding of (incompatible) desires in the context of early social interactions.

First, children's interactions with peers and siblings possess unique characteristics (compared to interactions with parents, teachers, or adults in general) that probably promote their understanding of subjective desires. Most importantly, they are more symmetrical (i.e., egalitarian, equivalent) than interactions with adults and marked by less scaffolding and structuring. This makes them sociocognitively more demanding so that they require more effort in disputing and coordinating one's own and others' desires (Cutting & Dunn, 2006; Shantz, 1987). Moreover, they are accompanied by discourse about different points of view and rejections or revisions of own and others' wishes and goals during play (e.g., Göncü, 1993; Viernickel, 2000).

Second, various studies support the assumption that the comprehension of volitions as subjective mental states is associated with different forms of 'positive'

social interactions with peers (or siblings) during toddlers' everyday activities—that is, prosocial and collaborative behavior. Collaborative activities with peers among two-year-olds to three-year-olds encompass cooperative play, joint problem solving, and mutual assistance (e.g., Brownell, Ramani, & Zerwas, 2006; Hamann, Warneken, & Tomasello, 2012). These interactions typically afford a coordination of the different goals and desires held by each playing partner (Bratman, 1992; Tomasello et al., 2005). In addition, preschoolers comfort and help others (e.g., peers and siblings) in increasingly more adequate ways (Eisenberg, Fabes, & Spinrad, 2006). Competent comforting implies a general insight into others' volitions, because unfulfilled desires are often the reason for a target's sadness, and they need to be understood in order to effectively alleviate the other's negative emotional state.

Third, the literature on children's ToM development delivers empirical support for the significance of siblings and peers in toddlers' sociocognitive development. For example, children with siblings score significantly better on ToM tasks than children without siblings (e.g., Jenkins & Astington, 1996; Perner, Ruffman, & Leekam, 1994). However, some findings also report significant correlations only for older siblings (e.g., Lewis, Freeman, Kyriakidou, & Maridaki-Kassotaki, 1996). In addition, researchers focusing on the meaning of peer relationships and interaction quality for ToM development (Dunn, 2000; Dunn & Cutting, 1999) have found, for example, that more harmonious peer interactions are associated with higher ToM scores.

Notably, many of the aforementioned studies of peer interactions were conducted in a day care setting. This highlights the important role of day care as an essential context in which children experience natural peer interactions. Extrafamilial day care gives toddlers the opportunity to interact with peers and friends on a regular basis, and it supports them by providing important social experiences that help them develop an understanding of their own and others' desires, that is, (cooperative) play and desire discourse (Howes, 1988; Rubin, Bukowski, & Parker, 2006).

To summarize, various social activities with same- or similar-age children (i.e., peers and siblings) provide children with opportunities to apply and exercise their desire-reasoning skills. Moreover, it is not only the quantity but also the quality (e.g., a positive valence) of these interactions that is probably associated with two-year-olds' and three-year-olds' conative understanding.

However, there is a lack of direct empirical evidence explicitly addressing the social correlates of toddlers' understanding of incompatible desires. The majority of studies on social factors that explain interindividual differences in children's ToM development mentioned above have focused on preschoolers' (mostly four-year-olds and older three-year-olds) false belief understanding. Moreover, the few studies on social correlates of preschoolers' desire understanding (e.g., Pears & Moses, 2003) used compatible (third-party) desire tasks, and it is questionable whether these are suitable measures to assess preschoolers' subjective understanding of desires (see above). Therefore, this study is based on a first-person procedure (similar to Rakoczy et al., 2007) to investigate toddlers' (i.e., older two-year-olds) understanding of their own and others' (incompatible) desires along with the corresponding social correlates thereof. More importantly, earlier findings focused exclusively on family characteristics (e.g., number of siblings, SES, family size, and so on; see also Hughes & Leekam, 2004, for a review) as potential socialization factors. Thus, comparably little is known about the contribution of peers and day care to toddlers'

desire understanding, although both factors are becoming increasingly important for children's social experiences of everyday life in Western industrialized societies. Thus, the relation between these different social factors and children's desire understanding clearly needs further specification.

Goals of the Present Study

Beyond replicating earlier findings on three-year-olds' understanding of the subjectivity of desires, we want to provide further evidence for the asymmetry hypothesis by investigating the relation between understanding desires and corresponding emotional consequences. In contrast to previous studies, we want to address this issue explicitly: We assume a certain order of emergence of desire understanding and emotion prediction, namely that desire understanding precedes correct emotion prediction.

The second aim of our study is to specify the quantity and quality of sibling and peer interactions and analyze how these factors relate to the development of toddlers' understanding of incompatible desires. As the literature review above suggests, there is a lack of studies that simultaneously assess the contribution of multiple social factors (i.e., family, peers, and day care) to explain interindividual differences in toddlers' understanding of incompatible desires. Moreover, our findings should help to identify potential social sources of the belief–desire asymmetry. Given the studies on children's understanding of simple desires and false beliefs, we hypothesize that number of siblings will correlate positively with children's understanding of incompatible desires. Furthermore, we expect that both quantitative (i.e., number of friends, attendance of day care) and qualitative aspects of peer interactions (i.e., quality of peer interactions, enjoying peer interactions) will correlate positively with children's understanding of incompatible desires. Finally, we expect that each of these different social factors will make an individual contribution to explaining the variance in toddlers' desire-reasoning skills.

Method

Sample

We recruited 50 two-year-old to three-year-old children (mean age = 35.5 months, SD = 1.70 months, range: 33–39 months, 18 boys) all living in a mid-sized German city. Due to technical problems or procedural error, three children had to be excluded, resulting in a final sample of 47 children. Participating families were recruited via the local registry office. They were informed about the goals of the study and that participation was voluntary. Families gave their written agreement and received a financial reimbursement of 20 €. In terms of SES, our sample was representative for German urban educated middle-class families in terms of net household income (median = 2500€–3000€ per month on a 5-point scale) and education (26 percent of the mothers had a general secondary school qualification, 36 percent had university entrance qualifications, and 37 percent had a university degree).

Design and General Procedure

Each child was tested in a single session. Tasks were administered within a series of tests that were part of a larger study. However, they were always conducted in

the middle part of the overall test session. The assessment of the focal tasks lasted approximately 10–15 min with the whole test session lasting 60–70 min. Children visited our laboratory together with their mothers. Mothers were instructed to complete questionnaires and to remain passive during the test session. The whole session was videotaped. The quasiexperimental observations began with a warm-up period. When the child and the first experimenter (E1) were already in the room, the second experimenter joined them while enacting the role of a puppet (called Tilde). Tilde introduced herself and initiated play with the child and E1 (i.e., imitation game, rolling a ball, and so on). After having established rapport with the child, E1 started the test session. Each child received two desire-understanding tasks in which the child and the puppet character had mutually incompatible desires. On one trial, the child's own desire was fulfilled (child's desire matched trial), which means that the puppet's desire was unfulfilled. On the other trial, the puppet's desire was finally fulfilled (puppet's desire matched trial), which means the child's desire remained unfulfilled. We decided to conduct two trials (i.e., instead of four or more) to avoid repeatedly frustrating the toddlers' desires and to keep any potential conflict between the puppet and the child at a minimum level. The order of trials (whether the child's or the puppet's desire became fulfilled first) and test questions (whether children were first asked about their own desires and emotions or the puppet's desires and emotions) were counterbalanced across participants.

Materials and Procedure

The desire task was modeled after Rakoczy et al. (2007). The general setup was as follows (supplemental materials, i.e., overview of task structure, questionnaire items, and additional analyses, can be retrieved from https://dl.dropboxusercontent.com/u/80753504/Supplements_0001_SD_20143006.zip): E1, E2 (enacting the puppet), and the child sat or stood together at a table. The puppet and the child had a shared sticker booklet. E1 presented the booklet and stated that only one sticker could go into the booklet at a given time. Then he presented a laminated cardboard (21 cm × 30 cm) with two distinct stickers on it: an unattractive sticker (i.e., with simple geometric shapes on it, e.g., a line) and an attractive sticker (i.e., multicolored animal sticker, e.g., a duck). The order of stickers on the cardboard was counterbalanced across trials. The child was then asked to indicate which sticker should go into the booklet. Almost all children (86 percent) preferred the attractive sticker. In response to the child's choice, the puppet protested, saying 'No!' and further expressing her desire for the opposite sticker. To check the children's consistency, each child was then asked to show her or his preference for one of the stickers for a second time (control question). If the child's preference changed, the trial was repeated with a new pair of stickers. In addition, children who changed preferences repeatedly ($n = 3$) were excluded from further analyses.

In a next step, E1 introduced the 'magic' bag (a colored opaque bag). E1 alternated between looking into the bag and gazing at the child before expressing surprise and saying that there was a sticker in the bag (indicating that it was one of those two stickers on the cardboard). E1 closed the bag and then asked the child the first pair of test questions: 'Which sticker would you want it to be in the bag?' (Q1a) and 'Which sticker would Tilde want it to be in the bag?'(Q1b). After the child responded, E1 drew the sticker out of the 'magic' bag (child's desire matched trial: the sticker preferred by the child; puppet's desire matched trial: the sticker

preferred by the puppet) and showed the sticker to the child (up to this point, which of the two different stickers could be in the bag was not obvious to the child, making it seem like a random outcome). Then the experimenter asked the second pair of test questions about the child's (Q2a) and the puppet's emotions (Q2b), that is, whether the child or puppet is happy with the outcome or not. During all test questions, the puppet remained calm and looked down onto the table in front of her. After children answered the question pair Q2, the sticker was put into the booklet and the trial was repeated with a new pair of stickers. At the end of the second trial, children also received the desired sticker that was not in the 'magic' bag during the puppet's desire-matched trial. At the end of testing, the children took the sticker booklet home.

Measures

Desire and Emotion Scores. Children received a 'correct' score for their own desires if they answered test question Q1a correctly, and a correct score for understanding the puppet's desires if they replied correctly to question Q1b. Analogously, they received a 'correct' score for own emotions when answering Q2a and the puppet's emotions when answering Q2b properly. Data were coded on the basis of the recorded videos. Two coders rated 20 percent of all videos independently. The level of agreement among coders was very good (all Cohen's κs > .90).

Family Background and Siblings. Children had either no (48 percent), one (29 percent), or at least two (23 percent) siblings. Whereas 21 percent of the siblings were younger, 79 percent were older or the same age. The final sibling variables were 'number of younger siblings' ($M = 0.17$, $SD = 0.38$) and 'number of older siblings' ($M = 0.65$, $SD = 0.10$). For further analyses, we used the variables 'family income' and 'mother's educational level' (see sample description) to additionally control for possible social influences of family background (e.g., Pears & Moses, 2003).

Extrafamilial Day Care. Approximately, one-half of the children (63 percent) attended day care centers for an average of 4.60 days a week ($SD = 1.04$). On average, children had started attending day care 1 year previously ($M = 11.39$ months, $SD = 7.31$). Other children went to home day care (8.3 percent) for an average of 3.80 days a week ($SD = 1.50$) and had started their attendance an average of 2 years before ($M = 22.25$ months, $SD = 9.91$). German home day cares are run by self-employed child minders who offer a professional home-based childcare service in a family environment, typically for three to five infants or toddlers. A further 18.8 percent of the children were cared for (in part) by relatives or other persons and 10.4 percent received no extraparental care. For further analyses, we used the variable 'extrafamilial day care (in months)' to measure the length of time since children started attending day care centers or home day care.

Peers and Friends. On average, mothers indicated that their child had two friends ($M = 2.65$, $SD = 1.41$). The majority of friends were of the same or similar age (friends 3–4 years: $M = 1.43$, $SD = 1.21$), and rarely younger (friends < 3 years: $M = 0.60$, $SD = 0.88$) or older (friends > 4 years: $M = 0.62$, $SD = 0.99$). On average, 54 percent of the children's friends were of the same sex ($SD = 0.38$) and they predominantly met on at least 2 days per week (60 percent met 2–7 days a week).

Finally, mothers rated their children's interaction experiences with peers (i.e., both friends and strangers of similar age) on a 4-point scale ranging from 1 (total disagreement) to 4 (total agreement). Focal scales were 'enjoying peer interactions' consisting of five items describing how much children enjoy and look forward to interactions with peers (e.g., 'My child enjoys playing with other children') and 'quality of peer interactions', consisting of five items generally describing how harmoniously peer interactions usually are (e.g., 'My child and other children often build up intensive play episodes'). Internal consistencies were acceptable to good (enjoying interactions: Cronbach's $\alpha = .79$, interaction quality: Cronbach's $\alpha = .65$).

For the final analyses, we used 'number of younger friends' and 'number of older or same-age friends' (as main friend variables) and the mean values of the items for each focal peer interaction scale. The differentiation between younger and older/same-age friends is equivalent to the distinction regarding siblings, which is based on the assumption that older siblings/friends might be particularly important for toddlers' understanding of others' mental states (see, Lewis et al., 1996).

Age and Gender. To control for possible gender and age effects in the correlational analyses of toddlers' desire-reasoning skills we added the variables 'age' (in months) and 'gender' (dummy-coded: 1 = girl, 2 = boy).

Results

Desires and Emotions

Understanding Incompatible Desires. On both trials, that is, the child's desire matched trial (Trial 1) and the puppet's desire matched trial (Trail 2), 93 percent of the children were able to predict their own desires correctly (i.e., answering correctly to Q1a: 'Which sticker do you want to be in the magic bag?'; see also Figure 1). Performance was significantly above chance level (binomial tests, $ps < .001$). Moreover, children were reasonably good at predicting the puppet's desire with 76 percent of the children on Trial 1 and 70 percent on Trial 2 predicting it accurately (i.e., answering Q1b: 'Which sticker does the puppet want to be in the bag?'). Both results were significantly above chance level (binomial tests, all $ps < .01$). Furthermore, children were significantly better at predicting own desires compared to the puppet's desire on each trial (i.e., they were more correct in responding to Q1a than to Q1b; McNemar tests, all $ps < .05$). Finally, the consistency of responses across Trial 1 and Trial 2 was low to moderate (predicting own desire: $r_\phi = -.08$, *ns*; predicting puppet's desire: $r_\phi = .43$, $p < .01$).

In summary, these findings indicated that almost all children were able to express their own desires correctly by stating that they wanted the sticker preferred by themselves to be in the magic bag. In addition, they demonstrated that children were reasonably good in predicting the puppet's desire, which was opposed and incompatible to their personal desire.

Understanding Emotional Consequences. In the following, we present the results on children's predictions of their own and others' desire-dependent emotions. Generally, the children seemed to be highly sophisticated in predicting positive emotions (A+) as a consequence of a fulfilled desire (own emotion: 95 percent, puppet's emotion: 73 percent; binomial tests, $p < .001$ and $p < .01$). On the other hand, they
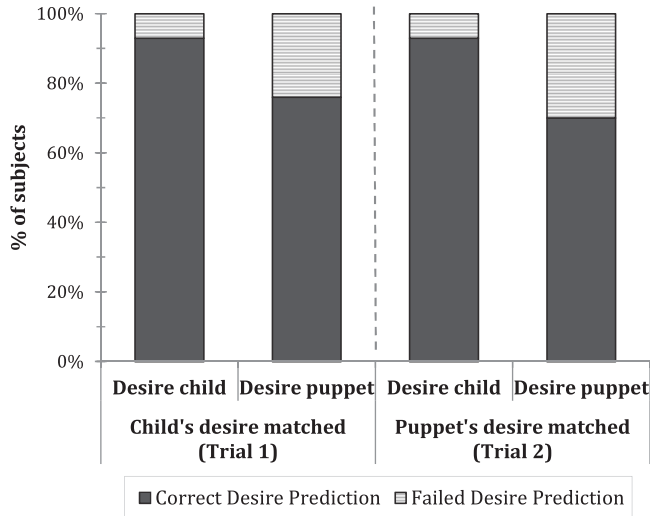
Figure 1. Percentage of Participants Correctly and Falsely Predicting Own and Puppet's Desires in the Different Trials.

had problems in predicting negative emotional consequences (A−) of unfulfilled desires (see also Figure 2). More specifically, 78 percent of the children falsely claimed that they were happy with the undesired sticker (binomial test, $p < .01$). Regarding the prediction of the puppet's emotion, children replied at chance level: 52 percent of the children falsely predicted that the puppet was happy with the undesired sticker (binomial test, $p = .88$). Furthermore, there was no significant difference in predicting own and the puppet's positive affect (McNemar test, $p = .57$), but children were considerably better at predicting the puppet's negative emotions than their own negative affect (McNemar test, $p < .05$).

Because of the ceiling effect for predicting own desires (reported above) and children's low performance in correctly predicting own negative emotions as a consequence of an unfulfilled desire, these scores were dropped from further analyses, and we focused on children's predictions of the puppet's desire and emotion.

Relations Between Understanding Incompatible Desires and Emotional Consequences. As expected, it was easier for the children to predict the object of desire than the emotional consequences of (un-)fulfilled desires, especially in Trial 1 in which they had to predict the negative emotional outcome for the puppet (McNemar test; $p < .05$). Differences were nonsignificant for the comparison of the puppet's desire and positive emotion in Trial 2 ($p = 1.0$).

To test whether the understanding of desires was a necessary (but not sufficient) prerequisite for correctly predicting emotional consequences, we calculated the corresponding conditional probabilities on the basis of the children's task responses (see Table 1 for contingency tables). Only a very few children were able to predict the puppet's emotion correctly, but failed to predict the puppet's desire (4 in Trial 1 and 8 in Trial 2). Moreover, a reasonable proportion of children understood desires but not emotions (16 in Trial 1 and 10 in Trial 2). Thus, not all children who predicted the puppet's desire correctly were also able to predict the puppet's emotion.
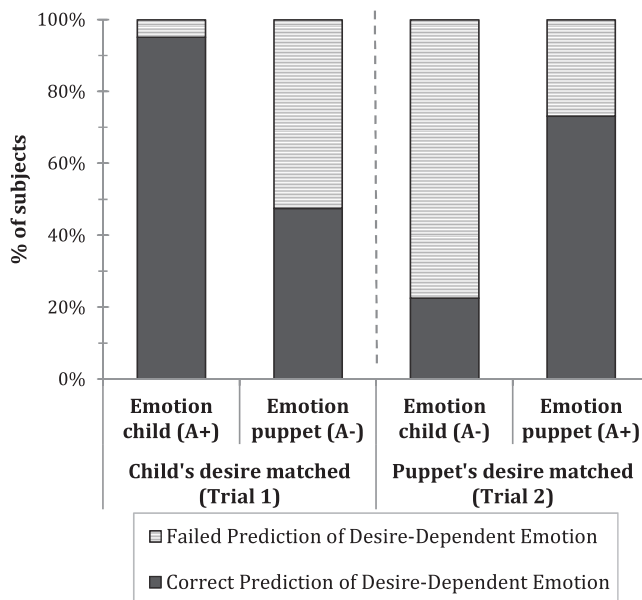
Figure 2. Percentage of Participants Correctly and Falsely Predicting Own and Puppet's Desire-Dependent Emotion in the Different Trials.
Note: A+ = positive affect/happiness, A− = negative affect/sadness. Correct responses for emotion prediction are in parentheses.

We conducted separate analyses for predicting negative emotions (A−: Trial 1) and positive emotions (A+: Trial 2): The probability of predicting the puppet's desire correctly given that children were able to predict the puppet's negative emotion correctly was $P(D_{\text{Puppet}} = 1 \mid E_{\text{Puppet}: A-} = 1) = .81$ with bootstrapping 95 percent CI [.62, .96] and $P(D_{\text{Puppet}} = 1 \mid E_{\text{Puppet}: A+} = 1) = .72$ for positive emotions

Table 1. Contingency Tables for Predicting Puppet's Desire and Emotion on Trials 1 and 2

	Emotion puppet					
	Child desire matched trial (A−)			Puppet desire matched trial (A+)		
Desire puppet	Incorrect	Correct	Total	Incorrect	Correct	Total
Incorrect	6	4	10	4	8	12
Correct	16	17	33	10	21	31
Total	22	21		14	29	

Note: Values in cells indicate frequency of children that falsely/correctly responded to Q1b (prediction of puppet's desire) and Q2b (prediction of puppet's emotion). Left: children's performance on Trial 1 (child's desire matched trial; correct emotion = A−); Right: children's performance on Trial 2 (puppet's desire matched trial; correct emotion = A+).

with bootstrapping 95 percent CI [.56, .88] and thus significantly above chance ($p = .50$). These results supported the theoretical assumption that children need to understand desires as an important precondition for understanding desire-dependent emotional consequences; or, to put it differently, that the successful understanding of emotions implies desire comprehension. In addition, we calculated the conditional probabilities of correct emotion prediction given that children could correctly predict the puppet's desire, indicating whether understanding desires is actually sufficient to predict emotions. As expected, these results did not differ significantly from chance level ($p = .50$) with $P(E_{\text{Puppet: } A-} = 1 \mid D_{\text{Puppet}} = 1) = .52$, bootstrapping 95 percent CI [.34, .69], and $P(E_{\text{Puppet: } A+} = 1 \mid D_{\text{Puppet}} = 1) = .68$, bootstrapping 95 percent CI [.50, .83], indicating that correct desire prediction does not guarantee correct emotion prediction.

In summary, these analyses yield a clear sequencing (i.e., desire understanding precedes emotion understanding) and indicate that children's responses provide a reliable scale for their level of desire reasoning. Therefore, we computed sum scores for puppet desire and emotion prediction on each trial to gain a more informative and robust measure of children's desire-reasoning skills. Accordingly, children received a score of 0, 1 (puppet's emotion or desire correctly), or 2 (puppet's desire and emotion correctly) for each trial. For further analyses, we used the mean score across Trials 1 and 2 (desire-reasoning score).

Social Factors Associated With Desire Reasoning

We started our analyses on associated social factors by calculating the zero-order correlations for the different social variables (i.e., family demographics, peers, and day care) and the desire-reasoning score (results listed in Table 2). Because we wanted to control for possible gender and age effects, we added these variables to the correlational analyses. There were no significant correlations with age, family demographics (i.e., family income, mother's level of education), or number of siblings or friends, all rs between $-.14$ and .20, all ps $> .10$. Gender was associated significantly with desire reasoning (i.e., girls tended to have higher scores than boys). On the level of day care and peer variables, we found a significant positive relationship with extrafamilial day care (i.e., months of day care attendance). Furthermore, both the quality of peer interaction ($M = 3.46$, $SD = 0.53$) and enjoying peer interactions ($M = 3.12$, $SD = 0.37$) correlated positively with children's understanding of incompatible desires.

Because simple correlations do not take into account intercorrelations with other predictors of incompatible desire reasoning, we computed a hierarchical regression analysis with children's desire-reasoning score as dependent variable (see Table 3). Predictor variables were chosen on the basis of the significant zero-order correlations. Theoretically, we assumed that the relative importance of more general (or distal) variables describing the overall socialization context (e.g., attending day care) would be greater than more specific (or proximal) variables (e.g., characteristics of peer interactions). Therefore, we selected a hierarchical model with three steps: In Step 1, we entered gender (as control variable); the resulting model was significant ($\Delta R^2 = .14$, $F_{\text{inc}}(1,39) = 6.09$, $p < .05$). In Step 2, we included day care attendance (in months) and gained a significant increment in R^2 ($\Delta R^2 = .13$, $F_{\text{inc}}(1,38) = 6.66$, $p < .05$) with both gender and extrafamilial day care contributing significantly. In the final step, we entered the peer variables (enjoying peer

Table 2. Intercorrelations Between Toddlers' Desire Reasoning, Social Variables, Age, and Gender

	1	2	3	4	5	6	7	8	9	10	11
Toddlers' desire reasoning											
1. Desire-reasoning score											
Demographic variables											
2. Family income	.12										
3. Mother's educational level	.14	.46^c									
4. Number of younger siblings	.01	.07	.22								
5. Number of older siblings	−.14	.18	.15	−.31^b							
Day care and peers											
6. Extrafamilial day care (months)	.42^c	.19	.20	.03	−.17						
7. Number of younger friends	.20	−.07	−.04	−.20	−.06	.19					
8. Number of same-age or older friends	−.12	.20	−.02	.04	−.02	−.06	−.32^b				
9. Enjoying peer interactions	.26^a	.30^a	.09	.05	.19	−.12	−.09	.14			
10. Quality of peer interactions	.37^b	.04	.28^a	−.04	.03	−.15	.07	−.07	.28^a		
Age and gender											
11. Age	.09	.31^b	.17	.10	.01	−.04	−.51^c	.27	.06	−.05	
12. Gender	−.40^c	−.16	−.08	−.08	.12	−.18	−.05	−.15	−.42^c	−.30^b	−.01

Note: Spearman correlation coefficients r_S were used for ordinal data (income and education), point-biserial correlations r_{pb} for dichotomous data (gender: 1 = girls, 2 = boys), and Pearson's r for interval data. $N = 41$–44. ^{a} $p < .10$, two-tailed. ^{b} $p < .05$, two-tailed. ^{c} $p < .01$, two-tailed.

Table 3. Hierarchical Regression Model for Desire Understanding (Dependent Variable)

Predictor variables	β_{Step1}	β_{Step2}	β_{Step3}	R^2	ΔR^2
Gender	$-.37^a$	$-.31^a$	$-.10$	$.14^a$	$.14^a$
Extrafamilial day care (in months)		$.36^a$	$.45^b$	$.26^b$	$.13^a$
Enjoying peer interactions			$.14$	$.40^b$	$.14^a$
Quality of peer interactions			$.37^a$		

Note: $N = 41$. We also calculated the regression with a more robust bootstrapping procedure that yielded similar results (i.e., no substantial changes in general results and significance pattern). [a] $p < .05$. [b] $p < .01$.

interactions, quality of peer interactions) as additional predictors. This final model explained 40 percent of the variance ($\Delta R^2 = .14$, $F_{\text{inc}}(2,36) = 4.08$, $p < .05$) with duration of day care and quality of peer interactions as significant predictors, and gender no longer predicting desire reasoning (because it was associated with quality of peer interactions).

Discussion

This study had two major aims: First, we wanted to provide further evidence for the asymmetry hypothesis by analyzing the developmental progression from understanding subjective desires to understanding emotional consequences of these desires. Second, we were interested in specific social factors (i.e., family demographics, siblings, and peers) that might influence toddlers' development, that is, understanding of incompatible desires and related emotions as a first milestone in children's ToM development.

Understanding Incompatible Desires and Emotional Consequences

The present findings show that around the age of 3, children have a robust understanding of incompatible desires. Almost all children were able to express their own desires correctly, and, more importantly, a significant percentage accurately predicted the puppet's desire that was opposed to their own desire (see also Rakoczy et al., 2007). This indicates that they can take into account two mutually exclusive conative perspectives toward a desired outcome simultaneously (puppet wants *Y*, child wants *X* = *non Y*). In contrast to previous studies (e.g., Repacholi & Gopnik, 1997), the methodology in this study warrants a valid operationalization of toddlers' desire understanding, as the tasks include a perspective problem and thus elicit toddlers' subjective (and not objective) desire reasoning competencies (see also supplemental materials). Hence, these results support an asymmetry approach to children's ToM development, claiming that children develop a subjective understanding of desires by the age of 3 years and thus almost 1 year before they understand the subjectivity of beliefs.

Moreover, our analyses further supported the asymmetry hypothesis by revealing a specific sequence in the development of children's desire understanding. We found a developmental progression from understanding others' desires to understanding desire-dependent emotions in two-year-olds to three-year-olds that parallels

four-year-olds to five-year-olds' sequencing from understanding others' false beliefs to corresponding belief emotions.

In addition, our findings indicate that experiential factors likely contribute to explaining a belief–desire asymmetry. It has been argued that various social activities with peers such as cooperative play or prosocial acts, that essentially afford a subjective understanding of own and others' desires but not beliefs, potentially explain this asymmetry (e.g., Rakoczy et al., 2007). This study yields the first empirical evidence for such an assumption: In particular, our findings indicate that peer experiences in the context of day care and the quality of peer interactions (i.e., harmonious and joyful activities) potentially support three-year-olds' subjective understanding. In light of previous findings regarding the positive influences of sibling and peer interactions on children's false-belief understanding, one might argue that these social experiences foster belief and desire understanding to a similar degree (thus supporting a symmetry position). However, typical peer/sibling interactions supporting children's understanding of beliefs, that is, mental state talk and pretense play, seem to be rather limited in contrast to the variety of social activities that involve subjective desire understanding and dominate toddlers' everyday lives (e.g., various forms of social and cooperative play, prosocial acts, possession conflicts during daycare, etc.; see also below).

Furthermore, beside some structural equivalences, there are also specific differences between desires and beliefs accounting for an asymmetry: One major difference is that desires have a world-to-mind fit, that is, they aim toward changes of the world whereas beliefs have a mind-to-world fit, that is, they are mental representations of the world and aim toward the truth (Perner, 1991). As a consequence, the content of beliefs usually affords an *ad hoc* evaluation, that is, a mapping of the subjective belief of a person onto the actual state of the world. Desires, in contrast, do not require such comparisons, because their content is fulfilled mostly at some time point in the future. Thus, the ascription of beliefs might be sociocognitively more demanding than the assignment of desires (see also Rakoczy et al., 2007, for a discussion).

Finally, children were above chance when predicting that another agent would be happy or satisfied, if her or his desires were fulfilled. However, they still had some problems in predicting negative emotional consequences as a result of unfulfilled wishes. Especially, when they themselves had to predict their own disappointment with an undesired result, the children tended to exhibit a significant positivity bias. This unexpected finding is, however, in line with research on children's emotional development showing that young children generally tend to prefer positive over negative emotions (Harter & Buddin, 1987). Our results also replicate previous findings indicating a tendency for children to report more positive feelings when their desires are unfulfilled instead of expressing negative emotions (Rakoczy, 2010). One possible methodological explanation for this might be that children understood the test question in general mood terms. Moreover, children could have been happy for the puppet. Alternatively, they might simply have tried to be polite to the experimenter by pretending to be happy with the 'boring' sticker (see also Lee, 2013). However, this might represent some vague or implicit understanding of corresponding social rules regarding politeness, but not a clear concept of white lies (i.e., preschoolers robustly tell white lies, but can not explicate why). Finally, children might have reinterpreted the undesired outcome in order to sustain their positive emotional level, that is, as a coping strategy (e.g., 'I can still be happy with the other sticker'). Such an interpretation is also in line with an adaptive immaturity

approach claiming that positive attitudes generally encourage children to persevere in goal achievement and protect them from loss of self-efficacy in case of failure (see Boseovski, 2010). One future field of research might be a more systematic analysis of possible interrelations between the negativity bias reported for children's information processing (see Vaish, Grossmann, & Woodward, 2008, for a review) and the positivity bias in children's behavioral evaluations and action/emotion predictions (e.g., Boseovski, 2010).

Social Factors Associated With Desire Understanding

The second aim of this study was to identify potential social influences on children's understanding of incompatible desires as an early milestone in their ToM development. There were two findings in support of our hypotheses: Both attending extrafamilial day care and specific peer interaction characteristics promoted toddlers' subjective understanding of incompatible desires. In detail, the more months children had already attended day care, the better they scored on understanding the puppet's desires and emotional outcomes. Moreover, the peer variables describing different characteristics of peer interactions correlated positively with children's sociocognitive skills: Mothers describing their children as enjoying peer interactions and/or reporting 'high' quality peer interactions had children who were better at recognizing others' desires and corresponding emotions.

   In summary, our results support the importance of peers and the day care context for children's sociocognitive development. However, what is it precisely (e.g., which experiences) in peer interactions and extrafamilial day care contexts that might foster children's subjective desire understanding? First, day care offers an important environment in which children can play freely and interact with their peers (Howes, 1988; Rubin et al., 2006). Especially, German Kindergartens provide these possibilities, because the dominant educational curriculum clearly emphasizes free play activities with peers. Typical free play activities encompass social role play, pretense play, and joint collaborative activities (Howes, 1988; Viernickel, 2000). What all these different social interactions have in common is that they are instances of harmonious or 'high' quality peer interactions and thus share specific positive, qualitative characteristics. Moreover, they ultimately rely on the communication of own and others' goals and desires as well as a coconstruction of these activities based on the actors' desires (e.g., Bratman, 1992; Göncü, 1993). Furthermore, these activities usually contain various subplans that also afford the coordination of goals and desires. In summary, this iterative and reciprocal process of communication and consideration calls for a constant mapping of own and others' desires and therefore probably promotes children's subjective understanding of volitions.

   Moreover, results of the regression model showed that day care attendance and peer interaction quality both contributed significantly in predicting toddler's desire reasoning competencies. This leads us to ask which additional experiences during day care (apart from harmonious peer interactions) might be important for children's understanding of incompatible desires. One viable answer is that children improve their understanding of incompatible desires by experiencing controversies and struggles with peers. Children's discourse is often less structured, and there is less anticipation (or thoughtfulness) of others' volitions compared with adult interactions, making the discourse more sociocognitively demanding. Children are challenged to communicate and negotiate their own ideas, goals, and desires. Furthermore, quarrel

scenarios are typical for day care contexts and children's everyday experiences with peers, with object possession conflicts being one of most frequent interactions observed in preschool (e.g., Shantz, 1987). Indeed, detailed observations in a German preschool setting revealed that around 50 percent of two-year-olds' interactions were struggles followed by 30 percent cooperative or social play (Viernickel, 2000). Finally, the quality of children's day care centers and teachers' characteristics might additionally promote children's desire reasoning competences (e.g., teachers' use of inductive practices to solve desire conflicts together with the children in a coconstructive fashion). Future research should take these aspects into account by assessing toddlers' amounts and types of conflicts as well as their conflict resolution strategies and coregulation experiences in struggle situations, for example, on the basis of observations in day care settings.

Nevertheless, we have to be cautious when interpreting the directionality of peer relation characteristics: On the one hand, positive and harmonious peer interactions could promote children's desire understanding. On the other hand, children might enjoy peer interactions more and achieve a better quality of peer interaction, because they are better at understanding their interaction partners' desires and emotions. It is also likely that both is the case, implying an interactive and bidirectional dynamic process: Qualitatively good interactions (e.g., maintaining harmonious interactions by adjusting one's own in relation to others' desires, and so on) can improve children's sociocognitive skills. In turn, these improved skills lead to more sophisticated ways of interacting positively. This characterizes a typical reinforcing and self-stabilizing dynamic process (Van Geert, 1994). Longitudinal data combined with a dynamic systems approach could be used to test the proposed bidirectionality assumption. Interpreting the directionality of day care characteristics is more straightforward: Results indicate that attending day care has a positive effect on children's sociocognitive development. This is highlighted by the fact that 'the cumulative history' of day care experience was a significant predictor of children's desire understanding.

Finally, looking at the significance of siblings for children's subjective desire understanding, our results replicated other findings reporting no relationship between the number of siblings and other aspects of children's sociocognitive development (e.g., Pears & Moses, 2003). How can this be explained? First, it may well be that specific qualitative characteristics of sibling relations are more important for explaining differences in children's ToM development than simply the number of siblings (Cutting & Dunn, 2006; Dunn, 2000). These include the conflicts, relationship positivity, or discourse styles and content. In addition, peer interactions have different qualitative characteristics than sibling interactions (e.g., Cutting & Dunn, 2006), namely relationships are less hierarchical and they have similar developmental levels. These unique properties may well promote children's subjective understanding of desires and highlight the relative importance of peers for children's ToM development.

Conclusion and Outlook

To conclude, the present findings provide new empirical support for a belief–desire asymmetry by uncovering a progression from a subjective understanding of desires to desire-dependent emotions in three-year-olds, which is structurally equivalent to four-year-olds' progression from a subjective understanding of beliefs to belief-dependent emotions, and social experiences accounting for this asymmetry.

Furthermore, this study delivers the first empirical evidence for the importance of peers and extrafamilial day care for toddlers' understanding of incompatible desires. The findings also inspire future work on investigating specific day care characteristics, discourse elements (e.g., conflict-solving strategies), and peer experiences that are likely to contribute to children's understanding of own and others' desires. Summing up, this study fills a gap in explaining the progression and interindividual differences in toddlers' sociocognitive development around the age of 3 years and highlights the role of day care and peer experiences in children's development toward becoming early desire theorists.

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