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"This way!", "No! That way!"—3-year olds know that two people can have mutually incompatible desires

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Abstract

In theory of mind research, there is a long standing dispute about whether children come to understand the subjectivity of both desires and beliefs at the same time (around age 4), or whether there is an asymmetry such that desires are understood earlier. To address this issue, 3-year olds' understanding of situations in which two persons have mutually incompatible desires was tested in two studies. Results revealed that (i) children were quite proficient at ascribing incompatible desires to two persons, and in simpler scenarios even incompatible desire-dependent emotions; (ii) children showed this proficiency even though they mostly failed the false belief task. Overall, these results suggest that there is an asymmetry such that young children come to understand the subjective nature of desires before they understand the corresponding subjectivity of beliefs. Possible explanations for this asymmetry are discussed in light of conceptual change and information-processing accounts of theory of mind development.
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Keywords: Theory of Mind; Social cognitive development; False belief; Desire

In our everyday "folk psychology" we ascribe to others and ourselves two kinds of propositional attitudes: (1) conative or "pro" attitudes (Davidson, 1963)—what someone desires (or wants or wishes or hopes) to be the case; and (2) cognitive attitudes—what someone believes (or sees or knows or thinks) to be the case. Together, these two kinds of attitudes constitute reasons for acting and are referred to in rational action explanation, as in "He carried an umbrella because he *thought* it might rain, and he *wanted* to stay dry" (e.g., Davidson, 1963; von Wright, 1971). Thus, folk psychology is sometimes called "belief-desire psychology".

In developmental research on folk psychology (or "theory of mind"), the predominant view is that there is an asymmetry in the way children come to understand the two kinds of attitudes:

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they have a rich concept of desires as truly subjective attitudes long before they have an equally rich concept of beliefs as truly subjective attitudes. Thus, 2- and 3-year-old children – long before they pass the false belief and other related tasks and thus enter into adult like belief-desire folk psychology – are often said to be "desire theorists" (Wellman, 1990).

Empirical support for this assumption comes from various lines of research, for example, 3- (and to some degree 2-) year-old children can predict how a person will act given her desires (Wellman & Woolley, 1990) and explain actions with recourse to the agent's desires (Bartsch & Wellman, 1995). Children at this age are also capable of ascribing desire-dependent emotions: they correctly describe persons as happy when their desires have been fulfilled, and as sad in the case of non-fulfillment (Hadwin & Perner, 1991; Wellman & Banerjee, 1991; Wellman & Bartsch, 1988; Yuill, 1984). This ability precedes the analogous ability in ascribing the belief-dependent emotion of surprise (Hadwin & Perner, 1991; Wellman & Banerjee, 1991). Linguistically, German 3-year olds can use "that" complementation clauses to describe a character's unfulfilled desires ("She wants that the cat be in the bed" when the cat is on the mat) before they can describe a person's mistaken belief in this way ("She thinks that the cat is in the bed" while the cat is on the mat; Perner, Sprung, Zauner, & Haider, 2003). In tasks in which they themselves were involved in some way, 3-year olds also understood that other people might in a given situation have desires that differ from their own ones (Cassidy et al., 2005; Wellman & Woolley, 1990). Most dramatically, even children from 18 months have been shown to appreciate that someone else may have preferences that diverge from their own ones, e.g., that the other wants to have a piece of broccoli but not a cracker whereas they themselves prefer the cracker, of course (Repacholi & Gopnik, 1997).

The asymmetry assumption which these data seem to support, however, has recently been challenged both on theoretical and empirical grounds (Moore et al., 1995; Perner, 2004; Perner, Zauner, & Sprung, 2005; Rieffe, Terwogt, Koop, Stegge, & Oomen, 2001). The main thrust of the symmetry counter position is this: though having some considerable proficiency in ascribing desire-like attitudes to persons, young children before age 4 do not yet have a concept of desires as truly subjective and perspectival states, but only a sophisticated notion of objective desirability (Perner et al., 2005). On such a notion, different events can be marked as objectively good or bad in different situations for different people (e.g., eating broccoli is objectively good for the other, but objectively bad for the child); and people can be described as aiming at what is good, as happy when the good happens. But what is impossible on such a notion is ascribing different evaluations of one and the same event to different persons in a given situation. Only at age 4 do children then acquire the more general conceptual ability to ascribe truly subjective attitudes, both cognitive and conative ones, such that (i) the attitudes might be fulfilled or unfulfilled and (ii) different persons might hold not only different but mutually incompatible attitudes regarding identical reference situations (e.g., A believes/desires that p, whereas B believes/desires that non-p).

The symmetry position argues that the above mentioned early competence in children's desire reasoning can be explained as being based on an objectivist conception of desires. For example, understanding that others have different preferences from one's own ones (as in the Rapacholi & Gopnik study, for example) can be achieved on the basis of sophisticated objectivist reasoning in the following way: that the other person have a piece of broccoli is good/desirable, but that I have a piece of broccoli is not good. Rather, it is good that I have a cracker. There is no single situation which the two characters evaluate differently and towards which they have different desires, but there are two situations – the two mouths and stomachs – so to speak, and accordingly there is no incompatibility. A truly subjectivist concept of desires is only required for understanding scenarios in which there is real incompatibility between two person's desires relating to the same

state of affairs. For example, imagine that two persons have a broccoli and a cracker and wonder what the cat should eat right now. If A desires that the cat eats the cracker and B desires that cat does not eat the cracker, but the broccoli, there is no way to understand this situation in purely objectivist terms (on such terms it would have to be good and not good that the cat eat the cracker—a contradiction). Rather, a subjective notion of desires is needed that allows one to say that from A's perspective it is subjectively good that the cat eats the cracker, whereas it is bad from B's subjective perspective. Children should thus not be able to understand such a scenario before around age 4 when they also acquire the notion of subjective cognitive attitudes (as indexed by their passing the false belief task).

Positive support for this claim of the symmetry position comes from two studies: Moore et al. (1995) engaged 3-year-old children in a game against a puppet character, Fat Cat. Both had to solve their own jigsaw puzzle for which they needed parts that were in a blue or red box. In each round a card was drawn from a stack, turned around and shown to be either blue or red. Both players could then take a piece from the corresponding box. While in the beginning both characters needed pieces from the same box, there came a point where their needs diverged and thus their desires for which color the card should have became incompatible. At this point the test question was asked about what color Fat Cat wanted the card to be. Three-year olds performed poorly in this task (falsely ascribing to Fat Cat the same desire they themselves held), as poorly as in a false belief task. Recently, Daxeder and Feichtinger (2003, cited in Perner et al., 2005) replicated these findings and added a "compatible desires" control condition: in this condition each player had her own stack of cards. That is, the two characters' desires pertaining to the next card's color would still be different (A wants his card to be red, B wants hers to be blue), but importantly they would not be incompatible any more. Children in this control condition performed better than the children in the original condition.

The second line of support comes from a study by Lichtermann (1991, cited in Perner et al., 2005). Three and 4-year olds in this study were told stories about two characters who in a given situation wanted different things to happen, for example, the one wanted to go left whereas the other wanted to go right at a river junction. In the incompatible version of one story, the two characters were sitting in one boat, whereas in the compatible version of the same story each was sitting in her own boat. That is, according to the symmetry account, the compatible scenario can be interpreted with an objectivist notion of desirability ("The one boat going left is good/desirable; the other boat going right is good/desirable")—which is impossible for the incompatible scenario. Then in both versions both children were taken by the river to one side such that one's desire was fulfilled whereas the other one's was not. The test questions were, first, "Who is happy?" and, second, "Is the other child happy, too?" Children answered the first question correctly in both conditions, but on the second question were much worse in the incompatible desire tasks than in the compatible ones. Furthermore, their performance on the incompatible version was comparable to (and highly correlated with) their false belief task performance.

These studies thus seem to seriously put into question the by now almost traditional asymmetry assumption. There are, however, some methodological concerns with these studies: first, the task used by Moore et al. has a very complex inferential structure: the child has to infer from which piece is missing for each player to which box is the "good" one for each, and finally from there to which color is desirable from her point of view. Furthermore, the child herself was always part of the situation. Poor performance might thus be due to a general conceptual problem in ascribing subjective attitudes, or more specifically due to difficulty in overcoming the own perspective (in fact, Moore et al. interpret their findings along the latter lines). Second, the structure of the story and the question format in the Lichtermann study pose some problems: children did

correctly identify the person whose desire was satisfied (first question), but then incorrectly ascribed happiness to the other person in the incompatible condition as well (second question). But it remains unclear, for example, what would have happened if the children had been asked first who was sad. Furthermore, perhaps children thought the second person was happy as well because she liked to go with the first character together, even though they went to a place different from where she had originally wanted to go (this cannot be ruled out because the child was not told that the second person had a negative desire not to go to the place where the first wanted to go).

In light of these methodological concerns with existing studies, the aim of the present study was to test the symmetry and asymmetry accounts against each other by looking at young children's understanding of incompatible desires with a refined methodology. We tested this understanding with regard to scenarios which were broadly cooperative and involved some quarreling between the protagonists. The reason for this is the following: intuitively, the symmetry account and its claim that young children do not understand truly subjective desires seems implausible in light of children's everyday behaviour: 3-year olds do engage in simple cooperative activities with others (e.g., Brownell & Carriger, 1993; Eckerman & Peterman, 2001) which requires some coordination, some mutual adjustment of plans and intentions (e.g., Bratman, 1992)—in other words, some agreement in potentially conflicting subjective desires. More dramatically, 3-year olds engage in a lot of quarreling and seem to understand something about quarreling in others (e.g., Dunn & Slomkowski, 1992; Shantz, 1987). Now, quarreling is a broadly cooperative activity (in contrast to just forcing one's will on someone else) which involves confrontation and competition of individual desires (see, e.g., Searle, 1995, for a more general treatment of the cooperative basis of many competitive acts). Technically speaking, quarreling only makes sense if two person's desires refer to the same situation and evaluate it differently, if their desires are logically mutually incompatible. Children's understanding of quarreling thus presents a good test case for evaluating the asymmetry and symmetry accounts against each other.

Furthermore, existing studies have looked at children's understanding of incompatible desires in the first person plural (other and child have incompatible desires) or the third person plural (two others have mutually incompatible desires) only. In the present work, we therefore added a direct comparison between children's performance when they themselves are one of the desirers and their performance in understanding two-third persons. Finally, existing studies so far have each used only one of several possible measures to tap understanding of (in-)compatible desires: whereas Moore et al. directly asked about a character's desire, Lichtermann asked about desire-dependent emotions-whether two characters would be happy or sad after an (un-)desired event. In the present studies we systematically combined these different measures in one and the same scenario in order to obtain a more comprehensive picture of possibly different levels of desire understanding. In each scenario the child was first asked about the desires of the two characters (Q1), and then after the (un-)desired event about the characters' desire-dependent emotions (whether each was happy or sad) (Q2).

In sum, children's performance on different types of questions incompatible desire understanding tasks was compared to their performance on analogous compatible desires tasks and on false belief tasks.[1] In Study 1, children were tested on third person plural versions in which two

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[1] A theoretical and methodological clarification is in order here: in the present studies we provisionally accepted the not uncontroversial claim that passing the standard false belief task counts as index of the acquisition of a concept of belief (for elaborated criticism of this claim see, e.g., Bloom & German, 2000). The reason for this is that most symmetry

characters had (in-)compatible desires. In Study 2, analogous third person and first person plural incompatible desire tasks and a false belief task were administered.

1. Study 1

The desire tasks in this study combined elements from the Lichtermann study and from "memory for complements" tasks (Perner et al., 2003). In "memory for complements" tasks with German speaking children, subjects see a protagonist express a belief or desire, for example, "The cat is in the bed" (belief) or "The cat should be in the bed" (desire), are then shown that the cat is on the mat and are asked (in German) "What does he (protagonist) believe where the cat is?" or "Where does he want that the cat be?[2]". Three-year olds are quite good at remembering false desire complements, but poor at remembering false belief complements (Perner et al., 2003). One interpretation of this finding is that the desire version can be solved with an objectivist notion of desirability whereas the belief version can only be solved with a truly subjective notion of belief (Perner et al., 2003). However, following a similar logic, on a symmetry account 3-year olds with their purely objectivist notion of desirability should have difficulty remembering two incompatible desire complements by two speakers.

We thus constructed scenarios similar to the ones used in Lichtermann (1991) and added the following modifications: (i) instead of explicitly telling children what the two characters wanted, the (puppet) characters themselves implicitly expressed their desires ("The boat should go to the left/right"[3]). (ii) In the case of incompatible desires, the two characters then quarreled (A: "The boat should go to the left"; B: "No, the boat should go to the right"). (iii) There were two pairs of questions children were asked after the boat (incompatible version) or the boats (compatible version) had gone to one side: first, the desire questions as in memory for complements tasks, "Where did A want that the boat go?" and "Where did B want that the boat go?" (Q1). Second, the desire-dependent emotion questions "Is A happy or sad now?" and "Is B happy or sad now?" (Q2). (iv) In order to accustom children to the questions about desire-dependent emotions of the two characters (Q2), at the beginning of the session a short pre-test was used in which children were asked about desire-dependent emotions of one single character (after Wellman & Woolley, 1990). This pre-test was included because informal piloting suggested that German children this age often did not read questions about characters' emotions in the required intentional sense (happy/sad *about* something), but rather in an undirected mood sense (happy/sad just to). The pre-test thus presented a baseline for children's proficiency with using "happy" and "sad" in intentional ways. Furthermore, children were corrected if necessary, and so the pre-test presented an introductory training to use "happy" and "sad" in the intentional rather way for those children who did not yet do it this way.

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and asymmetry approaches take this claim for granted, and take performance on the false belief task as standard against which to compare desire understanding tasks. And the specific claim of the most elaborated symmetry position (Perner et al., 2005) is that children begin to understand incompatible desire when they solve the false belief task. We are thus concerned with this version of the claim of the symmetry account. This, needless to say, does not preclude the necessity that future studies use other measures for understanding subjective cognitive attitudes (belief) and might find symmetry at an earlier age such that, say, 3-year olds begin to pass simple belief tasks and incompatible desire tasks at the same time.

[2] This only works in German because German allows want + that-complementation constructions analogous to belief + that-complementation, in contrast to English.

[3] In German: "Das Boot soll nach links/rechts fahren". We used here the same kind of German construction as Perner et al. (2003) did for implicitly expressing desires. "Soll" in German is a natural word for implicitly expressing desires, and carries less objective (ethical) connotation than "should".

1.1. Method

1.1.1. Participants

Twenty-four 3-year olds (3; 0–3; 6; mean age = 3; 4; 13 boys, 11 girls) were included in the final sample. Two additional children were tested but had to be excluded because they were uncooperative.

1.1.2. Design

Each child was tested in one single session (15–25 min) in which she received six tasks: two change-of-location false belief tasks, two incompatible desires tasks and two compatible desires tasks. There were four story topics for the desire tasks (see Table A.1). All four stories could be presented in a compatible or an incompatible desires version. Across children the assignment of the different story topics to incompatible or compatible desires versions and the order of the six tasks was systematically varied.

1.1.3. Materials and procedure

1.1.3.1. "Happy/sad" pre-test. Before the six test tasks were administered, children got a short pre-test on using "happy" and "sad". In this pre-test children were shown stories acted out with plastic play people about one single person to whom something good/bad or desired/undesired happened and were asked about the character's emotion. If the child answered incorrectly, the experimenter repeated the question. If the child answered incorrectly again, the experimenter corrected her. First, children were told four "objective" stories, two about Peter, the other two about Susi (the protagonists of the desire tasks later in the session) in which something good (in two stories) or bad (in the other two) happened to the character (see Table A.2). Second, children were told four "subjective" stories in which the character expressed a desire that was then fulfilled (in two of the stories) or unfulfilled (in the other two stories).

1.1.3.2. False belief tasks. Two traditional change-of-location false belief task (Wimmer & Perner, 1983) were administered by acting out stories with plastic figures. In one task, a boy put a piece of cake into a cupboard. In his absence the mother moved the cake to another location. Upon the boy's return children are told that he wants his cake now and asked the following questions: Test: "Where will he look for his cake first?" Control 1: "Where is his cake really?" Control 2: "Where did he put his cake in the beginning?" In the other story a girl put a marble into one of two containers from where it was transferred in her absence.

1.1.3.3. Desires tasks. The desires tasks were acted out with small plastic toy figures and additional material. For example, in one of the stories (modeled after Lichtermann, 1991), two characters, Susi and Tom, were at a lake (drawn on a piece of cardboard). At two different sides of the lake there were a house and a tree. In the compatible desires version, Susi and Tom each sat in her/his own boat; in the incompatible desires version, both sat together in one boat. In the compatible desires version the story went as follows: first, E introduced the characters and the objects to the child. Then the characters expressed their differing but compatible desires, acted out in direct speech by the experimenter (Susi: "My boat should go to X", Peter: "And my boat should go to Y"). Importantly, the characters' desires were never reported explicitly, but only expressed implicitly by the direct speech of the characters. Next, an event happened that fulfilled one of the character's desires, but did not fulfill the other character's one. Then the first pair of test questions (Q1) was asked about each character's desire. The second pair of test questions

Table 1
Example of one story in the compatible and incompatible desires version in Study 1

	Compatible desires boat story	Incompatible desires boat story
Introduction of the scenario	Susi and Tom are at a lake. They sit each in his/her own boat. At different opposing sides of the lake there are a house and a tree	Susi and Tom are at a lake. They sit in one boat together. At different opposing sides of the lake there are a house and a tree
Expression of desires	Susi: "My boat should go to the tree" Tom: "Any my boat should go to the house" Susi: "And my boat should go to the tree" Tom: "Any my boat should go to the house"	Susi: "The boat should go to the tree". Tom: "No! The boat should go to the house" Susi: "No! The boat should go to the tree" Tom: "No! The boat should go to the house"
Event (dis-)satisfying the desires	Wind blows both boats to one of the locations (e.g., to the tree)	Wind blows the boat to one of the locations (e.g., to the tree)
Q1	Q1a: Susi wanted her boat to go where? Q1b: And Tom wanted his boat to go where?[a]	Q1a: Susi wanted the boat to go where? Q1b: And Tom wanted the boat to go where?
Q2	Q2a: "The boat is at the tree now. Is Susi happy now or is she sad"[b] Q2b: "The boat is at the tree now. And Tom: is he happy now or is he sad" (order of happy/sad counterbalanced across tasks and children)	Q2a: "The boat is at the tree now. Is Susi happy now or is she sad" Q2b: "The boat is at the tree now. And Tom: is he happy now or is he sad" (order of happy/sad counterbalanced across tasks and children)

[a] The questions were formulated in German in the following way: "Susi will, dass ihr Boot wohin fährt?" (Susi wants that her boat go where?).

[b] Throughout these studies, the German "freut sich" was used for "is happy" and "traurig" was used for "sad". The question thus was "Freut sich die Susi jetzt oder ist sie traurig?".

(Q2) was now asked whether each character was now happy or sad. In the incompatible desires version, the story structure was the same with the only exception that the characters – sitting in one boat – expressed not only differing, but incompatible desires and quarreled (see Table 1).

Thus, in all desire tasks the two characters had different desires, and only one character's desires was fulfilled. In the incompatible desires tasks the desires of the two characters were incompatible, i.e., could not have both been fulfilled, whereas in the compatible desires tasks they could have been.

1.2. Results

1.2.1. Pre-test on "happy"/"sad"

Children on average answered 2.79 out of 4 questions correctly on the "objective" warm-up stories (significantly above chance, *t*-test, $p < .01$). In the "subjective" stories, the average of correct answers was three out of four (significantly above chance, *t*-test, $p < .01$). That is, children were above chance, but far from perfect in both the objective and subjective stories overall. Furthermore, across the subjective stories children showed a learning effect as evidenced by the
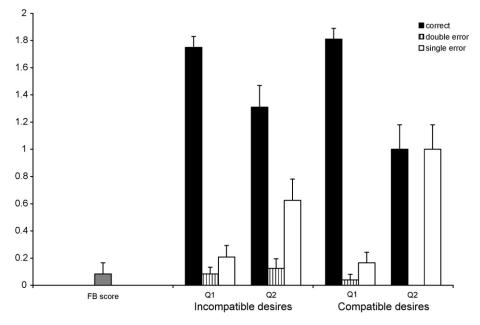
Fig. 1. Mean false belief and desire scores (and standard errors) in Study 1.

fact that they performed significantly better on the last two ($M = 1.71$) compared to the first two trials ($M = 1.29$), $t(23) = 2.31$, $p < .03$.

1.2.2. Desire and false belief tasks

Children got a score of 0–2 for the false belief tasks (each task was scored correct if the child answered test and control questions correctly[4]).

On each desire task, children's responses to Q1 ("Where does A/B want the boat to go?") were scored as "correct" if they answered both questions (about the two characters) correctly. When children answered both questions incorrectly, the response was coded as "double error". When one answer was correct and the other one incorrect (i.e., children ascribed the same desire to the two characters), the response was coded as "single error". Answers to Q2 ("Is A/B happy or sad now?") were coded analogously. For each of the four task types (Q1 and Q2 for compatible and incompatible desires tasks, respectively), the "correct", "single error" and "double error" responses on the two instances of the type were summed, respectively, each yielding scores of 0–2.

The mean numbers of the false belief and "correct", "single error" and "double error" desire scores are depicted in Fig. 1. First, a within-subjects ANOVA on the mean "correct" scores in the five tasks (FB – Q1 incompatible desires – Q2 incompatible desires – Q1 compatible desires – Q2 incompatible desires) yielded a significant effect of task type, $F(4, 20) = 3.90$, $p < .0001$. Post hoc t-tests (one-tailed) revealed the following: (1) children were significantly better on Q1 and Q2 of both incompatible and compatible desires tasks than in the FB tasks. (Q1 in the compatible

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[4] Two children failed a control question in both FB tasks, another eight children failed on a control question in one FB task. All the effects reported hold also when these children are discarded from the analyses.

desires tasks: $t(23) = 18.03$, $p < .0001$; Q1 in the incompatible desires task: $t(23) = 16.10$, $p < .0001$. Q2 in the compatible desires task: $t(23) = 5.41$, $p < .0001$. Q2 in the incompatible desires task: $t(23) = 7.00$, $p < .0001$). (2) Regarding Q1, there was no significant difference between incompatible and compatible desires tasks, $p = .25$. Regarding Q2, children were not better on compatible than on incompatible desire tasks. On the contrary, performance was better in the incompatible condition, $p < .05$. (3) For both compatible and incompatible desires scores, children were significantly better on Q1 than on Q2 (ps $< .008$).

Note that the "double error" responses can be interpreted in different ways. On the one hand, it might be argued that these responses reveal an understanding of the fact that the characters had different and sometimes incompatible desires—only children confused who desired what. On this interpretation children would be even more competent on the desire tasks than shown by the above analyses on the "correct" scores only. On the other hand, it might be argued that the "double error" scores have to be discounted as a control for guessing. In a more conservative analysis, therefore, we scored each "correct" answer as 1 and each "double error" as -1 and computed sum scores out of these for each of the four desire tasks. However, the same results as in the original analysis were obtained.

Finally, children's performance in the desire tasks was also tested against chance. Children's "correct" scores on all four desire tasks were significantly above the chance level of .5 (t-tests, ps $< .01$).

1.3. Discussion

Children in this study performed significantly better on both kinds of questions (what two characters wanted (Q1) and whether they were happy or sad after the desire was or was not fulfilled (Q2)) in both compatible and incompatible desires tasks than they were on false belief tasks. In fact, the children were at floor in the false belief task, almost at ceiling in Q1, and reasonably good in Q2 in both desire conditions.

With regard to Q2, the results of the pre-test in "happy"/"sad" questions are interesting in several respects: first, in contrast to what could be expected in light of the findings by Wellman and Woolley (1990) on older 2-year olds, the 3-year olds in the present study were not at ceiling in the simple one person tasks. It was thus not the case, as would be predicted on an extreme symmetry account, that children were perfect in using the words "happy" and "sad" in intentional ways as long as only one person was involved whose desire was fulfilled or not, but were poor in ascribing different emotions to two persons with incompatible desires. Second, children did profit from feedback in the pre-test, as shown by their increasing performance over the subjective story trials. That is, the pre-test seemed to be successful in prompting children to read "happy" and "sad" in intentional ways.

This might invite the concern that children's competence at answering Q2 was only based on training effects in the pre-test. We think, however, that this is not a serious concern for the following reason: granted, children who were not yet perfect in the simple one person pre-test were trained in some way through correction. But they were trained (a) in tasks that had a much simpler structure than the compatible and incompatible desire tasks, and (b) only up to a level which is generally presupposed both by the asymmetry and the symmetry accounts: the level of being able to use the words "happy" and "sad" *about* something in the most elementary form.[5]

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[5] The only difference between the accounts in this respect is that the symmetry account claims that this competence rests on children's objectivist notion of desirability, which permits them also to ascribe different intentional emotions to

Without children having mastered this basic level, testing them on Q2 in complex scenarios with two persons that have different (and sometimes incompatible) desires only one of which is fulfilled would be rather uninformative.

In sum, the present findings speak against a straightforward symmetry account in two respects: first, no differences between incompatible and compatible desires tasks could be found (except one difference regarding Q2 which, however, is in the opposite direction: incompatible desires tasks were easier). Second, in this study superior performance on the desires tasks compared to the false belief task could be found on two measures, Q1 and Q2. That is, with the modified methodology used here, the findings by Lichtermann (1991) could not be replicated.

An interesting open question is how the present findings relate to Moore et al.'s (1995) findings on first person plural desire tasks in which children performed very similar as in the false belief task: was the difficulty of Moore et al.'s task due to the conceptual structure of the scenario (incompatible desires by the child and Fat Cat), or was it rather the first person involvement of the child that made the task difficult? To pursue this question, in Study 2 we directly compared incompatible desires tasks in which the child either watched two characters who had incompatible desires, or was herself one of the desirers.

2. Study 2

The main goal of this study was to test for the role of first person involvement in incompatible desire[6] tasks generally, and more specifically whether the poor performance of the 3-year olds in the Moore et al. (1995) task can be accounted for by genuine conceptual difficulties or by first person involvement.

Moore et al., in fact, interpret their findings along the latter lines: their incompatible desires task and the false belief task were both similarly difficult due to similar executive demands posed by first person involvement: in the false belief task the child herself has a belief that indexes what is true from her perspective. In the incompatible desires task the child herself has a desire that indexes what is good from her perspective. In both cases, ascription of differing beliefs or desires to someone else requires dis-engagement from the child's own perspective, dis-engagement that would not be required in tasks where the child herself has no particular beliefs or desires in question herself. As our tasks in Study 1 did not involve any particular desires of the child herself, on Moore et al.'s account they should in fact be easier than tasks of the kind they used.

For this reason we devised tasks that had the same basic structure as that of Moore et al. (1995), but could be used in first person and third person plural versions, and added the following elements of the scenarios used in Study 1: (i) the two characters implicitly expressed their desires and quarreled. (ii) The question pair Q2 about the emotion of the two players was added after the relevant event. The basic structure of the tasks was as follows: two characters (the child and a puppet in the first person case; two puppets in the third person case) had a book together into which one of two available stickers could go at a given time. Asked by the experimenter, the two characters then expressed different incompatible desires about which sticker should go into the book. Which sticker eventually went into the book was determined in the game by a "chance machine" which could eject a marble at one of two locations. The desire question pair (Q1) was

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two characters when the desires are compatible and about different events (see the Lichtermann study), but which does not allow the ascription of different emotions to two characters about one and the same event.

  [6] As we had found that compatible desires tasks were not easier than incompatible desire tasks in Study 1, we only used incompatible desire tasks in this study, which allowed us to test children in one session.

now where each character wanted the marble to be. And after the marble came out at one location, the question pair Q2 regarding the desire-dependent emotions (are they happy/sad?) was asked.

Note that the task structure is more complex than in the previous studies and thus presents a more stringent test of children's understanding of incompatible desires in the following way: in Study 1 children were asked about an intrinsic desire that the characters had implicitly expressed. In the present study, in contrast, children were asked about a derived desire (where should the marble go?) that was instrumental for the characters in relation to the desire they had implicitly expressed (which sticker?). In Study 1 children thus had to infer from A's saying "p should happen" and B's saying "No! q should happen" the answers "A wanted p to happen" and "B wanted q to happen" after either p or q had happened (Q1), and then they had to infer "A wanted p to happen. And p has happened. So A is happy" (Q2). In the present study there is one more inferential step: children have to infer on Q1 from A's saying "p should happen" and from "for p to happen it is necessary that x happens" the answer "A wanted x to happen", and analogously the inferential chain required for Q2 is one step longer (for recent evidence that inferential complexity affects children's performance on similar tasks, see German & Nichols, 2003).

2.1. Method

2.1.1. Participants

Thirty-two 3-year olds (3; 0–3; 5, mean age = 3; 3, 14 boys, 18 girls) were included in the final sample. Nine additional children were tested but had to be excluded, 6 of them because they failed to answer control questions in the false belief task correctly (see below), two because they changed their preference during the first person desires task, and one due to experimental error.

2.1.2. Design

Each child received three tasks: a standard change-of-location false belief task (the boy/cake story as in Study 1), and two incompatible desires tasks: one first person plural version in which the child and another puppet character had mutually incompatible desires; and one third person plural version in which two puppet characters hade mutually incompatible desires. The order of these three tasks, the order of questions about the two characters (whether it was first asked about the child's or about the other character's desire) and the fulfillment of the desires in the first person plural version (whether the child's or the other character's desire was fulfilled) were counterbalanced across subjects.

2.1.3. Materials and procedure

2.1.3.1. False belief task.
For the false belief task, the same material was used as in Study 1, and the same story was told. However, now the following control questions (taken from Perner et al., 2003) were asked before the test question: Control 1: "Where did he put it in the beginning?"; Control 2: "Where is it now?"; Control 3: "Who put it there?"

If a child answered one of the questions incorrectly, the experimenter re-told the story and asked the control question again. This was repeated twice, and if a child did not answer all control questions correctly on the third trial, she/he was excluded from the study.

2.1.3.2. Desires tasks.
The incompatible desires tasks were modeled after Moore et al. (1995). The basic setup of the game was this: two characters had a booklet together. There were 2 stickers only one of which could go into the booklet at a given time. The stickers were pinned to a "chance machine" which determined which sticker would be put into the book. The "chance
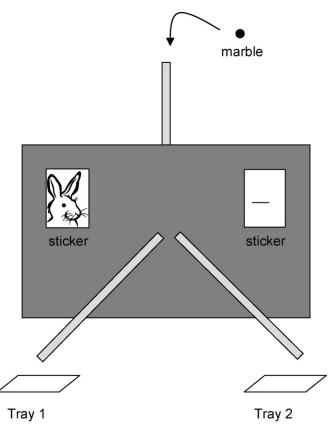
Fig. 2. Experimental apparatus for the desires tasks in Study 2.

machine" consisted of a Styrofoam board (approximately $50\,\text{cm} \times 30\,\text{cm}$) and an inverted Y-shaped transparent tube attached to the board (see Fig. 2). A marble could be dropped in the tube and then disappeared behind the board and re-appeared in one of the two tube endings on one of the two sides of the board where it dropped to a tray in a seemingly random fashion (in fact, the experimenter could surreptitiously control to which location the marble would go). The rule was that the sticker above the tray to which the marble went would be put into the booklet.

Before the actual test trials, the child was familiarized with the apparatus in a series of warm-up trials in which she alone played (Table A.3).

In the test trials, two characters (the child and Rudi, in the first person case, and Peter and Susi, two play plastic people, in the third person case) had a small booklet together into which one (and only one) sticker could be put per page. The characters were enacted by the experimenter who moved them and spoke for them as in the previous studies. At the beginning of each trial, two stickers, a boring and an interesting one were pinned to the two sides of the board, respectively. The two characters then expressed their mutually incompatible desires regarding which sticker should go into the book. In the first person case, the child was asked first which sticker should go in the book. All children chose the interesting sticker. Then Rudi exclaimed "No!" and expressed the opposite desire. Next, the child was asked again, and finally Rudi repeated his "No!" and expressed the opposite desire again. If a child on her second turn changed her desire and agreed

Table 2
Structure of the incompatible desires tasks in the first and third person version in Study 2

	First person plural (Child & Rudi)	Third person plural (Peter & Susi)
1	Two stickers – one interesting (X), one boring (Y) – are put into the two drawers, respectively	Two stickers – one interesting (X), one boring (Y) – are put into the two drawers, respectively
2	Child is asked "Which sticker should go into the booklet?" Child says "X" Rudi is asked and says "No! The Y should go in the booklet" Child is asked again and says "X"[a] Rudi: "No! The Y should go in the booklet"	Peter is asked "Which sticker should go into the booklet?" Peter says "X" Susi is asked and says "No! The Y should go in the booklet" Peter is asked again and says "X" Susi: "No! The Y should go in the booklet". (counterbalanced across subjects (i) which of the two characters talked first, and (ii) which of the two characters wanted the boring sticker)
3	Experimenter (E) puts marble above the tube without yet dropping it	Experimenter (E) puts marble above the tube without yet dropping it
4	Q1a: "You want the marble to roll where?" Q1b: "Rudi wants the marble to roll where?" (order of questions counterbalanced)	Q1a: "Peter wants the marble to roll where?" Q1b: "Susi wants the marble to roll where?" (order of questions counterbalanced)
5	Experimenter drops marble. The marble rolls into one tray, and E points to the tray	Experimenter drops marble. The marble rolls into one tray, and E points to the tray
6	Q2a: "Now the marble is here (points): Are you happy now or are you sad?" Q2b: "Now the marble is here (points): Is Rudi happy now or is he sad?" (order of questions counterbalanced)	Q2a: "Now the marble is here (points): Is Peter happy now or is he sad?" Q2b: "Now the marble is here (points): Is Susi happy now or is she sad?" (order of questions counterbalanced)
7	Experimenter takes sticker from the corresponding location and puts it into the booklet	Experimenter takes sticker from the corresponding location and puts it into the booklet

[a] If children changed their preference at this point, they were excluded from the study.

with Rudi, so that there could be no further quarreling, she was excluded from the analyses (see above).

After the two characters expressed their desires and quarreled, the experimenter took the marble, held it close to the opening of the upper tube and asked the first question pair (Q1) "You want/Rudi/Peter/Susi wants the marble to go where?". Then the experimenter dropped the marble and it rolled to its (unbeknownst to the child) pre-determined location. Then the second question pair (Q2) was asked as in Study 2a. After children answered this last pair of questions the sticker in the indicated location was taken and put into the booklet (see Table 2 for details).

2.2. Results

2.2.1. Pre-test on "happy"/"sad"

Children on average answered 3.03 out of 4 questions correctly on the "objective" warm-up stories (significantly above chance, *t*-test, $p < .01$). In the "subjective" stories, the average of correct answers was 2.56 out of 4 (significantly above chance, *t*-test, $p < .01$). That is, children in this study performed similar to the ones in Studies 1b and 2a, though slightly less proficient

Table 3
Frequencies of children passing/failing the false belief and desire tasks in Study 2

	Complete sample ($n = 32$)			Sub-sample of children passing the FB control questions on trial 1 ($n = 20$)		
	Pass	Single error	Double error	Pass	Single error	Double error
False belief	10	22	–	9	11	–
Incompatible desires first person						
Q1	18	11	3	13	4	3
Q2	13	16	3	8	10	2
Incompatible desires third person						
Q1	19	8	5	13	4	3
Q2	13	17	2	11	9	0

on the subjective stories. The learning effect from the first two ($M = 1.16$) to the last two trials ($M = 1.41$) in the subjective stories approached significance, $t(31) = 1.54$, $p < .07$.

2.2.2. Desire and false belief tasks

Children got a pass score for the false belief task if they answered the test question correctly. In the compatible and incompatible desires tasks, children got a "correct" score for each question pair (Q1 and Q2) if they answered both questions in the pair correctly, and a "double error" score if they answered both questions in the pair incorrectly. If one question in the pair was answered correctly and the other one incorrectly, children were assigned a "single error" score. The left columns of Table 3 show the number of children in the complete sample passing the false belief task, and revealing "correct", "double error" and "single error" scores on the four desire tasks.

First, a Cochran's Q test over the number of children passing the five tasks approached significance: $Q(4) = 9.38$, $p < .052$. Second, planned comparisons between the five tasks (McNemar-tests, one-sided) yielded the following results: (i) both in the third person and first person desires task, children performed better on Q1 than on the false belief task ($ps < .02$). (ii) There were trends for Q1 to be easier than Q2 (first person task: $p < .14$; Third person task: $p < .11$). (iii) There were no other significant differences.

Children's performance on the four desire tasks was also tested against chance. On all four desire tasks, significantly more children performed successfully than expected by chance (Binomial tests, $ps < .05$).

In an additional analysis, children's performance on the false belief control questions was taken into account. 20 out of 32 children (62.5 %) answered the control questions correctly on the first trial. 9 of these 20 children passed the false belief task, compared to 1 out of the 12 children who passed the control questions on trial 2 or 3 (this was a highly significant difference, McNemar test, $p < .01$). That is, those children that passed the control questions on the first trial were much more competent also on the test questions. Not surprisingly then, when only considering those 20 children who passed the false belief control questions on trial 1, differences between the desire tasks (Q1) and the false belief task failed to reach significance.

2.3. Discussion

Children in this study found it significantly easier to ascribe incompatible desires to two characters (Q1) both when they themselves were one of them and when they watched two other

characters than they found the false belief task. There was no significant effect of first person involvement. These results thus prima facie confirm the findings from Study 1 – understanding incompatible desires is easier than understanding false beliefs – and extend them by showing that with a suitable methodology children even succeed when they themselves are involved.

Regarding the inference that two characters have different desire-dependent emotions about one and the same event (Q2), neither of the desires tasks was significantly easier than the false belief task. This latter finding might seem surprising given the fact that in Study 1 children were significantly better on Q2 than on the false belief task. Note, however, that the tasks in Study 2 had a more complex inferential structure than the tasks in Study 1: in Study 2 one additional inferential step was required, as noted above (and we know that inferential complexity affects children's performance in similar tasks, see Cassidy et al., 2005; German & Nichols, 2003). Given this fact it is thus not so surprising that the tasks in the present study were more difficult overall, and not only regarding Q2: whereas the success rate on Q1 was above 80 % in Study 1, it was only slightly above 55 % in the present study (chance level being 25 %). Similarly, success rate for Q2 was around 50 % in Study 1, but only around 40 % in Study 2.

In the present study we found results that differ from Moore et al.'s (1995): the children in our study were significantly better on first person plural incompatible desires tasks than they were on false belief tasks, whereas Moore et al. found that an incompatible desires task in which the child was involved as one of the desirers was as difficult as a false belief task. A key difference in methods that might account for this is the temporal complexity of the tasks: whereas in our studies one task consisted of one phase in which the two characters had incompatible desires, in the Moore et al. task there were first several phases in which the two characters had compatible desires, before they then had incompatible desires in the crucial test phase. This temporal complexity might have made Moore et al.'s task more difficult than the one we used. Another relevant difference is this: whereas in our studies the characters expressed a simple desire (which sticker should be in the booklet) from which children had to infer an instrumental desire (where the marble should be) that followed from the simple one. In the Moore et al. study, in contrast, the other character (Fat Cat) did not express any desires, but all his desires had to be inferred from the setup of the game and its current state in quite complex ways (he is missing puzzle piece X which he needs to win; he wants to win; puzzle piece X is in the blue box; to get a piece from the blue box he needs a blue card; therefore he desires that the card be blue). This clearly seems to pose much bigger inferential demands than the setup of our Study 2.

In sum, in the present studies, 3-year olds performed better on incompatible desire tasks than on false belief tasks regarding the ascription both of the incompatible desires themselves and of different desire dependent emotions if the inferential structure of the task was simple enough (in Study 1). With a more taxing inferential task structure (Study 2), 3-year olds still perform better in ascribing incompatible desires than in the false belief task, but now fail to do so in the ascription of desire dependent emotions which requires another inferential step.

3. General discussion

3.1. Summary of the findings

The question pursued in the present studies was how children's understanding of desires as truly subjective conative propositional attitudes develops in relation to their understanding of beliefs as subjective cognitive attitudes. The asymmetry account holds that children understand desires earlier than beliefs. The symmetry position, in contrast, claims that children acquire a

general notion of subjective attitudes – both conative and cognitive ones – at around age 4 when they master the false belief task. Before this, according to the symmetry account, children only have an objective notion of desirability. The crucial test cases for these incompatible accounts are situations where different people have not only different but incompatible desires regarding one and the same referent-situations which cannot be understood within a framework of objective desirability.

In Study 1, children were tested on third person versions of matched incompatible and compatible desire tasks. Children were very good and much better than in the false belief task at ascribing the correct desires to the characters (Q1) and at inferring the different desire dependent emotions of the two characters (Q2)—both when these were compatible and when they were incompatible.

One concern with Study 1 relates to Q1: Could this question pair not very simply be solved by dumb echolalia? A implicitly expresses her desire "The boat should go to the tree", B counters "No! The boat should go to the house", and somewhat later – when the boat is at the one of the places – the child is asked where A and B wanted the boat to go. When asked about A, the child just has to say "tree", when asked about B she just has to repeat "house". No conceptual understanding of A's and B's desires and their incompatibility, the concern goes, is required. While such a possibility cannot be strictly ruled out theoretically, we think it is implausible for the following reasons: there are many other tasks with similar structures for which such concerns could be put forward. In the unexpected content false belief task (Perner et al., 1987), for example, the child could succeed by just repeating what she had said some seconds before. Similarly, in the memory for complements tasks (Perner et al., 2003) children hear a character say "p", then see that p is not the case, and could just answer the question what the characters believes by repeating "p". Finally, in two false belief test versions by Wellman and Bartsch (1988), (Study 3) and Flavell, Flavell, Green, and Moses (1990) (Study 3) children were explicitly told what the protagonist falsely believed, and could thus succeed on the question what she believed by just repeating what had been reported as content of her belief. Yet, on the conceptual side, these tasks are interpreted by most authors as requiring a conceptually structured grasp of the situation far beyond echolalia. On the empirical side, these interpretations are supported by findings with 3-year olds who systematically fail these tasks. In line with the interpretation of such other tasks, then, we think it is warranted to conclude that dumb echolalia strategies are implausible as an explanation of children's success.

Further validation for this conclusion comes from the results of Study 2. The question pair about what the characters wanted (Q1) in these studies is not subject to the echolalia concern, anyway, due to the inferential structure of the tasks: the characters expressed their desire that sticker A/sticker B should go in the book, and from this, together with the rule "For sticker A/B to go in the book, the marble has to go right/left", children had to infer that the characters wanted the marble to go right or left, respectively. Three-year olds in Study 2 did not perform as well on Q1 as did the children in Study 1—which should be expected given the additional inferential challenge. But performance on Q1 in Study 2 was still significantly better than false belief performance.

In sum, the present studies show that young children understand incompatible desires as well as compatible ones, and earlier than they understand an actor's mistaken belief in the false belief task. This refutes the version of the symmetry account which takes as a premise that false belief task competence is the hallmark of understanding subjective cognitive attitudes. Two possibilities are left:

(1) One possibility is to reject the premise that the false belief task is the best index of understanding subjective cognitive attitudes (see, e.g., Bloom & German, 2000). This might enable

one to then save a symmetry account at lower levels, so to speak. For example, with easier tasks of understanding belief, one might find with younger 3-year olds, say, that belief and desire understanding emerge together, after all, only earlier than assumed. Of course, what would be needed is a simpler but valid test of belief understanding on whose validity there would be wide agreement. Future research would have to come up with such a task.

(2) However, given the lack of such an agreed upon task, the premise that the false belief task currently still is the best index of understanding subjective cognitive attitudes seems at least provisionally preferable. Accepting this premise, the asymmetry account becomes reinforced such that there is a genuine developmental dissociation between understanding conative and cognitive subjective attitudes. The theoretical challenge is then, of course, to interpret and explain this dissociation.

3.2. Belief-desire asymmetry: towards an explanation

3.2.1. Pragmatic and experiential factors

One line of explanation would view pragmatic and experiential factors as crucial: about beliefs we only talk when there is some doubt; in normal action explanation we usually use an elliptic form of the practical syllogism which leaves out the belief premise and just takes for granted a common world (e.g., "She bought this lawn-mower because it mows well" rather than "She bought this lawn-mower because she thinks it mows well"). Similarly, young children participate in many cooperative activities, but what has to be coordinated in these are rarely beliefs but rather desires and sub-plans (see, e.g., Bratman, 1992). And children take part in lots of conflicts, but early in ontogeny these are rarely ideological conflicts about what is the case, but mostly value conflicts about what should happen or be done (e.g., Dunn & Slomkowski, 1992; Shantz, 1987). In sum, children early on experience a lot more explicit reference to conative attitudes and potential conflicts between these than to cognitive ones and thus learn earlier to ascribe conative attitudes.

3.2.2. Logical properties of beliefs versus desires

Another-complementary-line of explanation seeks structural analyses of conative and cognitive attitudes which make it sensible why the former should be easier to understand (e.g., Perner, 1991a, 1991b). Basically, the types of intentionality and normativity involved in the two kinds of attitudes are very different: conative attitudes have world-to-mind direction of fit, i.e., aim at changing the world according to their content. Cognitive attitudes, in contrast, have mind-to-world direction of fit, i.e., aim at truth (Anscombe, 1957; Searle, 1983). The essential normative evaluation of beliefs is to their truth, the essential normative evaluation of desires is to their fulfillment. Both kinds of attitudes commit the person who holds them in certain ways to certain actions: If I believe that p, I am committed to acting and speaking on the basis of p. If I desire that p, I am committed to acting in ways that help bring p about in the future. Yet, in the case of beliefs, the belief itself at the time when it is held is subject to instantaneous normative evaluation against truth. Desires, in contrast, are mostly future-directed and thus are only later normatively evaluated against fulfillment. That is, when we ascribe beliefs, at the time of the ascription the question of truth arises and the default case is to ascribe true beliefs. Beliefs ought to be true when they are held. In contrast, in the case of the desires at the time of the ascription the question of fulfillment does not necessarily arise, and it is not necessarily the default case that the desire will be fulfilled (rather it is the case that people ought to act to fulfill their desires subsequently).

There is another normative dimension along which beliefs and desires differ: whereas even basic beliefs have to be justified by giving evidence, basic desires – in contrast to instrumentally derived desires – are often not subject to further justification ("I just like broccoli"). Furthermore, when two persons have differing beliefs on a given topic, one believing p, the other one non-p, one of them is objectively wrong and therefore criticizable. In contrast, if one person desires p and another non-p, it is true that they cannot both get happy, but it is not necessarily the case that one of them is to be criticized on objective grounds.

In sum, there are a number of structural similarities and differences between conative and cognitive attitudes. Among the differences, it is particularly the central normative notion of truth (and related notions of justification, etc.) which is essential for belief but not for desire directly which might make the ascription of beliefs to others psychologically more taxing than desire ascription.

3.3. Executive demands

The two foregoing lines of argument stress structural, normative features of beliefs versus desires and, connectedly, pragmatic features of belief versus desire discourse in explaining the asymmetry in the mastery of the concepts of beliefs and desires, and are thus variants of *conceptual change* accounts in the broadest sense.

An alternative line of explanation in more basic information-processing terms is that ascribing beliefs might be more difficult due to increased executive demands (German & Leslie, 2001; Leslie, 1994, 2000; Moore et al., 1995; Russell, 1996). The reason is this: in ascribing subjective, i.e., potentially false, beliefs about some situation to someone else, the child herself always has a cognitive perspective dealing with the question of objective truth. Thus, the child has to suppress what from her perspective is the salient and default representation, i.e., the truth in the situation when ascribing a false belief about the situation to another person.

In ascribing subjective desires, in contrast, to two persons sitting in a boat together, for example, the child's does *not* necessarily occupy a conative perspective herself. And thus – from her perspective – no question of goodness of the two options (boat to the left or boat to the right) has to arise. Therefore, in ascribing the desires no own salient default representations have to be suppressed, and thus no substantial executive demands arise.

While such information-processing approaches might well account for the asymmetry regarding ascribing false beliefs and incompatible desires to two-third persons (in Study 1), the findings in Study 2 challenge these accounts in two respects: on such accounts (i) the first person plural version of the incompatible desires tasks should be more difficult than the third person version, because in the first person version there is – from the child's conative perspective – a default case of what is good (what the child herself desires) which has to be inhibited; and, for analogous reasons (ii) the first person plural desires task should be equally difficult as the false belief task.

4. Conclusion

The results of Study 2 thus speak against any straightforward account of the belief desire asymmetry in terms of inhibition demands which are supposed to be present in belief but absent in desire ascription. However, the findings leave open the possibility of refined inhibition

accounts which qualify the notion of "default case" in semantic (normative) terms, as conceptual change accounts do. For example, Sabbagh, Moses, and Shiverick (2006) have recently put forward such a refined account, hypothesizing, "that executive function is related to reasoning about representations that are supposed to be up-to-date representations of some true state of affairs" (p. 1046). In favor of this hypothesis Sabbagh et al. found in two studies that executive function tasks were correlated with false belief tasks (beliefs aim at truth) but not with structurally analogous false photo tasks (photos do not aim at truth). A similar logic can be applied to the case of beliefs versus desires: whereas ascription of true beliefs in fact is the default case no such unique default case to be inhibited exists in the case of desires. Conceptual change and inhibition approaches together might thus provide more illuminating explanations of the developmental asymmetry in reasoning about beliefs and desires in the future.

Acknowledgements

Appendix A

See Tables A.1–A.3.

Table A.1
Desire tasks used in Study 1

	Compatible desires	Incompatible desires
Boat	Susi and Peter sit each in her/his boat. Susi wants her boat to go to the flower, Tom wants his to go to the stone. The wind blows the boats to the stone.	Susi and Peter sit in one boat together. Susi wants the boat to go to the flower, Tom wants it to go to the stone, so they quarrel. The wind blows the boat to the stone.
Train	Susi and Peter sit each in a train. Susi wants here train to go to the house, Peter wants his train to go to the tree. The trains start and both go to the house.	Susi and Peter sit in a train together. Susi wants the train to go to the house, Peter wants it to go to the tree, so they quarrel The train starts and goes to the house.
Marble(s)	Peter and Susi each have a marble. Peter wants his marble to go into the box, Susi wants hers to go into the cupboard. Mother comes in and puts both into the box.	Peter and Susi have a marble together. Peter wants the marble to go into the box, Susi wants it to go into the cupboard. Mother comes in and puts the marble into the box.
Book(s)	Peter and Susi each have a book. Peter wants his book to go into the box, Susi wants hers to go into the bag. Mother comes in and puts both into the bag.	Peter and Susi have a book together. Peter wants the book to go into the box, Susi wants it to go into the bag. Mother comes in and puts the book into the bag.

Table A.2
Pre-test stories used in Study 1

	Objective stories
1	Peter rides his bike and enjoys it very much. Now the bike breaks.
2	But now Peter gets a new bike as a present.
3	Susi is very ill. She has pains and has to lie in bed.
4	Now it is Susi's birthday. She gets a birthday cake as a present.

	Subjective stories
1	Susi has a book. There are two stickers, a rabbit and an elephant. Susi says: "The rabbit should be in the book. The elephant should not be in the book. The rabbit should be in the book". Then comes the mother and puts the rabbit in the book.
2	This is Peter's room. Here is his bed, there is his chair. Peter's cat comes in. Peter says:"The cat should go to the chair. She should not go the bed. She should go to the chair". The cat then goes to the bed.
3	Peter has a carrot. There are a cat and a dog. Peter puts the carrot on the floor and says: "The cat should eat the carrot. The dog should not eat the carrot. The cat should eat the carrot". Then comes the cat and eats the carrot.
4	Susi has a piece of bread. Ther are a horse and a chicken. Susi puts the piece of the bread on the floor and says: "The horse should eat the bread. The chicken should not eat the bread. The horse should eat the bread". Then comes the chicken and eats the bread.

Table A.3
Warm-up in Study 2

	Introduction of the "chance machine"
1	Before the proper session began: To introduce the "chance machine" to the child the experimenter put a marble into the upper tube repeatedly and made it emerge in (seemingly) random fashion.

	Explanation of the game
2	E explains basic logic to the child ("Look! Here is a sticker (points to the left sticker), and there is one (points to the right). Now we can put the marble in. The marble sometimes comes out here (points). If it comes out here this sticker above (points) goes on the book . . .").

	Introduction of the puppet
3	Rudi, the puppet is introduced and the booklet which belongs to the child and Rudi together. E tells the child that was very tired and had to sleep for a while (at which point the experimenter put away Rudi).

	Warm-up trials 1 + 2 (without questions)
4	E pins 1 sticker and 1 boring object to the board. E drops the marble, points out where it rolled to and takes the corresponding object.

	Warm-up trials 3 + 4 (with questions)
5	E pins 2 stickers (1 interesting, 1 boring) to the board. E asks child which sticker she wants to have in the booklet. During the game, E asks the child questions (which sticker she wants to be in the book; where she wantes the marble to roll, etc.) and gives feedback if necessary. E pins 2 stickers (1 interesting, 1 boring) to the board.

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