Available online at www.sciencedirect.com
ScienceDirect
Cognitive Development 22 (2007) 110–123
COGNITIVE DEVELOPMENT

# Choosing between hearts and minds: Children's understanding of moral advisors

Judith H. Danovitch [a,*], Frank C. Keil [b]

[a] *Child Study Center, Yale University School of Medicine, 40 Temple St. Suite 6B, New Haven, CT 06510, United States*
[b] *Department of Psychology, Yale University, United States*

**Abstract**

Moral development research has often focused on the development of moral reasoning without considering children's understanding of moral advisors. We investigated how children construe sources of moral advice by examining the characteristics that children deem necessary for reasoning about moral or scientific problems. In two experiments, children in grades K, 2, and 4 were presented with dilemmas of a moral nature or scientific nature and chose between two advisors. Second and fourth graders chose advisors differentially based on their expertise, while kindergartners did not discriminate between advisors. In a third experiment, older children indicated that only certain characteristics are needed to solve moral or scientific problems, and they endorsed these characteristics differentially based on the problem to be solved. Thus, by middle childhood, children construe moral knowledge as distinct from scientific knowledge and select advisors in each area accordingly.


*Keywords:* Conceptual development; Moral knowledge; Scientific knowledge; Division of cognitive labor

In a complex world where no one person knows everything, it is important to know where to find the answers we seek. In order to do so efficiently and accurately, we rely on our understanding that different people are knowledgeable about different domains. For instance, given a set of unrelated facts, adults find it quite natural and easy to cluster knowledge into domains that correspond to many of the academic disciplines found in the modern university, such as biology, physics, economics, and psychology (Keil & Rozenblit, 1997).

Children as young as age 4 demonstrate a crude understanding of the division of cognitive labor (Lutz & Keil, 2002). Moreover, by the end of elementary school, children's intuitions about

* Corresponding author. Tel.: +1 203 7371337; fax: +1 203 7853705.
*E-mail address:* Judith.Danovitch@yale.edu (J.H. Danovitch).

0885-2014/$ – see front matter © 2006 Elsevier Inc. All rights reserved.
doi:10.1016/j.cogdev.2006.07.001

discipline based ways of clustering knowledge are quite strong, even when presented with competing ways of clustering knowledge, such as around goals (Danovitch & Keil, 2004). However, these findings entail a limitation in that they focus on domains of knowledge within the natural and social sciences where regularities arise from stable, clearly physical, causal patterns. Indeed, young children seem to sense how to cluster knowledge in these domains by thinking about distinctive causal patterns that give rise to different sets of phenomena and assuming that people who understand one phenomena arising from these causal patterns will also understand other phenomena that rely on the same causal forces.

Not all forms of knowledge, however, arise in this way. Some domains of knowledge are not so closely linked to physical causal regularities, such as morality and social conventions. Although there has been extensive work on reasoning within domains involving physical causal regularities (e.g., Wellman & Gelman, 1998) and those that are outside of the sphere of the natural sciences, including morality and social conventions (e.g., Lockhart, Abrahams, & Osherson, 1977; Turiel, 1998), there has been far less work exploring how children come to understand those knowledge domains and their corresponding experts. This paper focuses on understanding morality as a distinct area of knowledge by examining how children discern the contrast between the moral and scientific domains when seeking advice. If children treat moral experts as distinct from scientific experts, then early notions of the division of cognitive labor are not limited to domains such as biology and mechanics.

Because the causal structure of morality is less apparent and the application of moral rules can vary depending on the situation, one might think it difficult for people to perceive any one individual as more qualified to make moral judgments than others, yet modern culture reveals precisely the opposite sentiment. Moral experts or advisors are present throughout our lives, most often in the form of religious leaders, judges and other mediators. Religious leaders derive their authority from their understanding and endorsement of a particular set of religious beliefs or doctrines, and judges gain credibility as impartial arbitrators who are familiar with legal rules that instantiate a moral code and historical precedents. Nevertheless, because both religious leaders and judges are viewed as moral authorities, they might also have certain characteristics in common that differ from the characteristics of other intelligent members of society. Given that children and adults do find it conceivable to seek advice from other people about questions of a moral nature (Kim, 1998; Laupa, Turiel, & Cowan, 1995), there seems to be a common intuition that moral expertise exists and that those who possess it have access to information or insights that are not available to the rest of the population.

Children are particularly dependent on other people as sources of new information. By age 4, children understand that other people have knowledge and beliefs that differ from their own, often referred to as a "theory of mind" (see Wellman, Cross, & Watson, 2001 for a review). However, in order to successfully acquire new information, children must often strategically select amongst multiple potential sources. They know to avoid information from informants who are obviously ignorant (Koenig, Clement, & Harris, 2004; Sabbagh & Baldwin, 2001; Sabbagh, Wdowiak, & Ottaway, 2003), but it remains unclear how they select advisors when there is more than one potentially knowledgeable source, as the case may be with morality. Existing research on moral development has focused on the development of moral reasoning skills (see Turiel, 1998 for a review) without considering whom children consult for answers to moral questions.

In the following experiments, we asked whether children have a coherent sense of a moral advisor distinct from an amoral but otherwise intelligent person. Experiments 1 and 2 examined whether children would differentiate between an extremely nice person and an extremely knowledgeable person when they were asked to select the best advisor for dilemmas of a moral or

scientific nature. Experiment 3 looked more closely at the specific mental characteristics children associate with the ability to solve moral or scientific problems.

If children indeed base their notions of expertise on causal patterns that are easily available in the world around them, then morality may be a particularly difficult domain to grasp due to the abstract nature of the principles it entails and, consequently, children may not perceive moral advisors as distinct from other advisors until later in development. Alternatively, because moral issues often have a personal relevance not found in other domains, that relevance might foster an early awareness of sources of moral expertise. Our view, however, is that the understanding of morality as a distinct area of knowledge may require considerable time to develop and be seen as distinct from other areas of knowledge.

## 1. Experiment 1

### *1.1. Method*

#### *1.1.1. Participants*

Forty-eight children participated in the experiment. The experimenter interviewed each participant individually in one session lasting approximately 15 min. Participants included 16 kindergarteners (8 male; $M = 5$ years 10 months), 16 second graders (8 male; $M = 7$ years 10 months), and 16 fourth graders (7 male; $M = 9$ years 10 months). Participants were predominantly European-American from middle and upper-middle-class backgrounds.

#### *1.1.2. Materials and procedure*

Before the experiment began, participants were introduced to the concept of asking another person for advice by discussing a time in their own lives when they sought advice from someone else. Participants named a potential advisor for a simple dilemma (deciding which blanket to put on their bed). They were then presented with a second dilemma (deciding what kind of helmet to wear on a spaceship) where the first potential advisor they named (often a relative or friend) would be unlikely to provide the best advice, suggesting that one must select the best advisor based on the problem at hand.

Participants were then introduced to the two potential advisors for the study with accompanying line drawings depicting the person's behavior. The line drawings depicted both advisors as adult males and were virtually identical except for different geometric figures on each advisor's shirt (a triangle versus a square). The first advisor was described as follows:

> This person is always nice to other people. When this person's friend dropped his ice cream cone on the ground, this person gave his friend his own ice cream even though he really wanted it. This person really wanted to make his friend happy. He really cares about other people's feelings and always does what he thinks will help others. One day, this person saw a cat stuck in a tree. He helped the cat out of the tree right away. This person never asks for anything in return. But, he doesn't read many books, and doesn't do so well in school.

The second advisor was described as follows:

> This person is someone who is really smart and knows about a lot of different things. When this person's friend dropped his ice cream cone, this person told his friend how fast ice cream melts, where to buy a new cone, and how ice cream was invented, but he did not give his friend one of his cones. He is really good at thinking about what happens when

people make different kinds of decisions. But, this person doesn't care about other people's feelings and doesn't try to be nice to them. When he saw a cat stuck up in a tree, he knew what kind of cat it was, and what kind of tree it was, and all about cats and what they do, but he did not do anything to help the cat.

Following each description, participants were asked to describe the advisor's characteristics in their own words with prompts from the experimenter if necessary. Participants then completed two pre-test questions asking them to identify the person who "is really nice and caring but does not know about a lot of things" and the person who "is really smart and knows about a lot of things but is not nice."

Stimuli consisted of 12 short vignettes describing a character faced with a dilemma. In six vignettes, the character faces a dilemma of a moral nature, such as whether to break a promise, tell the truth, or respect another person's privacy. In the other six vignettes, the dilemmas involve a scientific issue, such as how to design a stable tower of blocks, how to mix paints to produce a desired color, or how to bake cookies without one of the usual ingredients. (See Appendix A for full text of vignettes.) Because the moral dilemmas inherently involved another person, all of the science vignettes included a secondary character in order to avoid the use of simple heuristics. All vignettes concluded with the statement "(Character's name) doesn't know what to do. Who should (she/he) ask for advice?"

Each vignette was also accompanied by a line drawing depicting only the main character and their dilemma. Vignettes were presented in an intermixed pseudo-random order with the constraint that no more than two vignettes from each category (moral or scientific) appeared together. Two orders of presentation were created for the vignettes and the order of presentation of the two experts was also counterbalanced across participants.

During the presentation of the 12 vignettes, participants always had the line drawings depicting each expert visible on the table in front of them. Following the 12 vignettes, participants also completed two post-test questions ("which one would do better on a math test?" and "which one would be better at helping a friend?") intended to confirm their memory and understanding of the two advisors. All participants in Experiment 1 answered these questions correctly.

### *1.1.3. Results and discussion*

Participants received a score of 1 for each response where they selected the appropriate advisor for the vignette (the nice advisor for moral dilemmas and the highly intelligent advisor for the scientific dilemmas). Therefore, a score of 0–6 was possible for each of the two types of vignettes. Pilot testing with a group of 16 adults revealed that adults perform well on this task, choosing the correct match on 93% of the moral dilemmas and 97% of the science dilemmas.

Among children, a 3 (grade) × 2 (vignette) repeated measures analysis of variance (ANOVA) demonstrated a significant main effect for grade, $F(2,45) = 26.26$, $p < 0.001$, $\eta^2 = 0.539$ (see Fig. 1). Not surprisingly, post hoc Tukey HSD analyses revealed that children's performance overall improved with age, with second graders performing more accurately than kindergarteners ($p = 0.001$), and fourth graders performing more accurately than second graders ($p = 0.008$). Likewise, one-way ANOVAs revealed significant improvement with increasing age on the moral dilemmas, $F(2,45) = 27.28$, $p < 0.001$, $\eta^2 = 0.548$ and the science dilemmas, $F(2,45) = 6.43$, $p = 0.004$, $\eta^2 = 0.222$. All three groups also performed significantly above chance in each condition, with the exception of the kindergarteners' performance on the moral vignettes, $t(15) = 1.20$, $p = 0.246$.

The omnibus ANOVA also revealed a Grade × Vignette interaction that approached significance, $F(2,45) = 4.89$, $p = 0.067$, $\eta^2 = 0.113$. To further explore differences in performance

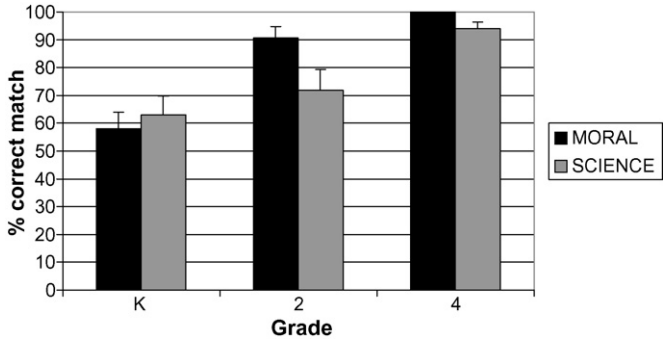


Fig. 1. Mean percentage of correct matches for each type of vignette in Experiment 1.

between the two types of dilemmas, paired *t*-tests were conducted, revealing that fourth graders had significantly higher scores on the moral vignettes than on the science vignettes, $t(15) = 2.42$, $p = 0.029$, while the difference in scores among the second graders also approached significance, $t(15) = 2.09$, $p = 0.054$. This pattern indicates that older children were more likely to err by selecting the nice advisor for the science dilemmas than by selecting the general intelligence advisor for the moral dilemmas.

These findings suggest a shift in how children view moral expertise between the ages of 5 and 10 years. Initially, they do not distinguish the moral advisor from the intelligent advisor, but by the fourth grade, this distinction becomes very clear. The question remains why younger children generally did not distinguish between the two advisors.

## 2. Experiment 2

It is possible that younger children understand that moral questions require an advisor with distinct characteristics but they may have trouble understanding the relationship between knowledge and behavior. Perhaps they believe that each advisor would know how to act given a dilemma, but they may not infer that the advisor would be able to give advice or share his knowledge with others. Experiment 2 explores the possibility that action might therefore be more immediately connected to children's intuitions about the distinct characteristics needed to give advice about morality or science.

### *2.1. Method*

#### *2.1.1. Participants*

Forty-eight children participated in the experiment. Participants included 16 kindergarteners (8 male; $M = 5$ years 4 months), 16 second graders (4 male; $M = 7$ years 5 months), and 16 fourth graders (9 male; $M = 9$ years 5 months). Two additional kindergarten participants were excluded from data analysis due to failure on the post-test. Participants were predominantly European-American from middle and upper-middle-class backgrounds.

#### *2.1.2. Materials and procedure*

Stimuli consisted of the same 12 short vignettes and drawings used in Experiment 1. However, the concluding statement was altered to read: "(Character's name) doesn't know what to do.

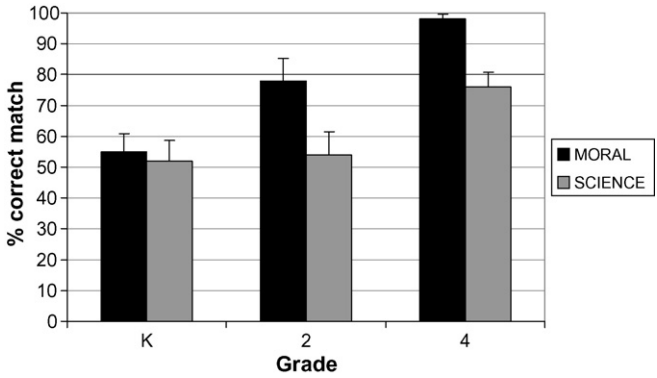


Fig. 2. Mean percentage of correct matches for each type of vignette in Experiment 2.

(He/she) knows that one of these people could *show* (him/her) the best thing to do. Who should (he/she) *watch*?" By emphasizing the visible actions likely to be performed by the advisor, this phrasing was intended to help the children focus on the advisor's behavior.

The training procedure was also altered to address the need to consider a potential advisor's behavior. The initial examples were changed to involve a doctor and a mechanic and participants were asked to identify which one could best demonstrate what to do if "your friend had a cut on their arm" or "you had a flat tire on your car." Otherwise, the training procedure and the description of the two advisors remained identical to Experiment 1. Participants also completed the same post-test questions as in Experiment 1.

### *2.1.3. Results and discussion*

Participants' responses were scored in a manner identical to Experiment 1. A 3 (grade) × 2 (vignette) repeated measures analysis of variance (ANOVA) demonstrated a significant main effect for grade, $F(2,45) = 20.93$, $p < 0.001$, $\eta^2 = 0.482$, and type of vignette, $F(1,45) = 8.96$, $p = 0.004$, $\eta^2 = 0.166$ (see Fig. 2). Post hoc analyses showed that the differences among grades were driven by the fourth graders, who received higher scores than both the kindergarteners, $p < 0.001$, and the second graders, $p = 0.001$. Moreover, the fourth graders performed above chance on both the moral vignettes, $t(15) = 33.67$, $p < 0.001$, and the science vignettes, $t(15) = 5.67$, $p < 0.001$. The second graders were only significantly above chance on the moral vignettes, $t(15) = 3.88$, $p = 0.001$, and the kindergarteners' responses did not differ from chance in both conditions.

Comparing performance between the moral and science vignettes, paired-sample *t*-tests again revealed that fourth graders showed significantly higher scores on the moral vignettes than on the science vignettes, $t(15) = 4.44$, $p < 0.001$, as did second graders, $t(15) = 2.16$, $p = 0.047$. Thus, despite showing less accuracy overall, older children demonstrated the same asymmetrical pattern of responses as in Experiment 1.

Experiment 2 showed that focusing on an advisor's behavior does not make it easier for children to distinguish between the two types of advisors; rather, it seems to be detrimental. It may be that the focus on behavior proved difficult because it was unnatural for children. In real life, one rarely has the option of asking an advisor to actually perform the behavior in question; receiving verbal guidance seems to be a much more common occurrence. Hence, children may have found it more natural to draw inferences about an advisor's advice than their actual behavior.

## 3. Experiment 3

In Experiments 1 and 2, both the moral and scientific vignettes were deliberately designed to present problems that would be difficult enough to justify consulting another person. However, the level of complexity needed to accomplish this goal, particularly on the moral vignettes, may have made these items more difficult for younger children to grasp and contributed to their weaker performance. Likewise, young children find it challenging to attribute simultaneous emotions (Harter & Budin, 1987; Kestenbaum & Gelman, 1995; Reissland, 1985) or desires (Choe, Keil, & Bloom, 2005) to one individual. Perhaps a similar difficulty appreciating both positively and negatively valence traits may have skewed their perceptions of each advisor. Although all participants included in the data analyses passed the post-test questions, it remains possible that the younger children did not fully encode both the positive and negative characteristics of each advisor, perhaps leaving them to focus solely on the positive qualities of each one. Experiment 3 addresses these possibilities by investigating the specific mental characteristics that children believe are required in order to solve moral or scientific problems, thus distancing the task from potential memory limitations and children's judgments of the overall likeability of the two advisors.

### *3.1. Method*

#### *3.1.1. Participants*

Forty-eight children participated in the experiment. Participants included 16 kindergarteners (7 male; $M = 6$ years 0 months), 16 second graders (8 male; $M = 8$ years 0 months), and 16 fourth graders (7 male; $M = 9$ years 11 months). Participants were predominantly European-American from middle and upper-middle-class backgrounds.

#### *3.1.2. Materials and procedure*

Before the experiment began, participants were introduced to the task with two stories about characters faced with a simple dilemma (how to bake a cake and whether to go to a carnival) followed by questions about the characteristics needed to solve that dilemma. The questions were intended to demonstrate to the participant that they should only endorse characteristics that are *necessary* to solve the dilemma, and that they should not endorse those characteristics that are not necessary, even if the character might possess them anyway. For example, in the dilemma involving a girl baking a cake, knowing how to measure the flour was presented as a necessary characteristic that should be endorsed, while knowing how to roller-skate was presented as a characteristic that should not be endorsed because, even if one knows how to roller-skate, skating is not a necessary skill for baking a cake.

Stimuli consisted of four short vignettes describing a character faced with a dilemma. In two of the vignettes, the character faced a moral dilemma (e.g., respecting another's privacy). The other two vignettes involved a scientific problem (e.g., building a rocket). (See Appendix B for full text of vignettes.) Each vignette concluded with the statement: "(Character's name) has to decide what to do."

Following each vignette, participants answered eight questions. All questions had the following sentence structure: "Does he need to (statement of characteristic)?" Four of the questions dealt with characteristics associated with moral behavior and the other four involved characteristics associated with scientific achievement. (See Appendix C for the complete list of test items.) Participants were instructed to indicate "yes" or "no" based on whether a certain characteristic was needed in order to solve the problem.

Each vignette was also accompanied by a line drawing depicting only the main character and an object involved in their dilemma. Two orders of presentation were created for the vignettes and the order of presentation of the questions was also counterbalanced across subjects.

### 3.1.3. Results and discussion

For each vignette, each child was assigned a score of 0–4 for the total number of moral characteristics that were endorsed and another score of 0–4 for the total number of scientific characteristics that were endorsed. Because there were two science vignettes and two moral vignettes, the score for each type of vignette was calculated by adding the scores for the two individual vignettes, yielding a total score of 0–8 for each type of vignette. These scores served as the dependent measure.

In order to assess children's rates of endorsement of mental characteristics with respect to the two types of dilemmas, we performed a 2 (type of vignette) × 2 (mental characteristics—moral or scientific) × 3 (grade) repeated measures analysis of variance (ANOVA), with type of vignette and category of mental characteristics as within-subject variables and grade as the between-subjects variable. The ANOVA revealed a main effect for type of vignette $F(2,45) = 12.33$, $p = 0.001$, $\eta^2 = 0.215$, (see Fig. 3), and post hoc analyses revealed that children were slightly more likely to endorse either type of characteristic for the science vignettes than the moral vignettes, $t(47) = -3.169$, $p = 0.003$.

There was also a main effect for mental characteristics, $F(2,45) = 92.43$, $p < 0.001$, $\eta^2 = 0.673$. Post hoc $t$-tests showed that this effect was driven by a significantly higher rate of endorsing the moral characteristics, $t(47) = 7.951$, $p < 0.001$. Thus, children are generally more likely to value moral traits in an advisor regardless of the type of problem at hand.

Based on the results of Experiments 1 and 2, we were interested in evaluating whether children would endorse the characteristics associated with moral behavior as necessary not only for solving the moral dilemmas but also for solving the science dilemmas. The omnibus ANOVA showed a significant Vignette × Characteristic interaction, $F(2,45) = 273.02$, $p < 0.001$, $\eta^2 = 0.858$, indicating that children endorsed each type of characteristic differentially depending on whether they were presented with a moral or scientific problem. Post hoc analyses found that, on the moral vignettes, children endorsed the moral characteristics more often than the science characteristics,

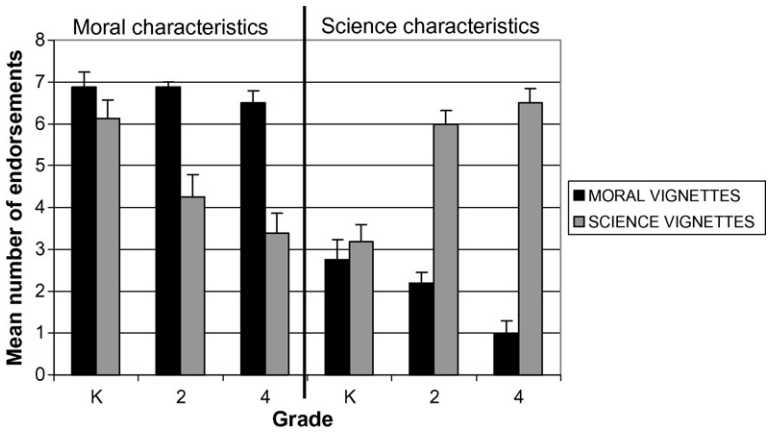


Fig. 3. Mean number of endorsements of each category of mental characteristics for each type of vignette in Experiment 3.

$t(47) = 9.13$, $p < 0.001$. However, on the science vignettes, children were equally likely to endorse the moral and scientific characteristics, $t(47) = 1.33$, $p = 0.139$, indicating that they viewed moral characteristics to be as valuable as science characteristics for solving the science problems. This inappropriately high rate of endorsing moral characteristics as necessary for solving scientific problems supports the interpretation of Experiments 1 and 2 as reflecting a general overemphasis on moral behavior and traits.

A related question was whether we would see an asymmetric pattern of endorsing the moral characteristics on the science vignettes, but not for matching the science characteristics to the moral vignettes, as suggested by the asymmetries in Experiments 1 and 2. Paired *t*-tests across all age groups revealed that this was indeed the case, with children significantly more likely to endorse the moral characteristics for the science vignettes than to endorse the science characteristics for the moral vignettes, $t(47) = 9.29$, $p < 0.001$. Likewise, children were more likely to endorse the moral characteristics for the moral vignettes than the science characteristics for the science vignettes, $t(47) = 4.50$, $p < 0.001$. Hence, moral characteristics seem to stand out as being necessary for both types of dilemmas in a way that the science characteristics do not.

With respect to differences between age groups on this task, the ANOVA revealed no main effect of grade, yet there was a significant Vignette × Grade interaction, $F(2,45) = 6.35$, $p = 0.004$, $\eta^2 = 0.220$, a Characteristic × Grade interaction, $F(2,45) = 11.86$, $p < 0.001$, $\eta^2 = 0.345$, and a Vignette × Characteristic × Grade interaction, $F(2,45) = 45.32$, $p < 0.001$, $\eta^2 = 0.668$. These results suggest that there were important differences between age groups in children's differential endorsement of characteristics based on the dilemma at hand. On the science vignettes, one-way ANOVAs showed significant improvement with increasing age in rates of rejecting moral characteristics, $F(2,45) = 8.329$, $p = 0.001$, and endorsing science characteristics $F(2,45) = 25.387$, $p < 0.001$. Additional paired *t*-tests revealed that kindergarteners were more likely to select the moral characteristics than the science characteristics as necessary for solving science problems, $t(15) = 5.48$, $p < 0.001$. Conversely, the second and fourth graders endorsed the science characteristics more often for the science problems, $t(15) = 3.09$, $p = 0.007$, for second graders; $t(15) = 6.26$, $p < 0.001$, for fourth graders. Thus, for kindergarteners, behaving in a caring and just way is more important for solving science problems than being knowledgeable or possessing critical thinking skills, yet older children show the opposite pattern of intuitions.

On the moral vignettes, one-way ANOVAs showed no difference among age groups in the endorsement of moral characteristics and a significant decrease with age in the endorsement of science characteristics, $F(2,45) = 6.285$, $p = 0.004$. Children of all ages viewed moral characteristics as important for solving moral problems, but kindergarteners were more likely to also indicate that science characteristics are important than their older counterparts. It is important to note, though, that even among the youngest children the science characteristics were endorsed at a much lower rate overall (less than 50 percent of the time).

Taken together, the results of Experiment 3 demonstrate that children in all three age groups view moral characteristics as important for solving moral and, to a lesser degree, scientific problems, but only the older children consistently indicate that scientific characteristics are more likely to be necessary for solving scientific problems. Even though kindergarteners show some differentiation between the mental characteristics needed to solve moral as opposed to scientific problems, they tend to be heavily biased toward considering the moral characteristics important for both types of dilemmas. This suggests that a halo of competence based on moral attributes extends further than a halo based on general intelligence. By the fourth grade, however, children clearly compartmentalize these two kinds of mental characteristics into their appropriate domains of application.

## 4. General discussion

In three experiments, children differentiated between sources of moral and scientific advice and the distinction between these domains became more fine-tuned during the elementary school years. Experiments 1 and 2 demonstrated that, by fourth grade, distinguishing between moral and scientific advisors seems to be quite easy for children and they distinguish between two potential sources of advice consistently and accurately. Previous work has shown that kindergarteners are successful at distinguishing among experts when dealing with familiar domains and have more difficulty clustering scientific knowledge in terms of causal principles applied to less familiar domains (Danovitch & Keil, 2004; Lutz & Keil, 2002). Similarly, in the experiments presented here, kindergarteners may have failed to grasp the distinction between moral and scientific knowledge due to difficulty perceiving the common threads that bind each of these areas of expertise.

Based on concerns that other cognitive influences may have limited younger children's recall of personality traits or skewed their perceptions of each advisor, Experiment 3 explored precisely what factors influence children's understanding of each area of knowledge and form the basis for their judgments of expertise. This experiment showed that one genuine obstacle to younger children's ability to distinguish between moral and scientific sources of advice seems to be a view of moral characteristics as essential to solving both types of problems. Conversely, older children begin to appreciate that it is not necessary to behave morally or act in accordance with moral standards in order to solve problems in the sciences. This "overextension" among younger children may result from the perception of moral behavior as an indicator of willingness to give advice or help someone solve a problem, or perhaps from personal experiences where knowing the moral response is emphasized above all other types of knowledge. For instance, in a typical kindergarten classroom, moral behaviors such as sharing with one's peers and obeying the teacher's instructions, rather than the acquisition of factual knowledge, may be highlighted as the way to achieve academic success.

Younger children may also find it more difficult to make fine tuned distinctions between moral knowledge and scientific knowledge, possibly resulting in a belief that moral behavior can make someone more adept at solving other types of problems. Previous work has shown that younger children are more likely to endorse the notion of immanent justice, meaning that immoral behavior may cause negative consequences in other unrelated domains (e.g., being naughty can cause a toothache; Kister & Patterson, 1980; Siegal, 1988). An analogous type of immanent justice may exist where younger children reason that moral behavior can produce positive consequences in other domains of knowledge, such as science. Such a pattern of reasoning would explain why younger children favored the nice advisor and chose the moral characteristics for both types of dilemmas in our studies, but did not display the reverse pattern of overextending the need for scientific knowledge into the moral realm nearly as frequently. A final explanation may involve an overestimation by younger children of factual knowledge and general intelligence in others, as suggested by our finding that younger children are less likely to state that scientific knowledge is necessary in order to solve a scientific problem. Hence, young children may not only overestimate their own knowledge (see Mills & Keil, 2004), but they may also overestimate what other people know to the point of assuming that an average person possesses far more factual knowledge than they actually do.

The current studies do not support an all-or-nothing understanding of moral advisors. Rather, children's understanding that moral and scientific advisors are distinct appears to develop gradually and become more defined with age. This gradual differentiation between the two domains may be explained in a number of ways. First, if children are not able to discern causal patterns

regarding morality and associate an understanding of these patterns with an advisor, they may rely instead on other indicators of moral knowledge, such as the presence of emotion or the person's proficiency with factual information. Furthermore, the studies presented here suggest that, as children develop, their ability to distinguish among indicators of moral or scientific knowledge improves. These heuristics are likely to continue to develop and change through adolescence and into adulthood as individuals gain experience with more complex problems in different domains.

The findings presented here show that a shift takes place during the early elementary school years in how children construe morality as a distinct area of knowledge and how their understanding influences their selection of sources of advice. Children come to see a clear and dramatic difference between decisions based on cold analytic thought and those based on a set of moral intuitions that may well involve assumptions about people's hearts as well as their minds. Given the pervasive appeals and deference to moral authorities in contemporary cultures throughout the world, it is striking that such behaviors would not make much sense to young children. As adults, we have strong intuitions about what qualifications make one person a better moral advisor than another. Young children, by contrast, seem to have a limited understanding of what makes someone a good or bad advisor when dealing with challenging moral and non-moral problems.

## Acknowledgements

This research was supported in part by an NSF Graduate Research Fellowship to Judith Danovitch and NIH Grant RD37-HD023922 to Frank Keil. We thank the staff, parents, and students at Country Hills Elementary School, Derynoski School, Ezra Academy, Thalberg School, and Strong School for their support. Special thanks to Patricia Balbas, Valerie Gerry, and Daniel Hyde for their assistance.

## Appendix A

### *A.1. Moral vignettes*

1. Greg buys a new toy car and a new video game at the store. The video game is really fun, and the car is not as fun. Greg wants to give one of the toys to his friend Sam for his birthday. Greg knows that Sam would really enjoy playing with the video game. Greg wants to keep the video game for himself, but he knows that Sam would not like the car. Greg does not know what to do. Who should he ask for advice?
2. A teacher is giving out stickers to the kids who cleaned up their desks. She accidentally gives a sticker to Anna, but Anna did not clean up her desk. When Anna saw that the teacher made a mistake, she was honest and told the teacher about the mistake. The teacher knows that Anna should not have a sticker, but she also thinks that Anna should keep it because she told the truth. The teacher does not know what to do. Who should she ask for advice?
3. Mike and John usually watch TV together. It is Mike's turn to pick which show to watch. John really likes to watch sports and does not like cartoons very much. There is a special cartoon today that Mike really wants to see, even though he knows that John will be bored if they watch it. Mike wants John to have fun, but he also wants to watch the special cartoon. Mike does not know what to do. Who should he ask for advice?
4. Tom's teacher gave out M&M's to his class. The teacher went around the room and put them on every child's desk. When Tom got his, he put them in his pocket to save for later. The teacher did not see Tom put the M&M's in his pocket so she thinks that she forgot him and tells him to

get more. Tom knows that the teacher is making a mistake, and that if he takes more M&M's, no one else will know. Tom does not know what do. Who should he ask for advice?

5. Jessica likes to play with her friend Tiffany. Jessica invited Tiffany to play with her on Saturday and Tiffany said yes. Jessica then found out that the carnival is also on Saturday. She knows that Tiffany is not allowed to go to the carnival. Jessica really wants to go to the carnival but if she goes, she cannot play with Tiffany. Jessica does not know what to do. Who should she ask for advice?
6. Joe and Dave are friends. As Dave is about to leave one day, he puts a notebook on the table and tells Joe not to look inside it. It is a list of things that Dave wants for his birthday, but Dave does not want anyone to look at what he wrote. Dave goes out and Joe really wants to know what the notebook says. Joe knows that his friend will not be able to tell if he opens it. Joe does not know what to do. Who should he ask for advice?

### *A.2. Science vignettes*

1. Maria is baking cookies for her grandmother who is coming to visit. As she is making the cookies, she sees that she does not have enough butter for the recipe. Maria could use oil instead of butter, but she is worried that they will be too hard for her grandmother to eat. She could also try to make the cookies without the butter, but she is worried that they will get burnt and her grandmother would not like them. Maria does not know what to do. Who should she ask for advice?
2. Jenny invited her friend Kim to see her new pet frog. When Kim saw that Jenny was feeding the frog a worm, she told her that worms make frogs get sick. Kim told Jenny that she should give the frog a grasshopper to eat instead. Jenny still thinks that frogs like to eat worms, but she is not sure if they will make the frog sick. Jenny does not know what to do. Who should she ask for advice?
3. Kyle's class is making holiday cards. The teacher gave out paint to each child in the class, but when Kyle got the paint it was missing his favorite color orange. The teacher told Kyle that there was no more orange so he should use red instead. Kyle thinks that he can make orange paint by mixing some of the other colors, but he is worried that it will mess up the card. Kyle knows that if he uses red, the card would not be as pretty but it would not make a mess. Kyle does not know what to do. Who should he ask for advice?
4. Alice bought a new dress to wear to Julie's wedding. Right before the wedding, Alice tripped and got mud on her new dress. Julie saw her and told her to go put soap on it right away before the stain got stuck. Alice knows that water usually gets mud out of clothes, but she really wants to make sure that the water will not ruin the new dress. Alice does not know what to do. Who should she ask for advice?
5. Molly and Jane are having a contest to see who can build the highest tower out of blocks. They each get the same amount of blocks. Molly knows that if she puts one block on top of another, she will have a tall tower but it might fall down before Jane's tower does. If she makes a wider tower, it would not be as tall as Jane's tower but it will not fall down before the contest ends. Molly does not know what to do. Who should she ask for advice?
6. Barbara owns a factory that makes shoes. Sally comes and tells Barbara about a new shoe-making machine for her factory. Sally tells her that the new machine will cost a lot of money, but if Barbara buys it she will be able to make more shoes more quickly. If Barbara keeps her old machine, she will continue to make as many shoes as she does now. Barbara does not know what to do. Who should she ask for advice?

## Appendix B

### *B.1. Moral vignettes*

1. Joe and Dave are friends. As Dave is about to leave one day, he puts a notebook on the table and tells Joe not to look inside it. It is a list of things that Dave wants for his birthday, but Dave does not want anyone to look at what he wrote. Dave goes out and Joe really wants to know what the notebook says. Joe knows that his friend will not be able to tell if he opens it. Joe has to decide what to do.
2. Mike and John usually watch TV together. It is Mike's turn to pick which show to watch. John really likes to watch sports and does not like cartoons very much. There is a special cartoon today that Mike really wants to see, even though he knows that John will be bored if they watch it. Mike wants John to have fun, but he also wants to watch the special cartoon. Mike has to decide to do.

### *B.2. Science vignettes*

1. Jeff's class is having a contest to see who can build the rocket that is able to travel the most high up in the air. The teacher told Jeff he should use cardboard to build his rocket but Jeff is worried that it will not be sturdy enough. Jeff thinks that he can make a good rocket out of plastic but he is worried that it will be too heavy and the rocket would not go up as high. Jeff has to decide what to do.
2. Tom loves to collect ladybugs and he is going to look for them. His friend Bob thinks that the best place to look for ladybugs is on the ground because they crawl there. But Tom thinks that there are more ladybugs in the trees because they like to fly around. Tom only has time to look in one place, and he wants to look in the place that will have the most ladybugs. Tom has to decide what do.

## Appendix C

### *C.1. Moral characteristic questions*

1. Does he need to care about other people's feelings?
2. Does he need to be nice to other people?
3. Does he need to follow the rules and laws people have?
4. Does he need to be fair with other people?

### *C.2. Science characteristic questions*

1. Does he need to be good at trying out ideas?
2. Does he need to be a smart person?
3. Does he need to know facts about science?
4. Does he need to know how things move?

## References


Choe, K. S., Keil, F. C., & Bloom, P. (2005). Children's understanding of the Ulysses conflict. *Developmental Science*, *8*, 387–392.

Danovitch, J. H., & Keil, F. C. (2004). Should you ask a fisherman or a biologist?: Developmental shifts in ways of clustering knowledge. *Child Development*, *75*, 918–931.

Harter, S., & Budin, B. J. (1987). Children's understanding of the simultaneity of two emotions: A five-stage developmental acquisition sequence. *Developmental Psychology*, *23*, 388–399.

Keil, F. C., & Rozenblit, L. (1997). *Knowing who knows what: Intuitions about natural clusters of knowledge*. Paper presented at the 38th annual meeting of the Psychonomic Society, Philadelphia, PA.

Kestenbaum, R., & Gelman, S. A. (1995). Preschool children's identification and understanding of mixed emotions. *Cognitive Development*, *10*, 443–458.

Kim, J. M. (1998). Korean children's concepts of adult and peer authority and moral reasoning. *Developmental Psychology*, *34*, 947–955.

Kister, M. C., & Patterson, C. J. (1980). Children's conceptions of the causes of illness: Understanding of contagion and use of immanent justice. *Child Development*, *51*, 839–849.

Koenig, M. A., Clement, F., & Harris, P. L. (2004). Trust in testimony: Children's use of true and false statements. *Psychological Science*, *15*, 694–698.

Laupa, M., Turiel, E., & Cowan, P. A. (1995). Obedience to authority in children and adults. In M. Killen & D. Hart (Eds.), *Morality in everyday life* (pp. 131–165). Cambridge, UK: Cambridge University Press.

Lockhart, K. L., Abrahams, B., & Osherson, D. (1977). Children's understanding of uniformity in the environment. *Child Development*, *48*, 1521–1531.

Lutz, D., & Keil, F. C. (2002). Early understanding of the division of cognitive labor. *Child Development*, *73*, 1073–1084.

Mills, C. M., & Keil, F. (2004). Knowing the limits of one's understanding: The development of an awareness of an illusion of explanatory depth. *Journal of Experimental Child Psychology*, *87*, 1–32.

Reissland, N. (1985). The development of concepts of simultaneity in children's understanding of emotions. *Journal of Child Psychology and Psychiatry*, *26*, 811–824.

Sabbagh, M. A., & Baldwin, D. A. (2001). Learning words from knowledgeable versus ignorant speakers: Links between preschoolers' theory of mind and semantic development. *Child Development*, *72*, 1054–1070.

Sabbagh, M. A., Wdowiak, S. D., & Ottaway, J. M. (2003). Do word learners ignore ignorant speakers? *Journal of Child Language*, *30*, 905–924.

Siegal, M. (1988). Children's knowledge of contamination and contagion as causes of illness. *Child Development*, *59*, 1353–1359.

Turiel, E. (1998). The development of morality. In W. Damon (Series Ed.) & N. Eisenberg (Vol. Ed.), *Handbook of child psychology: Vol. 3. Social, emotional and personality development* (5th ed., pp. 863–932). New York: Wiley.

Wellman, H. M., Cross, D., & Watson, J. (2001). Meta-analysis of theory-of-mind development: The truth about false belief. *Child Development*, *72*, 655–684.

Wellman, H. M., Gelman, S. A. (1998). Knowledge acquisition in foundational domains. In W. Damon (Series Ed.) & D. Kuhn & R. S. Siegler (Vol. Eds.), *Handbook of Child Psychology: Vol. 2. Cognition, perception, and language* (5th ed., pp. 523–573). New York: Wiley.