Social cognition is not reducible to theory of mind: When children use deontic rules to predict the behaviour of others

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The objective of this paper is to discuss whether children have a capacity for deontic reasoning that is irreducible to mentalizing. The results of two experiments point to the existence of such non-mentalistic understanding and prediction of the behaviour of others. In Study 1, young children (3- and 4-year-olds) were told different versions of classic false-belief tasks, some of which were modified by the introduction of a rule or a regularity. When the task (a standard change of location task) included a rule, the performance of 3-year-olds, who fail traditional false-belief tasks, significantly improved. In Study 2, 3-year-olds proved to be able to infer a rule from a social situation and to use it in order to predict the behaviour of a character involved in a modified version of the false-belief task. These studies suggest that rules play a central role in the social cognition of young children and that deontic reasoning might not necessarily involve mind reading.

The prevailing trend in developmental, comparative, and evolutionary psychology is to assimilate social inferences to theory of mind, that is, to the capacity to understand others' behaviours by ascribing to them the beliefs, knowledge, and desires that are supposed to be the hidden causes of their actions. Within this framework, a target agent's internal states remain the fundamental information to be processed even when deontic reasoning is emphasized, that is, reasoning about what one may, must, or must not do in a given set of circumstances. In developmental psychology, there is currently one dominant theoretical strategy relied on to account for children's impressive capacity for grasping both context-specific rules (e.g., washing hands after eating) and cross-situational norms (e.g., ladies wear dresses) that govern the accepted, canonical practices of their familial and socio-cultural world (Dunn, 1988; Rubin, Bukowski, & Parker, 1998): it consists in elaborating a theory of mind broad enough to include obligations and permissions (Wellman & Miller, 2008). According to this view, a question such as 'Why did Bill wash

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his hands?' raises only superficially non-psychological, genuinely deontic explanations, for instance 'because his mother told him to' or 'that's the first thing he has to do when getting home'. Sooner or later, this superficial description is dismissed for a mentalistic one, which is assumed to be more fundamental: 'Bill believed his mother, who told him that there is a rule obliging him to wash his hands, and he wanted to obey his mother/the rule'. While recognizing the central role of rules in social life, the theory of mind paradigm tends to deny that deontic understanding of rights and obligations might trigger specific inferences (Ames *et al.*, 2001; Kalish, 2006; Nunez & Harris, 1998). With a few notable exceptions, mostly inspired by the numerous applications of the well-known Wason Selection Task (Cheng & Holyoak, 1985; Cosmides & Tooby, 2005; Cummins, 1996), deontic rules are said to be so intimately connected to mentalistic attitudes that it would be impossible to pull them apart.

As compelling as it can be, the empirical evidence that appears to support this mentalistic account of deontic rules might well be due to the kind of experimental design and the type of argument that prevail in studies of deontic reasoning. Most experimental designs tend to focus on the differential conceptions of moral and conventional rules and the permissibility of rule violations they involve (Smetana, 1981; Turiel, 1983); experimental designs tend also to focus on the understanding of the distinction between a deliberate violation and an accidental breach of a rule (Harris & Nunez, 1997) or on the cognitive and emotional states of mind that the violator is assumed to be in (Lagattuta, 2005; Nunez & Harris, 1998). Such experimental emphasis on the appraisal of rule transgression (e.g., 'why didn't Bill do what he was told?') and on its psychological consequences might well facilitate mentalistic characterizations. When confronted with the agent's non-compliance, which goes against his/her normative expectations, the observer is prompted to search for individual-level reasons that could explain this unexpected deviance. The focus on mentalistic understanding, duly activated in response to non-compliance, might thus overshadow the functioning of rule expectations and predictions that prevail as long as the normal course of action is not interrupted by a puzzling rule breach. Such a focus on rule breaches shows that most studies of deontics do not use the violation-of-expectation method in the same way as the literature on physical objects does. Whereas research on event knowledge uses such a method to reveal what infants expect about the physical world (Baillargeon & Wang, 2002), research on deontic reasoning tends to leave aside the set of deontic expectations and predictions to highlight the violation itself as well as the surprise, the appraisal, and the explanation that this very violation brings about.

A complementary explanation of the prevalence of mentalistic accounts of deontics might lie in the fact that those accounts carry out a *first-person* analysis of action: they start from the situated, practical reasoning of the agent who must determine his/her own action and, to do so, tend to weave together mentalistic and deontic considerations ('I like to run *and* I must be in good shape for my job'). Such first-person conceptual blending of desire, volition, obligation, and permission is found in the early development of young children's use of language. For instance, in the request of Abe, aged 34 months, who asks his parents to let him 'watch (TV) when I want to', the parents' granting of permission to watch TV (deontic consideration) is clearly linked to his own desire to engage in this activity (mentalistic consideration) (Wellman, Phillips, & Rodriguez, 2000, p. 905). Given the frequency and the precociousness of this conceptual hybridization, Wellman and Miller (2008) conclude that deontic reasoning is necessarily intermingled with the psychological inferences that form the subject matter of theory of mind.

And yet, the fact that this kind of syncretism is cognitively possible and quantitatively frequent in the first-person perspective of the agent does not imply that it is a necessary, essential feature of deontic information processing in general. Whereas the agent's first-person reasoning on self-produced actions certainly involves a blending of social and psychological considerations, the observer's reasoning, which primarily aims at predicting implicitly or explicitly *the behaviour of others*, might proceed differently. Such an interpretative stance indeed involves a 'spectatorial view' that objectively confronts others 'as a remote object of observation and prediction' (Hutto, 2004). Even if we assume a strong *self-other* equivalence, based either upon the theoretical premise that self-knowledge itself results from abstract, indirect, interpretative-like inferences (Gopnik, 1993), or upon the simulationist premise that third-person predictions feed on first-person introspections about what one would do if one were in others' shoes (Gordon, 1996), we have to admit that their pragmatic aim remains different. Whereas the first-person perspective of social agents aims to determine the action to be performed, the third-person perspective of social observers aims to make sense of the conduct of others and to predict their future behaviours (Strawson, 1959). First-person and third-person stances, whose distinction is confirmed at the neural level by positron emission tomography (PET) investigation of perspective taking during simulation of action (Ruby & Decety, 2001), thus tend to emphasize different components of activity (Moore, 1999). One can wonder whether the interpretative and predictive task proper to the third-person perspective on actions generated by others necessarily requires the search for the mental components of activity, whether through theorizing or simulating. Observers, especially within a deontic context, might not need, at least *a priori*, to make a systematic *detour* and to search, in the opaque minds of rule holders, the subjective counterpart of a given rule. They might resort instead to an exclusively deontic reasoning whose premise would not consist of mentalistic considerations ('If Amy *wants* to eat, then she *must* wash her hands'), but would consist of the social rule itself ('If everyone *must* wash their hands in the house, then Amy's hands *have to be* washed'). In other words, from a third-person perspective, deontic reasoning might be sufficient for successfully anticipating and predicting the behaviour of others – sufficient and above all less cognitively demanding than mentalizing since it does not require the representations of the representations of others. At least in the public, impersonal situations where the observed persons are subject to an objective, manifest rule that links, as Jackendoff (1999) put it, an 'actor to an Action, not to a Mental State', it certainly seems much more economical for the observer to rely on the rule itself.

Apart from Piaget's well-known reflections on the moral realism that prompts children between 6 and 8 years of age to see rules as external and immutable (Piaget, 1965), a growing body of evidence suggests that children attribute reality and power to social rules. For instance, 3- and 4-year-olds tend to deny that both social and physical laws can be violated (e.g., 'kids can't wear shoes in the bathtub' and 'kids can't jump up and fly') (Kalish, 1998a), judge that protagonists would conform to social laws despite their intentions to act otherwise (Kalish, 1998b), and assert that an authorized change in the rule of a game will affect the behaviour of uninformed protagonists (Kalish, Weissman, & Bernstein, 2000). Moreover, predictions of conformity by ignorant agents, who do not know the law and want to do something forbidden, are similar to predictions of conformity by deliberately disobedient agents who know the law (Kalish & Shiverick, 2004). In sum, although objective reality can influence people in two ways, directly and via representations, young children, when faced with this conjunction, tend to

ignore the subjective, representational route; as Kalish (2005, p. 249–250) put it, such ignorance might explain why young children assume that the fact that something is forbidden can affect your behaviour in the same way as the fact that something is heavy.

Surprisingly, although these well-crafted studies tend to show that young children see social conformity as independent of agents' mental states and as automatic, in some respects, as physical conformity, the interpretation of these studies remains mostly mentalistic (Kalish, 2006). Indeed, if we follow Kalish and Shiverick (2004), to predict that a person will obey a rule is to do something similar to judging that people act on the basis of what they think and want. In other words, even when obligations and permissions are conceived as external gatekeepers that have the power to shape actions, they are not considered as jeopardizing the central role of individual mental states (volition, belief, desire) in the determination of action (Wellman & Miller, 2006). On the contrary, on this view, it is because obligations enjoin volitional actions that they can be disobeyed or resisted as well as complied with; further, it is because permissions allow volitional acts that they can be exercised or not (Wellman & Miller, 2008).

The problem with these kinds of arguments is that they tend to blur an important theoretical distinction: the distinction between the *ontology* of norms, which derive from collective intentionality and which are indeed psychological motives for acting (Kalish, 2007), and the functioning of the deontic *heuristics* that might endow social rules with causal power over behaviour until there is evidence to the contrary. The reason for the existence of heuristics, as fast and frugal as it might be, is its pragmatic efficiency, not its ontological truth or its phenomenological soundness (Gigerenzer, 1991).

The experimental studies of this paper are designed precisely to determine whether social observers can adopt exclusively deontic heuristics, activated from a third-person stance, to make predictions about the rule-governed behaviours of others without taking their mental states into consideration. The strategy that we have adopted here in order to assess the predictive strength of rule information is to take an ontogenetic viewpoint and to investigate the social reasoning of young children, in this case children who are between 3 and 4 years of age. To do so, we have drawn on a landmark experimental setting, the false-belief task, used notoriously to sort out children who master the understanding of beliefs (Wimmer & Perner, 1983). Let us recall the classical false-belief task scenario: when an object (chocolate) is moved, in the absence of one of the protagonists of the story, Maxi, from the original location (a cupboard) to another hiding place, 3-year-olds predict that Maxi, once back in the room, will look for the object in its new hiding place. By contrast, 4- and 5- year-olds, just like adults, are able to use Maxi's belief to predict that Maxi would search for the object where he last saw it. In other words, the false-belief task reveals the acquisition, among 4-year-olds, of the cognitive capacity for inhibiting the strength of one's own reality-based perceptions and beliefs, and for putting oneself in others' minds. Although some recent studies claim that infants as young as 15-month-old have implicit understanding that others may hold and act on false beliefs (Onishi & Baillargeon, 2005), the false-belief task and its numerous sophisticated variations remain the most revealing way of indicating children's full-fledged mastery of theory of mind (Wellman, Cross, & Watson, 2001). It is precisely because the attribution of false beliefs is one of the milestones of theory of mind that our experiments use them to investigate whether deontic information processing and mind-reading ability can be pulled apart.

STUDY 1

To see whether rules can be used to predict a given behaviour independently of the mental states underlying it, Study 1 pitted a standard false-belief task against a false-belief task to which a deontic rule had been added. Similar to the Maxi scenario described above, the standard scenario thus consisted of a classic unexpected displacement task (no-rule condition). The deontic scenario was similar except for the fact that it contained a piece of information specifying that a certain rule applied to the situation (rule condition). The rationale behind these two scenarios was the following one: in standard false-belief tasks, younger children, still unable to attribute to the protagonist the false belief that would lead them to the appropriate answer *x* (the protagonist of the story will look for a hidden object where she knowingly put it herself), respond *y* (the protagonist will look for the object where it actually is). But what if children are given a rule stating that the object *must* be in *x*? If younger children, who do not have the cognitive resources needed for such belief processing, do answer *y* in the no-rule condition and *x* in the rule condition, this would support the hypothesis that deontic reasoning is separate from mentalistic reasoning.

Along with the rule and no-rule conditions, we also added a third control condition, namely the regularity condition (the object *is* always here), in order to see whether deontic input plays a specific role in children's reasoning. The issue at stake is the following one: do children rely on behavioural regularities in the same way as deontic rules to predict the behaviours of others? On the one hand, one can suppose that regularities and deontic rules are of a very different nature and that they do not elicit the same kind of reasoning. Deontic rules, which are established and reinforced by positive and negative sanctions, possess a quality of obligatoriness that regularities do not have: whereas regularities are merely factual (*it is the case*) and respond to a logic of repetition and conformity, rules seem to have a higher degree of necessity (*it ought or must be the case*) (Haugeland, 1998). On the other hand, one can suppose that the dividing line between rules and regularities is easily crossed and that they both play a very similar role in children's basis for inference and action. Often, indeed, the *is* of regular facts is loaded with a normative weight and becomes an *ought*: what we do or what one does tend to be conceived both as what people do and as what people must do or ought to do (Millikan, 2004). Comparing the rule condition with the regularity condition will allow us to pinpoint which one of these two hypotheses is the most likely: if the children's answers in the regularity condition differ from their answers in the rule condition, this would suggest that deontic reasoning is not reducible to regularity-based reasoning.

To sum up, Study 1 consists of three structurally analogous conditions, that is, the rule, the no-rule, and the regularity conditions, which aim at seeing whether there is something specific to deontic reasoning.

Method

Participants

One hundred and eighty-two children participated in the study. Forty-two children were not able to respond correctly to control questions (see below for the details) and were eliminated from the analyses. The final sample included 140 subjects divided into the following three conditions: rule condition, regularity condition, and no-rule condition (see Table 1). An approximately equal number of boys and girls were tested at each

Table 1. Mean age, standard deviation, age range and percentage of 'put' choices for each condition and in each age group

		M_{age}	SD	Age range	'Put' choices
Rule condition	Younger (N = 18)	43.05	2.09	38–45	72.2% (N = 13)
(N = 48)	Older (N = 30)	54.26	3.58	48–59	73.3% (N = 22)
Regularity condition	Younger (N = 19)	41.42	2.29	38–45	21.1% (N = 4)
(N = 40)	Older (N = 21)	56.19	2.76	51–60	71.4% (N = 15)
No-rule condition	Younger (N = 28)	41.96	2.51	36–45	32.1% (N = 9)
(N = 52)	Older (N = 24)	53.13	3.59	48–59	70.8% (N = 17)

age. Children were recruited and interviewed in Lausanne and Neuchâtel (Switzerland), and Lyon (France). The majority of participants came from middle and upper middle class families. All children were interviewed individually, in a small room, for about 10 min.

Materials and procedure

In order to assess the inferential use of rules by children, we took our design from the 'Sally and Anne' classical scenario of the false-belief task (Baron-Cohen, Leslie, & Frith, 1985). Three variants of the same scenario, one with a rule, one without a rule, and one with a regularity were designed in order to make an inter-group systematic comparison. Stimuli for the study were short story scenarios, presented with pictures of Playmobil's characters.

The scenario common to the three conditions was the following one. First, two characters, Sally and Anne, were presented (vignette 1), as well as their bedroom (vignette 2). In the third vignette, Anne was sitting on a chair, reading a book in the bedroom while Sally came in, carrying her doll. Sally put her doll in a toy box (vignette 4) and left the room (vignette 5). Anne, remained alone, went to the toy box (vignette 6), took the doll from the toy box (vignette 7) and hid it in a cupboard (vignette 8). After the control questions, asked when children were presented with a picture of the bedroom without Sally and Anne (vignette 9), Sally came back in the bedroom (vignette 10) and the experimenter said: 'Now I am going to show you two pictures and you will have to pick the picture that shows what Sally is going to do'. Then two pictures were simultaneously presented in randomized order (vignette 11): one picture depicted Sally looking into the toy box, the other one showed Sally looking into the cupboard. The experimenter added: 'Will Sally look for her doll here (pointing to one of the picture) or here (pointing to the other picture)?'

Differences between the three conditions were introduced when the picture of the bedroom was presented (vignette 2) and when the control questions were asked (vignette 9). In the rule condition, the experimenter pointed at the bedroom and said: 'In this house, there is a rule: dolls must be put in the toy box' (vignette 2a). In the regularity condition, the experimenter said: 'In this house, there is a habit: dolls are always put in the toy box' (vignette 2b). In order to ensure that the three conditions required the same amount of information to be processed and hence put the same cognitive load on participants' working memory, supplementary information was added to the no-rule condition (vignette 2c): 'In this bedroom, all pieces of furniture have been built by Sally and Anne's grandfather'.

For each condition, two classical control questions (memory and reality) were presented in vignette 9 ('Do you remember where Sally put her doll?' and 'Do you remember where Anne moved the doll?'). In each condition, another condition-specific reminder question was added: 'Do you remember what is the rule in this house?' (rule condition); 'Do you remember what is the habit in this house?' (regularity condition); 'Do you remember who built the furniture in this bedroom?' (no-rule condition). In each condition, the order of these three control questions was randomized.

Subjects who correctly answered the three questions in the rule and regularity conditions were included in the analysis, as well as the subjects who responded correctly to the memory and reality questions in the no-rule condition. Since the question about who built the furniture was not related to the rest of the task, failures to answer it correctly were without consequences. The variable Prediction in the false-belief task had two modalities: success, which means that the child chose the picture of Sally looking into the toy box, that is, where Sally put her doll ('put' choice); and failure, which means that the child chose the picture of Sally looking into the cupboard, that is, where Anne hid the doll ('hidden' choice).

Results

Thirty-eight children were not able to respond correctly to the memory and reality questions: 13 of the 62 children in the rule condition (7 younger and 6 older); 7 of the 50 children in the regularity condition (4 younger and 3 older); 18 of the 70 children in the no-rule condition (13 younger and 5 older). These percentages of success were not very high (respectively, 80.1, 86, and 74.3%) and were globally in line with the meta-analysis proposed by Wellman *et al.* (2001). With regard to the condition-specific reminder questions, 1 younger of the 49 remaining children in the rule condition failed in the rule question and 3 children of the 43 remaining children in the regularity condition failed in the regularity question (2 younger and 1 older).

Table 1 indicates the success rate in the false-belief task ('put' choices, i.e., Sally will look for her doll where she put it, i.e., in the toy box) for each age group and for each condition.

A log-linear analysis was performed to study the relationship between the variables Prediction ['Put' Choice, 'Hidden' Choice], Age Group [Younger, Older], and Condition [Rule, Regularity, No-Rule]. Starting from the saturated model including all possible effects, we applied a selection procedure to find the simplest model able to account for the data. In addition to the main effect of each variable, the final model consisted in only two interactions: the first interaction between Prediction and Age Group (χ^2 (1) = 14.78, $p < .001$) showed that the 'put' picture was chosen significantly more frequently by the older children (in 72% of the cases) than by the younger ones (40%); the second interaction between Prediction and Condition (χ^2 (2) = 7.70, $p = .021$) showed that children chose more often the 'put' picture in the rule condition (73%) than in the no-rule (50%) and regularity (48%) conditions. On the other hand, no direct relation between Condition and Age Group did remain in the model. This being so, the existing link between Prediction and Condition left open the possibility that a specific condition could have an impact on the relation between Age Group and Prediction. We thus chose to investigate, in more detail, this relation by means of three contingency tables computed for each level of the Condition variable. Analysis yielded no significant difference between the 'put' choices of the younger and older groups (χ^2 (1) = 0.007,

$p = 0.993$) in the rule condition. By contrast, the contingency table showed that the older children produced significantly more 'put' choices than the younger children in the regularity condition ($\chi^2(1) = 10.151, p = .001$) and in the no-rule condition ($\chi^2(1) = 7.738, p = .005$). In the same way, we investigated the relation between Prediction and Condition in each age group. For the younger children, the contingency table indicated that there were significant differences between the three conditions ($\chi^2(2) = 11.35, p = .003$). They chose more often the 'put' picture in the rule condition (72.2%) than in the regularity (21.1%) and no-rule conditions (32.1%). For the older children, there were no significant differences between these three conditions ($\chi^2(2) = 0.05, p = .977$).

Discussion

In both the regularity and no-rule conditions, the results for younger children were in line with the literature on the false-belief task: 78.9% and 67.9% of them answered that Sally will look for her doll where it *actually* is, not where she believes it is. By contrast, in the rule condition, 72.2% of the younger children answered in a different way, saying that Sally will look for the doll where she put it, that is, where it is *according to the rule*. The fact that the results of younger children in the rule condition score well above their results in the no-rule and regularity conditions strongly suggests that it is the use of the rule *as such* that has allowed them to correctly anticipate Sally's behaviour.

As for the difference of results between the regularity and the rule conditions, it interestingly suggests that the normative *ought* of deontic rules and the normal, factual *is* of social regularities might not be processed in the same way. Above all, such a difference between the regularity and the rule conditions allows to rule out an alternative interpretation of the results, which would go as follows: 3-year-olds might succeed in the deontic condition because the presence of the rule facilitates and boosts their reasoning with respect to beliefs. In this interpretation, deontic rules would inhibit young children's excessive 'realist bias', as Mitchell (1994) put it, by making particularly salient the original location of the object. As a result, the apparently exclusively rule-based reasoning 'Dolls must be put in the toy box, therefore she goes there' would be in fact underlain by a mentalistic form of reasoning, that is, 'Dolls must be put in the toy box, therefore Sally *believes* that her doll is in the toy box, therefore she goes there'. But if this interpretation were valid, the saliency effect should also work in the regularity condition, which makes equally salient the original location, e.g., 'Dolls always are in the toy box'. We have seen that this is not the case, with younger children failing the regularity condition just as they fail the no-rule condition. So it seems unlikely that the success of young children in the deontic condition was due to a saliency effect that would have facilitated young children's grasp of the representational quality of behaviour and then of the subjective reality of the other's mind.

Once the saliency effect has been ruled out, it seems that our results do support the hypothesis that young children can reason effectively about others' behaviours without inferring mental states: reasoning as to 'what ought to be the case' does not seem to go through reasoning as to 'what one particular person believes is the case'. Still, there could be other kinds of reasoning going on, not necessarily of a deontic nature, which might alleviate younger children's classical performance problems in the rule condition. In order to shed more light on the form of the reasoning at work, Study 2 modified the

false-belief task setting in two ways that made the experiment more demanding. First, to fend off, once again, the objection according to which the presence of a deontic rule, far from being alternative to mentalistic reasoning, might boost 3-year-olds' weak reasoning on beliefs, thereby explaining their good performances in the rule condition, Study 2 introduced a forced choice *justification* question. This justification aimed at getting children to reveal the reason for which they picked one of the scenario endings. Second, Study 2 aimed at seeing whether young children are good at predicting behaviours on the basis of more subtle, implicit deontic cues. The explicit, articulate way in which the rule was verbally stated by the experimenter in Study 1 might indeed have artificially directed the attention of participants away from the story to the rule. Study 2 addressed this issue by removing any direct reference to the rule and by replacing it with information about the emotional reaction of an authority figure confronted with a behaviour that either goes against or complies with an implicit rule.

STUDY 2

In order to strengthen the hypothesis that deontic inferences can be separated from theory of mind, our second study dealt only with 3-year-old children, who experience difficulty, as confirmed once again by our own study, to correctly predict the behaviour of persons who do not share their own representation of reality. Instead of giving a verbal rule, like in Study 1, Study 2 tested the capacity of 3-year-old children to infer the presence of a rule from the censoring behaviour of a significant figure (teacher) and to use this inferred rule in order to predict the behaviour of the protagonists. The rationale behind this study was the following one: emotional state and body language, that is, facial expressions and gestures, are very effective means of shaping behaviour and adjusting the conduct of children. It would be very surprising if children were not sensitive to such emotional expressions, which are all the more attention catching as they indicate not only what to do next but how to do it in a socially appropriate, acceptable way. The additional justification question aimed to make explicit the implicit reasoning adopted by younger children. As in Study 1, we pitted this rule-added version of false-belief task against a structurally equivalent standard false-belief task in order to compare the results.

Method

Participants

Ninety-seven 3-year-old children participated in the second study. Thirteen of them were not able to respond correctly to control questions (see below for the details). Accordingly, the responses of eighty-four children were linked in the analyses to prediction and justification questions: 47 children in the rule condition ($M_{age} = 43.49$ months, $SD = 3.31$, age range 37–48 months) and 37 children in the no-rule condition ($M_{age} = 42.86$ months, $SD = 3.49$, age range 37–48 months). An approximately equal number of boys and girls were tested in each condition. Children were recruited in Lausanne (Switzerland) and Lyon (France). The majority of participants came from middle and upper middle class families. All children were interviewed individually for about 10 min.
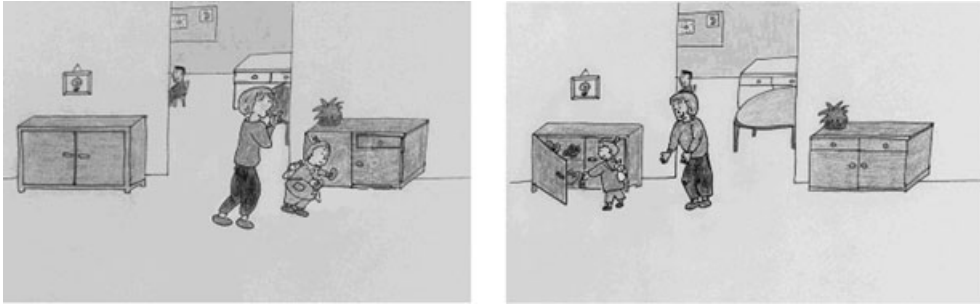
Figure 1. Vignettes 3 and 4 presented in the rule condition (original dimensions: 19 × 13 cm²).

Materials and procedure

Study 2 consisted of two coloured line drawing stories, one with a rule, the other one without a rule. In contrast with the rule condition used in Study 1, Study 2 did not resort to an explicit verbal rule: participants had to infer the rule in use from social clues, in this case the signs of reprobation and the expressions of satisfaction of the authority figure. Moreover, to better address the nature of child reasoning, a justification question was introduced after the prediction question. In order to bypass the well-known difficulty that children at this age have in giving explicit justifications for their predictions, Study 2 carried out an indirect way to reveal the nature of the informational processes at work. This indirect way consisted of asking children to choose between two pictures, one representing a justification of a deontic nature, the other one a justification of a mentalistic nature.

In the rule condition, the story began by showing a mother taking her daughter, Alice, to a childcare centre. It was specified that it was her first day at the day care centre and that they were running a little late (vignette 1). Then Alice was depicted in front of two cupboards, an orange one on her left side and a pink one on her right. Having put on her slippers, she was holding her shoes. The teacher was standing in front of the door, looking at her classmates, who were already in the classroom. The experimenter said that Alice did not know where to put her shoes (vignette 2). She was then putting her shoes in the pink cupboard. But the teacher was looking at her, one finger up, looking upset. At this point, the experimenter said: 'Alice is about to put her shoes in the pink cupboard. But look! The teacher does not look happy' (vignette 3; see Figure 1). Then Alice put her shoes in the orange cupboard in front of a smiling teacher. Here, the experimenter said: 'Then Alice is putting her shoes in the orange cupboard. Look! Now the teacher looks very happy. After that, Alice goes with the teacher in the classroom, where all the other children are already settling' (vignette 4; see Figure 1).

The next two vignettes showed a classic unexpected displacement task. A classmate took Alice's shoes (vignette 5) and moved them from the orange to the pink cupboard (vignette 6). Presenting a picture of the empty classroom's entrance (vignette 7), the experimenter asked the children the following questions, in random order: 'Where do we have to put one's shoes in this childcare center?' (rule question), 'Where did the classmate put Alice's shoes?' (reality question) and 'When Alice will come to get her shoes, can you show me where she will look for them?' (prediction question). Finally, only children who responded 'orange' to the prediction question were presented a vignette where Alice's mom was waiting outside the childcare centre, with her little brother in a stroller. In the background, one could see Alice looking for her shoes in
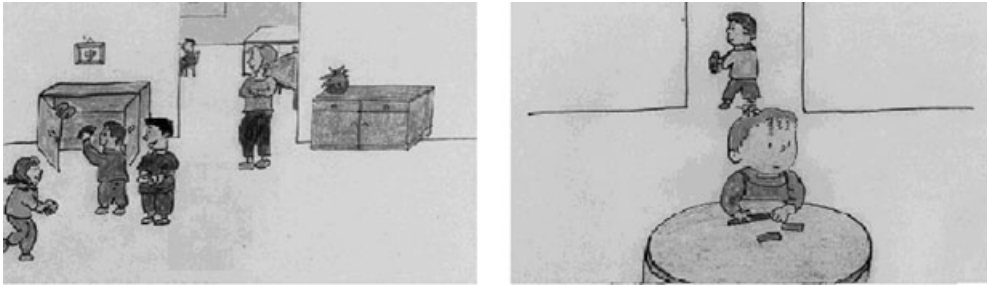
Figure 2. Pictures for the justification choice. Picture A (at left): deontic reasoning; picture B (at right): mentalistic reasoning (original dimensions: $15 \times 10 \text{ cm}^2$).

the orange cupboard. The experimenter then asked the following question (justification question) in order to reveal the implicit judgment and inferences used by the children to predict where Alice would look for her shoes: 'Why is Alice looking into the orange cupboard?' (vignette 8). At that point, two pictures were presented to the participants, in random order. Picture A showed some children putting their shoes in the orange cupboard, their teacher smiling at them, and was accompanied with the following deontic justification: 'Because the rule in this childcare center is to put one's shoes in the orange cupboard'. Picture B depicted Alice's classmate moving her shoes behind her back with the following mentalistic justification: 'Because Alice did not see her classmate moving her shoes' (Figure 2).

The no-rule condition started with the same narrative as the rule condition but changed with the third vignette, which showed Alice trying to put her shoes in the pink cupboard. At this point, the experimenter said: 'Alice is about to put her shoes in the pink cupboard. But look! She is too small and cannot open the drawer' (vignette 3). Alice was finally putting her shoes in the orange cupboard. The teacher, who was standing in front of the door, was looking at Alice's classmates, turning her back on Alice, and she did not intervene during the entire process. At this point, the experimenter added the following commentary: 'Then Alice is putting her shoes in the orange cupboard. After that, Alice goes with the teacher in the classroom, where all the other children are already settling' (vignette 4). The next two vignettes showed the same classic unexpected displacement task with the classmate taking the shoes (vignette 5) and moving them from the orange to the pink cupboard (vignette 6). Presenting a picture of the empty classroom's entrance (vignette 7), the experimenter then asked the following questions, in random order: 'Where did Alice put her shoes?' (memory question), 'Where did the classmate put Alice's shoes?' (reality question) and 'When Alice will come to get her shoes, can you show me where she will look for them?' (prediction question).

In the rule condition, only the children who correctly answered the rule and reality questions were included in the analysis of the prediction and the justification responses. In the no-rule condition, children who correctly answered the memory and reality questions were included in the analysis of the prediction responses. The variable Prediction refers to the choice of the child between two localizations: success, which means that the child pointed at the orange cupboard, that is, where Alice was putting her shoes; failure, which means that the child pointed at the pink cupboard, that is, where the classmate was putting Alice's shoes. The variable Justification refers to the choice between the two pictures A and B: *deontic justification* (Figure 2, picture A); *mentalistic justification* (Figure 2, picture B).

Results and discussion

In the rule condition ($N = 56$), the rule question, that is, 'Where do we have to put one's shoes in this childcare center?' enabled us to test the children's ability to draw a rule from emotional information. Indeed, 85.7% of the children were able to state the rule based on the teacher's approving/disapproving conduct (bilateral exact binomial test: number of successes = 48, number of subjects = 56, $p < 0.001$). Among these 48 children, one child was not able to say where the shoes had been hidden (reality question) and was therefore eliminated from the subsequent analyses. In the no-rule condition ($N = 41$), three children failed in the reality question and one child failed in the memory question.

With regard to the prediction question, 51.1% of the children predicted that Alice would look for her shoes in the orange cupboard in the rule condition. Only 18.9% of the children made the same prediction in the no-rule condition. Thus in the rule condition, the contingency table showed that children answered significantly more often 'orange cupboard' (e.g., where the shoes *must* be) than in the no-rule condition (χ^2 (1) = 9.19, $p = .002$). Still in the rule condition, the picture corresponding to the *deontic justification* (Figure 2, picture A) was chosen at 75% by the children who answered 'orange cupboard' to the prediction question ($N = 24$). This deontic choice in the justification question was significantly better than chance (bilateral exact binomial test: number of successes = 18, number of subjects = 24, $p = 0.023$).

To sum up, the data of Study 2 showed that 3-year-olds were good at inferring a deontic rule from emotional cues. In our study, indeed, children were able to use information about emotional expressions of disapproval and approval to infer the rule and to use it to predict Alice's compliant behaviour. Thus positive and negative 'censoriousness', as Haugeland (1998) put it, seems to be very effective in orienting behaviours or, at least, in orienting the prediction of behaviours. Moreover, the contingency table indicated that the difference between the performance of the children in Study 2 (51.1% of success in the rule condition) and in the Study 1 (72.2% of success in the rule condition) was not significant (χ^2(1) = 2.37, $p = .12$). Therefore, the fact that the rule was not explicitly stated did not significantly diminish its impact: adding a rule to the false-belief task did lead children to give an answer significantly different from the response to the standard version of the task.

Let us recall that the rationale behind Study 2 was that, for those who assume the systematic interplay between mentalistic and deontic reasoning, the presence of a deontic rule, far from being alternative to mentalistic reasoning, might boost 3-year-olds weak reasoning with respect to beliefs and thus explain their good performance in the rule condition of Study 1. Such an interpretation does not fare well when we consider the way in which children who said that Alice would look for her shoes in the orange cupboard justified their choice. If they were using mentalistic inferences, they would justify their answer by picking the picture showing that Alice did not see her classmate moving her shoes (Figure 2, picture B), so that she could not know that the shoes in question were currently in the pink cupboard. In fact, the results were the opposite: 75% of the children chose the vignette showing that Alice acted that way because the rule was to put one's shoes in the orange cupboard (Figure 2, picture A). It seems thus reasonable to conclude that the correct answers might not be motivated by an inference about mental states but by a rule-based strategy distinct from theory of mind.

This being so, one might object that deontic inferences drawn from the teacher's emotional state, which is a mental state, are in part mentalistic. Such an objection can be refuted by two arguments, one particular to this study, and the other more general.

In our study, the emotional reaction of the teacher is only the cue of the presence of a rule that, once identified, is susceptible to become the main input of reasoning that does not concern the teacher's behaviour but Alice's behaviour. In this sense, the study exclusively emphasizes the particular part of the inference about the girl's behaviour in a series of children's reasoning – a series that could encompass a mentalistic phase. But more generally, we would be inclined to argue that mentalistic, psychological reasoning in the representational, if not meta-representational, sense of mind reading should be distinguished from the 'bodyreading' that basic emotion perception requires (fear, happiness, anger). Like gaze and body posture, emotional stimuli seem to be detected in a very quick and partly unconscious way (Tamietto & de Gelder, 2010). Moreover, non-human primates, who do no have a theory of mind in this very heavy sense, are good at detecting emotional signals (Russell, Bard, Adamson, 1997). The fact that non-human primates are able to use emotional information to evaluate a situation and to predict behaviour supports the hypothesis of low-level emotional perception, distinct from high-level, psychological reasoning on complex emotions such as guilt or shame. Since basic emotional reasoning and mentalistic reasoning can be pulled apart, the use of emotional signals does not jeopardize the exclusively deontic interpretation of our results.

GENERAL DISCUSSION

The present studies were designed to determine whether deontic reasoning is systematically intermingled with theory of mind and whether deontic inferences in social contexts can be drawn without 'entering minds'. Our strategy was to compare children's performance in standard false-belief tasks with their performance in a similar task in which a rule was added. According to the theory of mind paradigm, the introduction of a rule should not change anything: 3-year-olds, unable to resort to the protagonist's mental states in false-belief tasks, should not be capable of predicting where the character will look for the object. In our two studies, however, the presence of a rule significantly modified the answers given by 3-year-old children.

As discussed above, it seems unlikely that such a change in 3-year-olds' answers might be due to the saliency effect that the deontic emphasis on the original location of the object in the displacement task could have brought about, thereby boosting their incomplete theory of mind. Firstly, in Study 1, 3-year-olds answered the same way as 4-year-olds only in the rule condition, not in the regularity condition that also put emphasis on the original location. This result makes it very difficult to explain why this saliency effect and the mentalizing boosting that goes with it would appear exclusively in the rule condition. Secondly, in Study 2, the majority of younger children who gave a 'correct response' justified their answer by referring to the rule, not to the protagonists' mental states. Our results thus support the hypothesis that this is a non-mentalistic form of deontic reasoning that enables children as young as 3-year-olds to form expectations about what people are supposed to do next in a rule-based situation. In other words, our studies suggest that deontic predictions about the behaviours of others can be performed without using the concept of belief. There is no question of denying that mentalistic reasoning and deontic reasoning might often overlap and that mental and deontic concepts might frequently intermingle; on the contrary, from an empirical point of view, such overlapping is certainly very frequent. But circumstantial overlapping is not cognitive necessity: mentalistic reasoning and deontic reasoning might well coexist

as two different systems of information processing that are, as such, partially overlapped but not completely merged into a single, overall system.

Of course, several remaining issues need to be addressed. One might rightly argue that our studies have only shown the disjunction of deontic reasoning and theory of mind with regard to the concept of *belief*, but not with regard to other mental concepts. It remains thus to be seen what could be their mutual link regarding the concept of desire (Repacholi & Gopnik, 1997), or the concept of intention (Behne, Carpenter, & Tomasello, 2005; Woodward, Sommerville, & Guajardo, 2001), which are more precociously mastered than the concept of belief. Various experiments on the way in which very young children construe situations in which desires and rules are incompatible with one another could be very informative. As regards the situation where rules and desires go in the same direction, it seems very difficult to pull them apart. Is the deontic assumption that Bill is going to act according to the rule underlain by the mental assumption according to which Bill *wants* or *intends* to follow the rule? The principle of parsimony, according to which the simplest cognitive treatments should be considered before higher psychological processes (Epstein, 1984), strongly supports the exclusively deontic assumption. But to confirm the latter, research in neuroscience might be needed in order to pinpoint the different brain areas – if any – that desire-based reasoning and rule-based reasoning might involve.

Our studies have focused mainly on younger children who do not pass the false-belief task. But it would also be very interesting to see, in further research, what kind of justification older children use when they pass the kind of deontic false-belief task that we have carried out. One could imagine, indeed, that even older children who do master mind reading do not necessarily activate it in every social situation and that they might also use exclusively rule-based reasoning to solve the deontic false-belief task. In other words, the full-fledged acquisition of a competence (in this case, the capacity for attributing false beliefs) might not necessarily entail giving up on the use of another effective kind of reasoning (e.g., deontic reasoning). Although theory of mind is a universal *competence* (Liu, Wellman, Tardif, & Sabbagh, 2008), and a constant resource for older children and adult reasoning, it is not necessarily a systematic, reliable *performance* in everyday social settings as well as in artificial experimental settings. Thus, some studies show that even 6- to 11-year-old children who do have a theory of mind do not use it spontaneously to recount a story: on the contrary, they tend to produce a mere behavioural and factual narrative and it is only after repeated scaffolding and explicit instructions that they insert references to the protagonist's false beliefs in their narratives (Veneziano, Plumet, Cupello, & Tardif, 2004). Even adults do not always reliably use their theory of mind, as shown by their tendency to be biased by their own knowledge when attempting to appreciate others' beliefs (Apperly, Riggs, Simpson, Chiavarino, & Samson, 2006; Birch & Bloom, 2004; Keysar, Lin, & Barr, 2003). Further research is thus needed to pinpoint the kind of reasoning activated by older children (and, eventually, adults) in everyday social situations, especially in *impersonal*, *public* situations where social observers might not have the time, the ambition, or even the possibility to 'enter the heads of others' (in a seminar or a store, on the bus, at a cocktail party, etc.). Actually, in public situations where the anonymous mind of others is hidden behind social features, mentalizing seems to be a far more challenging performance than deontic reasoning, which is based on the rules that anyone is supposed to act out.

This hypothesis suggests a way in which the two kinds of social information processing, one deontic and the other one mentalistic, might be linked. Deontic inferences might be devoted to the processing of external rules or situational forces,

that is, 'desire-independent reasons for acting', in particular obligations, which are, so to speak, *out there* and which people have to endorse regardless of their desires and even beliefs (Kaufmann, 2005; Searle, 2001). Such third-person inferences might prove to be especially efficient in impersonal settings: in diminishing the scope of behavioural propensities and determining what actions are acceptable or expected, they do indeed make the social environment predictable *despite* the local, partial uncertainty of individual actions. For instance, understanding the fact that Alfred, the street cleaner, sweeps the sidewalk does not necessarily require mentalizing: Alfred does that because it is his job, period. Even for observers who are nevertheless interested in Alfred's subjective world, mentalistic inquiry would have a very weak explanatory power because it would consist in the superfluous paraphrase of self-evident social behaviour (e.g., Alfred sweeps up the sidewalk because he believes that this is his job and because he needs an income). But in the cases where people act in a way that is not required by their role, mentalizing seems to be indispensable to restore the normal order of things. In other words, theory of mind might come into play precisely when reasoning on the basis of conformity to the normal, canonical way of behaving is undermined by individual non-compliance. If Bill is a manager and sweeps the sidewalk, amazed observers will likely try to pinpoint the bizarre desires and beliefs that explain why Bill is doing a job that is not his. In this view, one important function of theory of mind would be to solve the problem of *discrepancies*, whether this be an intersubjective discrepancy between what someone desires/believes and others believe/desire, an epistemic discrepancy between what is the case and what someone believes, or a deontic discrepancy between what someone should be doing and what she/he is really doing. This discrepancy hypothesis could explain why most literature on deontic reasoning lends support to the idea of an internal link between deontic reasoning and theory of mind. By mostly testing rule violation and emotional reactions to it, which are powerful mentalizing triggers, such literature necessarily led to highlight the interplay between theory of mind and deontic reasoning. The problem is that, by capturing scientific attention, rule violation, conflicting interpretations, and prediction failure might well mask the constant efficiency of non-mentalistic deontic reasoning that is so successful it is not even noticed.

The activation of the two kinds of social processing that we have postulated here, one deontic and the other one mentalistic, might thus depend on the type of situations and activities involved. The partial indeterminacy of intersubjective interactions and activities of conversation, which feed mostly on the discrepancies in perspective and belief and on the exchange of differences in viewpoints (Bernard & Deleau, 2007; Harris, 2006), should foster mentalistic processing. By contrast, activities of collective coordination should trigger deontic processing, based upon the shared social assumptions thanks to which the overall stability and predictability of impersonal relationships can be maintained.

If further research is needed to specify which social context triggers deontic or mentalistic reasoning, comparative research could help specify the *cultural* context that favours either reasoning. There is indeed a large amount of evidence showing cultural variation in the degree of saliency of deontic and mentalistic information and in their role in the causal explanations of human behaviour (Lillard, 1998; Miller, 1984; Nisbett, 2004). Such cultural variation in adults' performance might also support the hypothesis that the mastery of a full-fledged theory of mind is compatible with the coexistence of two inferential systems, one deontic and the other one mentalistic. More generally, a thorough inquiry is needed to establish the cognitive processing that others-as-rule-bearers are susceptible to elicit, especially with regard to the possible *domain-specificity* of deontic

reasoning. One could certainly wonder what would be the conceptual primitives – if any – of this domain-specificity and how those primitives would fit in with the so-called 'moral domain', which refers to issues of justice, rights, and welfare (Nucci, 2001; Turiel, 2008), or with Social Exchange Theory, which places at the centre of its evolutionary approach of deontics the capacity for cooperation monitoring and cheater detection (Cosmides & Tooby, 2005). *Last but not least*, another complementary line of research that would be worth exploring is the way in which social regularities and recurrent behaviours can create normative expectations about what should happen in given situations. Our studies suggest that the 'do the same thing' proper to regularity might not be considered by young children in the same way as the categorical 'do it correctly' proper to deontic rules. One challenge for research in social cognition would be to pit further well established, practical regularities against deontic rules in order to see how they can be moved across or, on the contrary, dissociated.

Acknowledgements

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