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wien

MASTERARBEIT / MASTER'S THESIS

Titel der Masterarbeit / Title of the Master's Thesis

“Mother knows best?”

Investigating preschoolers' over-imitation of parents and strangers”

verfasst von / submitted by

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angestrebter akademischer Grad / in partial fulfilment of the requirements for the degree of

Master of Science (MSc)

Wien, 2024 / Vienna 2024

Studienkennzahl lt. Studienblatt /
degree programme code as it appears on
the student record sheet:

UA 066 840

Studienrichtung lt. Studienblatt /
degree programme as it appears on
the student record sheet:

Masterstudium Psychologie UG2002

Betreut von / Supervisor:

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Mother knows best? Investigating preschooler's overimitation of parents and strangers

In everyday life, children are surrounded by many people, especially once they enter kindergarten. This gives them the opportunity to learn from a variety of people, often through observation and imitation. Imitation is how human culture and knowledge can be transferred, often implicitly, and it has been said that imitation is one of the bases of human cumulative cultural evolution (Boyd & Richerson, 1996). In this process, action sequences or behaviors are copied from others to maintain them; however, they can also be modified and created anew as culture evolves.

Imitation is an adaptive learning strategy that children use readily and from around two years of age, early on in their lives (Jones, 2009). However, there are some cases in which imitating faithfully, i.e. copying exactly what is being observed, might not always be the best or most efficient option. One prominent example is the imitation of traditions. Traditions often do not serve a specific (instrumental) purpose but are transferred through culture nevertheless, like clinking glasses together before drinking. Many such actions are encountered in everyday life, as people generally engage in irrelevant or unnecessary behaviors with no real purpose, such as slapping their legs before getting up or pressing the button at a traffic light multiple times when once would be sufficient, and people often copy these behaviors from others without much thought.

This phenomenon of *overimitation*, i.e. imitating even inefficient actions faithfully, has been found to be robust among human adults and children in many different circumstances. There are several theories as to why one might overimitate, for example social motivations or a lack of causal understanding (Hoehl et al., 2019). However, so far surprisingly little attention has been devoted to the role of familiarity or attachment as a factor in overimitation. While some studies have looked at model characteristics as an influence on overimitation (Schleihauf & Hoehl, 2021), there has been no investigation on whether children prefer to imitate their parents rather than a stranger. The current study aimed to close this research gap and shed light on whether familiarity influences overimitation. As children typically learn many cultural traditions from their parents, but are also surrounded by many different familiar and unfamiliar people in their everyday lives, it is important to know how they decide who to learn from and whether factors such as familiarity might lead to the imitation of less efficient behaviors.

Theoretical Background

What is imitation?

Imitation has been defined by Boesch and Tomasello (1998, p. 599) as the copying of actions or behaviors and their goals, although amendments to this definition as well as other definitions have been suggested (Fridland & Moore, 2014; Horner & Whiten, 2005; Over & Carpenter, 2012). As such, imitation is a useful and simple learning strategy that aids in the transmission of cultural knowledge and social behaviors through the observation and copying of models in the environment (Schleithauf & Hoehl, 2021). As an important aspect of daily life, unconscious imitation facilitates positive social interactions (Hayes, 2001; Chartrand & Bargh, 1999). Children have been shown to imitate early in life; initially, imitation might be rougher and less exact, but as children get older, they not only imitate more but also become more faithful in their imitation (Tomasello, 1999; McGuigan et al., 2007).

As the concept of imitation plays an important role in social learning, it has received much attention in research, both in children and animals, and it has become apparent that even humans' closest relatives differ, particularly in their faithfulness/accuracy, from humans in their imitation behavior (Dollard & Miller, 1945; Caldwell & Millen, 2013; Horner & Whiten, 2005).

What is overimitation?

Horner and Whiten (2005) were the first to demonstrate a striking difference in imitation strategies between human children and chimpanzees, our closest relatives. After observing a sequence of actions aimed at opening a puzzle box, the chimpanzees used emulation, a strategy of replicating an observed goal without strictly imitating the demonstrated actions. Children, however, copied all actions faithfully. This finding is striking because the action sequence contained both relevant and unnecessary actions, and while chimpanzees did not copy unneeded actions, human children did (Horner & Whiten, 2005). This phenomenon was later coined *overimitation* (Lyons et al., 2007) and has been defined as the imitation of actions that are not necessary for achieving a certain goal and that can also easily be identified as being unnecessary (Hoehl et al., 2019). With regard to this definition, it is important to note that actions are goal-directed and that imitation is faithful and intentional. Furthermore, the causality of the demonstrated actions must be discernible so that causally irrelevant actions can be identified (Hoehl et al., 2019). Other terms that have been used to describe the phenomenon are *indiscriminate imitation* (Gardiner, 2014) and *blanket copying*

(Whiten, 2017). The concept of overimitation should not be confused with similar concepts in imitation literature. One example is *faithful imitation*, which describes both overimitation and other kinds of imitation where the observed actions are copied exactly. Another example is *rational imitation*, which has been proposed to be related to overimitation and describes situations where the decision to imitate is based on factors that indicate whether the action makes sense (Gergely et al., 2002; Hoehl et al., 2019).

Since its discovery, overimitation has received much attention in psychological research and has been investigated in different age groups, contexts, and even species, aiming to disentangle the factors influencing overimitation (Hoehl et al., 2019). Although overimitation appears to be an overall robust phenomenon, some studies have questioned its existence due to conflicting results. For example, Lyons et al. (2011) observed that children continued to overimitate when they thought that the experiment was over, but McGuigan and Robertson (2015) found that children stopped overimitating after the experiment had supposedly ended. While the results are contradictory, this raises the question of whether overimitation as a concept might result solely from social pressures. In a cleverly designed study that observed adults' behavior "in the real world" to investigate this question, Whiten et al. (2016) found that people overimitated even without knowing that they were part of an experiment.

Another interesting finding on overimitation has been that children in some studies show overimitation behavior even when they personally experience disadvantages because of it. Specifically, children were shown how to operate a puzzle box using both efficient and inefficient actions and were then invited to compete with a puppet over who could solve the puzzle box faster in order to retrieve a reward. Over several rounds, even though children kept losing because the inefficient actions slowed them down, they did not adapt their strategy to use only efficient actions (Lyons et al., 2011).

Such fascinating and perhaps contradictory findings beg the questions of what factors influence overimitation and what ultimately motivates humans to overimitate.

Theories on overimitation

The reasons for overimitation have been hotly debated, with a range of explanations and theories being developed over the past decades. The two most prevalent theories over the years have tried to explain overimitation as a result of either social motivations or deficient causal reasoning (Hoehl et al., 2019). Overimitation might serve instrumental functions such

as learning something new through observation and imitation, but could also be due to children's attempts to affiliate with the demonstrator or to adhere to social norms. It has also been suggested that children's goals while overimitating may vary across different situations (Hoehl et al., 2019; Nielsen & Blank, 2011; Over & Carpenter, 2012). Furthermore, Whiten et al. (2009) suggested that overimitation might have evolutionary benefits, as it is generally adaptive to imitate exactly what one sees in order to reach a goal, and the copied strategies could be refined at a later point.

Causal reasoning

The causal reasoning account considers a deficit in causal reasoning as the driver behind overimitation behavior, assuming that children have an automatic tendency to encode all intentional actions they observe as causally relevant (Lyons et al., 2007; 2011). The authors suggest that automatic causal encoding is an adaptive strategy that aligns with other rational behaviors children show when it comes to imitation, particularly their ability to imitate selectively (Lyons et al., 2007; Gergely et al., 2002). The theory predicts that overimitation should be unavoidable when children are presented with an inefficient strategy. Lyons et al. (2007) showed that children overimitated even when they were trained to identify irrelevant action steps and explicitly instructed not to imitate these irrelevant actions. However, when children are presented with an efficient strategy that does not contain any irrelevant actions after already seeing the inefficient strategy, it should be clear that these actions do not lead to the goal and overimitation should drop. Accordingly, it has been shown that children's overimitation rates do indeed drop once an efficient strategy is revealed (Schleihauf et al., 2018).

Although the theory describes overimitation as essentially unavoidable, there are cases in which even the automatic causal encoding account predicts that overimitation should not occur. This is the case for actions that violate the contact principle (Spelke, 1990), a basic concept that is understood even by very young children. If an action does not stand in contact with the reward container, no causal effect on the reward container should be achieved. In line with this prediction, Lyons et al. (2007) found that actions performed on a second container, which was disconnected from the reward container, were not imitated by children. Interestingly, if the two containers were physically connected, children overimitated the actions even though they still had no effect (Lyons et al., 2007). Therefore, actions that violated the contact principle did not elicit overimitation.

While the automatic causal encoding approach can explain a range of findings, flaws in this account become apparent when looking at studies investigating the framing of the overimitation tasks given to children. For example, due to its inflexibility, the causal reasoning perspective fails to account for the influence of social encouragement on overimitation (Keupp et al., 2015; Hoehl et al., 2014). Furthermore, recent research has found that context matters, more than the automatic causal encoding theory would predict, and that children flexibly adapt whether they overimitate or not with regard to different contexts (Keupp et al., 2015). Therefore, other theories such as the normative account have emerged, aiming to explain overimitation and account for children's flexibility when it comes to overimitation.

Normative accounts of overimitation

Unlike the causal reasoning account, the normative account assumes that children are able to understand that unnecessary actions are not causally relevant but that they overimitate them nevertheless because they see these actions as conventional in some contexts (Keupp et al., 2015; Kenward et al., 2011). In many situations, inefficient actions are part of cultural conventions or norms, and children learn to continue performing these actions even if they learn more efficient alternatives, as norms create a standard for people's actions and behaviors and are enforced by the group, with deviations being punished (Altinok et al., 2020; Hoehl et al., 2019). Similarly, the normative account not only predicts that children should perform actions they view as normative but also protest if others do not perform these actions and thereby violate the norms (Keupp et al., 2015; Rakoczy et al., 2008). However, norms and conventional actions are often specific to certain contexts and groups, and the normative account therefore predicts wide-ranging flexibility and context sensitivity in children's overimitation (Keupp et al., 2015).

Findings supporting this theory of overimitation have shown that children imitate unnecessary actions less if the imitation context is different from the original demonstration context, and they also show less protesting behavior if the context is different (Keupp et al., 2015). In the study by Keupp et al. (2015), the difference in context was achieved through naming the activities differently, i.e. giving a name (e.g. "daxing") to the conventional action sequence while simply naming the desired outcome in the instrumental context. Furthermore, Schmidt et al. (2012) found that children protest against norm violations within their ingroup, but not if the violator is part of an outgroup. Children are also sensitive to the communicative introduction of actions, with higher fidelity in their copying being observed in a conventional

context rather than an instrumental one, and their criticism of action omission increasing in the conventional context (Herrmann et al., 2013; Keupp et al., 2013). When it comes to game contexts, where certain actions might be unusual but part of the game rules, it has been shown that children who overimitate use more normative language when relaying game rules to their peers, as opposed to children who do not overimitate (Stengelin et al., 2022). Strikingly, in Lyons et al.'s (2011) study, children overimitated even in a racing game in which they lost to a puppet opponent if they overimitated all the actions they were shown before. Even after several losses, many children continued to overimitate despite their lack of success. While the authors argue that children did so because they were not able to understand the causal structure of the actions, it is plausible that children saw the actions they had observed as norms or game rules and did not want to risk sanctions if they stopped performing unnecessary actions (Lyons et al., 2011).

Due to the assumption that children are flexible in their overimitation depending on the context, the normative account can explain a wide range of findings. Nevertheless, this theory has some limitations. For example, under the normative account, violations of the contact principle should not influence overimitation rates, but Lyons et al. (2007) were able to show that actions which violate the contact principle are overimitated less, indicating that the contact-principle influences overimitation rates. Why would children assume that such actions would not be normative and therefore not overimitate them if the actions violated the contact principle, especially since they overimitated them when the contact principle was not violated? Furthermore, when children observed both a majority group performing an inefficient action sequence that contained unnecessary actions and a minority group performing an efficient sequence without any unnecessary actions, they copied the more efficient minority group more than the less efficient majority group (Evans et al., 2017). Although the study found a majority bias when the two groups demonstrated equally efficient solutions, such a bias did not occur when children saw that the minority group was more efficient. If they were motivated by (perceived) norms, they would be more inclined to imitate the majority, regardless of efficiency.

As the normative account cannot fully explain parts of the wide range of findings on overimitation, another, similar theory has been a popular approach to explaining overimitation. Compared to the normative account, due to the social nature of norms, the social (or affiliative) account can explain similar findings to some extent. Nevertheless, the social and affiliative accounts of overimitation attempt to explain overimitation from a

different viewpoint, and therefore, should be considered separately when evaluating theories of overimitation.

Social accounts of overimitation

When it comes to social motivations for overimitation, the desire to affiliate with others is often considered an important factor (Hoehl et al., 2019). One reason children might overimitate could be that they want to affiliate with the demonstrating person and build a positive bond with them. In this case, overimitation would also serve a social function, as with normative overimitation; however, it might be less out of conventional obligation and more out of children's free will. Similarly, Schleihauf and Hoehl (2021) showed that children preferred to overimitate a prosocial demonstrator rather than an antisocial one, even though the demonstrators were not watching the child's turn, indicating that children specifically chose their actions based on their preferences. Additionally, ingroup bias appears to influence children's overimitation, as it has been shown that children prefer to overimitate if the demonstrator is part of the same natural ingroup as them (Krieger et al., 2020) and if they speak the same language (Altinok et al., 2020).

Another factor that might influence overimitation is social desirability (Paulhus, 1991). While the experimental setting alone might evoke expectations in children about how they ought to behave, the presence of the experimenter during the child's turn might also influence overimitation rates, as children could try to act in a socially desirable way, for example by overimitating if they assume that this is what the experimenter might expect from them (Hoehl et al., 2019). Overimitation might be perceived as a socially desirable behavior in the experimental setting. McGuigan et al. (2007) showed that children overimitated more if the demonstrator was in the room with them, which invites the interpretation that children felt more pressure to copy the demonstration exactly instead of modifying the action sequence. Moreover, research indicates that social encouragement can amplify overimitation tendencies (Hoehl et al., 2014; Keupp et al., 2015), implying that the rates of overimitation may be influenced by children's perception of desirable behavior within the experimental context. Despite these findings, overimitation has been consistently demonstrated in studies where the experimenter was not in the room while the children took their turn, indicating that social pressures and desirability effects are not, at least not exclusively, responsible for overimitation (for example: Schleihauf et al., 2018; Hoehl et al., 2014; Lyons et al., 2011).

One of the points that speaks against social motivations is that some experiments have shown that children continue to overimitate even when the demonstrator is out of the room or when they think the experiment is over, seemingly eliminating social pressure (Schleithauf & Hoehl, 2021; Lyons et al., 2011). One explanation for these results might be that children still experience a desire to affiliate with the model and look up to or want to be like them, therefore imitating their behavior. Additionally, studies where children are still in the experimental setting might nevertheless be influenced by children's expectations and a feeling of social pressure, even if nobody is in the room with them, as there are usually cameras recording them and they could still feel watched. However, the study conducted by Whiten et al. (2016) allowed for observation of participants who did not know they were part of an experiment at a zoo. Here, the overimitation behavior observed in these unknowing participants can be assumed to be untouched by social pressures, and it is unlikely that participants had any affiliative motivations towards who they assumed was another random visitor of the zoo. This study found overimitation despite an apparent lack of social motivation for participants, suggesting that the phenomenon of overimitation is not based solely on social or affiliative motivations.

So far, none of the theories discussed up to this point have been able to sufficiently explain the full extent of findings on overimitation over the past two decades. Instead of trying to explain overimitation solely based on either social, normative, or causal factors, it might be more plausible to take several of the factors discussed so far into account when trying to understand overimitation, and to consider that there could be different causes for overimitation depending on the circumstances. Such an integrative approach to explaining overimitation, combining several different approaches to overimitation, has been lacking in the theories of overimitation discussed thus far.

Copy first, refine later – a dual-process theory of overimitation

To combine the different approaches to explaining overimitation, Schleithauf and Hoehl (2020) suggested a dual-process model of overimitation inspired by theories of information processing. Their model describes two different processes that can occur when observing a demonstration of goal achievement. Type 1 processes should be fast, easy, and automatic, similar to heuristics of human cognition (De Neys & Glumicic, 2008). These processes are often efficient and usually lead to the correct solution. In their model, Schleithauf and Hoehl (2020) call the type 1 process *blanket copying*, which can be seen as the default option to imitate exactly what is being observed. Meanwhile, type 2 processing is

commonly described as the “harder” route, which requires attention and cognitive effort. Switching from type 1 to type 2 processing often takes place when the type 1 solution offers contradictory information or if it is too costly. The dual-process model of overimitation calls the type 2 process *deliberate considerations whether or not to copy*, where one might reason more explicitly about the demonstrated actions and their purpose. During deliberate consideration, different goals that are not salient during blanket copying are activated and can influence whether one will overimitate, including social goals, learning goals, or a combination thereof (Schleithauf & Hoehl, 2020; Over & Carpenter, 2012, 2013). It can be said that social and affiliative goals (directed towards the demonstrator) should lead to stronger overimitation, while learning goals should lead to less overimitation (Hoehl et al., 2019). This dual-process model and consistent findings by Schleithauf and Hoehl (2021) predict that after an initial demonstration of an inefficient strategy, children should overimitate more because they use blanket copying as a default processing strategy, but after a second efficient demonstration, deliberate considerations should begin (Schleithauf & Hoehl, 2020).

Is overimitation exclusive to humans?

While there has been wide-scale support for the concept of overimitation in humans, studies on other animals have overall been less successful at identifying similar behaviors (Whiten, 2019). In the first study demonstrating overimitation, it appeared that children show a behavior – overimitation – that is unique to humans, as the chimpanzees they were compared to did not show overimitation, but instead used emulation to solve the task they were given (Horner & Whiten, 2005). Research on other non-human primates has found similar results, with neither bonobos nor orangutans displaying overimitation behaviors in their given tasks (Clay & Tennie, 2018; Nielsen & Susianto, 2010).

While research on apes has not been successful in finding overimitation behavior, Huber et al. (2018, 2020) found evidence that dogs, often called humans’ closest friends, overimitate. One interesting finding from the research group is that dogs show a preference for overimitating their owners rather than a stranger (Huber et al., 2020). One reason for this might be that dogs share a close bond with their caregiver and might feel more motivated to imitate them more closely, or that their owner is familiar to them, and they trust them more because of that. Additionally, Huber et al. (2022) found that dogs that overimitated actions from their caregivers showed more affiliative behaviors towards them. These findings invite

the hypothesis that dogs overimitate due to social motivations, much like the affiliative account as an explanation of human overimitation behavior.

If we consider that dogs prefer to overimitate their caregiver, with whom they presumably have a closer social bond than a stranger, the question arises whether social bonds and familiarity also play a role in human overimitation behavior.

What role do model identity and social bonds play in overimitation?

Especially when considering affiliative motives, the identity or characteristics of the demonstrator could be an important factor in whether children want to “be like” a demonstrator, copying their actions more readily than someone they do not want to affiliate with. So far, overimitation research has examined the influence of model identity in different contexts. In a study by Schleihau and Hoehl (2021), which also tested the dual-process theory of overimitation, the authors investigated whether children would prefer to imitate a prosocial rather than an antisocial demonstrator. After establishing who was prosocial and antisocial during the interactive phase before the actual study, children first observed one of the demonstrators performing an inefficient strategy to open a puzzle box and retrieve a reward, followed by a test phase for children to interact with the box. The second demonstrator then performed an efficient action sequence before the child was tested again. The findings showed that children developed some preference for the prosocial demonstrator and continued to overimitate them even after learning the efficient solution, while they did not continue to overimitate the anti-social model after the efficient demonstration (Schleihau & Hoehl, 2021). Using a similar task design, children have been shown to overimitate a member of their ingroup more often than someone from the outgroup (Krieger et al., 2020). Specifically, Altinok et al. (2020) showed that younger children at age four differentiated between models based on the language they had heard them speaking before and adopted an efficient strategy only from a demonstrator speaking their language. Older children aged five to six years, however, did not make this distinction and adopted the efficient strategy regardless of the model’s language (Altinok et al., 2020). Thus far, research seems to indicate that model identity plays a significant role in children’s tendency to overimitate, allowing some insight into who children decide to imitate and learn from in their daily lives.

When considering who children spend most of their time with in their early years, their parents are usually their most important role models. Does this also mean that they trust their parents more than others when it comes to social learning? Henrich and Broesch’s

(2011) theory on cultural learning suggests that they initially seek and obtain cultural information from their parents and other familiar models. However, with age, children should refine their learning processes and shift towards seeking out more knowledgeable instructors or experts. In overimitation research, most studies have been conducted with the help of experimenters who were strangers to the participating children. Therefore, there appear to be no findings on whether children prefer to overimitate their parents, either because of social bonds or familiarity.

However, some studies have investigated the influence of model familiarity on imitation. Lucas et al. (2017) found that younger children up to six years of age generally prefer to imitate their parents rather than strangers. In this case, children were shown videos of their mother and a stranger both solving a puzzle box in different but equally efficient ways and were subsequently asked to solve the puzzle box on their own. Children more frequently chose the strategy their mothers had demonstrated before, and this effect persisted for five-year-olds even when the stranger was presented as an expert at the task (Lucas et al., 2017). Here, familiarity appears to be more important than the supposed expertise; however, it should be kept in mind that in this study, both strategies always achieved the desired outcome in equally efficient ways.

When it comes to cases where one model might provide wrong or misleading information, children might be more inclined to adapt their preferences. It has been shown that while children show a general tendency to trust information from familiar people more, they are also able to adapt if they receive misleading or conflicting information (Corriveau & Harris, 2009; Corriveau et al., 2009). Corriveau and Harris (2009) showed that children were more inclined to trust information from a familiar teacher rather than an unfamiliar teacher, but that they switched to trusting the unfamiliar teacher more once they observed that the familiar teacher gave wrong information. Similarly, children were more likely to endorse their mothers' answers than a stranger's when both answers were plausible; however, they adapted when perceptual cues indicated that the stranger might be correct instead of the mother (Corriveau et al., 2009).

There appears to be a difference between the findings above: if children have information or cues about the accuracy or trustworthiness of a model, they are able to base their trust and behavior on this information. But if they have no prior information or if both models give reasonable information, familiarity or social bonds seems to be what children

base their trust on. Given these considerations, one could assume that in an overimitation paradigm similar to that used by Schleihau and Hoehl (2021), where two models (a familiar parent and a stranger) demonstrate two strategies that lead to the desired outcome, the tendency to trust the familiar model more might be a reasonable way to go. Although the efficiency of the strategies might differ, the outcome is achieved, and children should have no reason to assume that one model is not trustworthy. Additionally, the familiarity bias might be connected to a strong social motivation for kids to imitate their parents, as usually, children share a close social bond with their parents.

Research question

Considering the findings on the role of social bonds for imitative behavior in children, as well as recent findings on overimitation in dogs, the question that arises is whether social bonds also play a role in children's overimitation. Therefore, this study aims to investigate whether children prefer to overimitate their parents rather than a stranger.

Hypothesis

We hypothesize that, in a two-step overimitation paradigm like the one used by Schleihau and Hoehl (2021), children should show no initial preference for either demonstrator in the first demonstration. However, in the second test children should continue overimitating their parents even after observing an efficient demonstration from a stranger, but should not continue to overimitate a stranger after observing the efficient demo from their parents. In short, after observing both an inefficient and an efficient demonstration, children should prefer to use the actions demonstrated by their parents, regardless of efficiency.

Methods

Participants

In total, 59 children, aged five years, were tested. After excluding children that were uncooperative as well as cases of experimenter or parent errors, the sample size stands at 52 children. Age in the final sample ranged from 61 months to 71 months (mean = 66.29), with 24 girls and 28 boys included in total. Each child was accompanied by one parent that took part in the experiment as a demonstrator (48 female, four male). Participants were recruited through the database of the department of developmental psychology of the University of Vienna, for which the parents were registered. Participation was voluntary, and parents gave their written consent after being informed about the contents and purpose of the study prior to

testing. For their participation, parents receive ten Euros while the children receive a certificate of participation as well as a small gift at the end of their test session.

Exclusion criteria

Children were excluded if they were uncooperative and failed to complete the tasks. Additionally, demonstration errors by either an experimenter or a parent, as well as strong parental interference with the child's actions lead to exclusion. Each case was discussed among the team before being classified as a dropout.

Design

In this study we employed a mixed design, with a between-subject factor (condition: parent-stranger, stranger-parent), as well as within-subject factors (test 1 and test 2; see Fig.1). While every child completed both phases of the experiment (test 1 and test 2), they only experienced one condition. Each child was assigned to one of the two conditions using a randomized list, allowing the number of children in each condition to remain balanced. The order of the demonstrations always remained the same, regardless of condition. First, children played a warm-up game, which was followed by the test phase, where the inefficient strategy was always shown first and the efficient sequence second. This was done in order to allow for testing of the dual-process theory of overimitation and to make this study comparable to many other studies employing this paradigm.

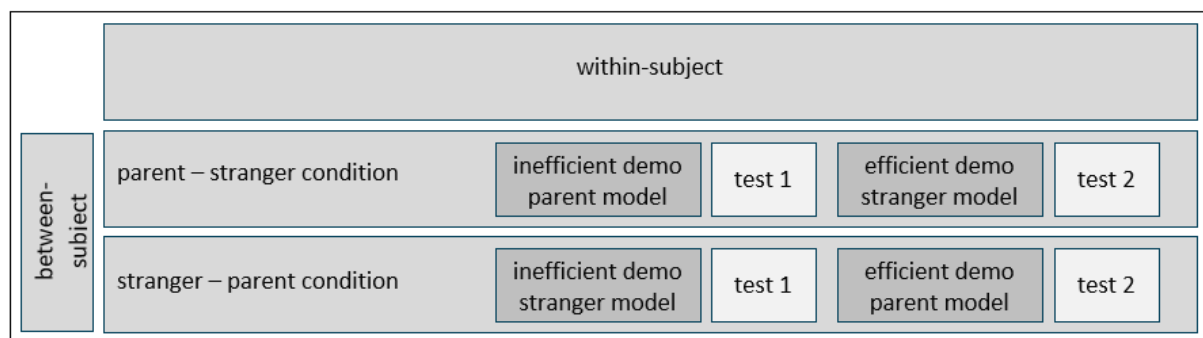


Figure 1 *Overview of the experimental conditions.*

Variables

The independent variable was the condition (parent-stranger / stranger-parent). In the parent-stranger condition, the child's parent demonstrated the inefficient action sequence, and experimenter 2 (E2, a stranger to the child) demonstrated the efficient actions. In the stranger-

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parent condition, the roles were swapped, with E2 demonstrating the inefficient actions and the parent demonstrating the efficient strategy.

Additional predictor variables measured are the test phase (test 1 / test 2), the action type (contact / no-contact), as well as children's gender (male / female).

For the dependent variable in this study, we recorded children's performance of each irrelevant action demonstrated in the inefficient sequence. The following actions were coded:

- Clapping hands together
- Moving the top lever
- Clapping the wooden stick into one hand
- Touching the button at the side with the stick

If an action was performed, it was coded as "1", if it was omitted, it was coded as "0". All actions were coded during both test phases. In order to complete their test phases, children had to perform the goal-relevant action, which they all did.

Additionally, children's protesting behavior was added as a variable after data collection finished due to allow for further exploratory analyses, as we observed that several children in the second phase tried to correct the second demonstrator or protest against their efficient strategy.

Materials

For the warm-up game, we used three marbles as well as a colorful mat to sit on while playing. Additionally, stickers with varying motives were given out to children as rewards, usually ranging between three and six stickers during the warm-up phase.



Figure 2 *Puzzle box used for the overimitation task containing four green marbles and wooden stick used for extracting marbles.*

The main apparatus used for the overimitation task was a transparent puzzle box containing four small, green cylindrical marbles (see Fig. 2). The marbles are placed inside a small tube on the inside of the box, which can be accessed by opening the flap at the front of the box and using a magnetic rod to pull out one marble at a time. On top of the box, there is a lever which can be moved forwards and back, and on the side of the box there is a little box with a button inside. Similar puzzle boxes have been used in previous overimitation studies (e.g. Schleihauf & Hoehl, 2021). Additionally, stickers were again used as rewards for extracted marbles.

The test sessions were recorded using one video camera (Panasonic HC-V777) that was placed on a tripod in a corner of the room. The recordings were transferred to a University of Vienna internal server for behavioral coding and then deleted from the SD card.

Procedure

Warm-up phase and instructions

After parents complete the informed consent forms, test sessions began with the warm-up game for the children in the test room. The warm-up game was led by experimenter 1, and was not related to the actual task but introduced the possibility for children to gather stickers as a reward. Meanwhile, the parent remained outside of the testing room and was

instructed about their participation in the study by E2. Parents were then shown a demonstration video of the action sequence that they would later demonstrate to their kids during the experiment, as well as what they had to say during their demonstration. By instructing parents not only on the actions to be performed but also on what they should say, we ensured that parents would not influence their child's behavior verbally and that their demonstration was as similar to E2's as possible. The parents were then asked to practice their action sequence on the puzzle box until they feel confident to perform the actions in front of their child. They were also free to ask questions. During this time, the parent was out of sight of their child, who was in another room distracted by the warm-up game. Whichever action sequence (inefficient or efficient) the parents learned was determined by the condition, and the alternate sequence would be demonstrated by E2 (stranger).

Main experiment

The design of the overimitation task was adapted from Schleihau and Hoehl (2021). For the overimitation task, experimenter 1 collected the puzzle box from outside the test room and placed it on a table in front of the child, while the parent and E2 also joined. Before beginning the task (which was presented as a game), experimenter 1 gave a short explanation of the rules. The game rules included that only one person could interact with the puzzle box at a time, that children should not interrupt a demonstrator, and that they should watch the demonstrator during their turn. Additionally, children were told that everyone who played the game could solve it however they wanted. This was done in order to encourage children to choose freely whether they wanted to copy the strategies used by the demonstrators.

Then, E1 asked the first demonstrator (either the parent or E2) to play the first round. This demonstrator then showed the inefficient sequence, while the other one waited outside. Experimenter 1 was present but turned away from the table. After the demonstration, the child was told that it was his/her turn now and was instructed to collect one marble from the puzzle box however they wanted while experimenter 1 waited outside. During his/her turn, the child was alone in the room. When the child was finished, he/she should then come out of the room and notify experimenter 1. After completing their turn, children could exchange their marble for a sticker. Next, the second demonstrator took their turn using the efficient strategy and then left the room for the child to have his/her second turn on the puzzle box. If children took longer than one minute to complete the task and notify the experimenter, or if they asked for help, experimenter 1 came into the room to encourage them to do the task, but left again when children felt confident to complete it.

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After the parent had performed their action sequence in front of their child, they were asked to fill out the Pianta Child Parent Relationship Questionnaire (CPRQ, Pianta, 1992), as a measure of the child-parent relationship, while the child received a certificate and a small gift for their participation.

Coding

Overimitation was coded as yes or no for whether each individual action was performed (“1” = yes, “0” = no) during both phases (total of 8 actions). In accordance with Schleihau and Hoehl (2021), we counted an action as performed if the child did the action at least once, and we did not record whether they repeated an action multiple times. Initial coding was done by the two main researchers, and another reliability coder also coded 25% of the videos again (15 of 59) to allow for the calculation of intercoder reliability. For reliability coding, videos were cut to contain only the children’s turns so that the coder could not see which condition the child was assigned to. The inter-rater reliability (Cohen’s Kappa) for overimitation scores was almost perfect ($k = 0.95$). In addition to overimitation behavior, we also coded protesting behavior, as some children tried to interrupt the second demonstrator during the efficient demonstration. Again, whether or not a child protested during the demonstration in phase two was coded as “1” = yes and “0” = no.

Data analysis

Due to the binomial data structure, we calculated Generalized Linear Mixed Models (GLMMs) to analyze overimitation scores using the ‘glmer’ function of the ‘lme4’ package in R (version 4.1.1). In the main model based on the analyses by Schleihau and Hoehl (2021), we included a three-way interaction between condition, phase and action type. Additionally, despite balancing the distribution in the conditions, we included gender as a predictor because it has been shown that boys imitate more often than girls (Frick et al., 2017). For baseline comparisons, we calculated four Generalized Linear Models (GLMs) for each phase in both conditions, in order to assess whether the overimitation rate was above or equal to the baseline overimitation rates measured by Schleihau and Hoehl (2021). In their study, baseline behavior was measured by letting children work on the puzzle box without any prior demonstration. Finally, to test whether protesting behavior in the second phase differed between the two demonstrators, we calculated a 2x2 Chi-Square Test.

Results

Descriptive analyses and baseline comparisons

When looking at mean overimitation scores, one can see that in the baseline, children consistently showed a low inclination to perform any of the redundant actions shown in the inefficient sequence. During the first phase of the test conditions, however, children's overimitation scores were significantly above baseline, with the overimitation score in the parent.stranger condition ($\chi^2 = 32.604$, $df = 1$, $p < .001$) higher than in the stranger.parent condition ($\chi^2 = 18.823$, $df = 1$, $p < .001$), however the difference between the conditions in phase one was not significant. In the second phase, overimitation scores dropped for both conditions. As we tested multiple conditions, Bonferroni correction was applied on the p-values for each comparison in order to reduce type 1 error.

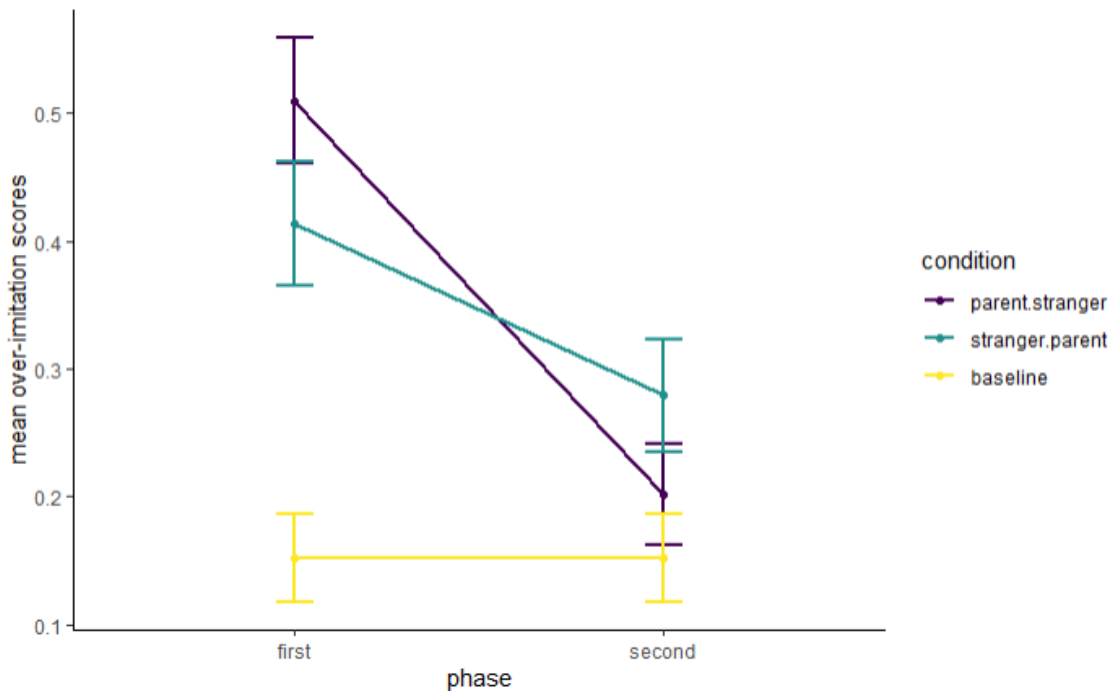


Figure 3 Mean overimitation scores, including error bars, for the baseline, parent.stranger and stranger.parent conditions in both phases, revealing a an interaction between phase and condition.

Main model

In the main model, we included a three-way interaction between condition, phase and action type, modelled after the study conducted by Schleihau and Hoehl (2021).

Additionally, the model contained gender as a control variable. Identity was also included as

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a random effect, as well as dummy-coded phase and action type within identity as random slopes.

The full model, which was planned for testing, and the null model, looked as follows:

$$\text{over.imitation} \sim \text{condition} * \text{phase} * \text{action.type} + \text{sex.child} + (1 + \text{phase.code} + \text{action.type.code} \mid \text{ID})$$
$$\text{over.imitation} \sim \text{sex.child} + (1 + \text{phase.code} + \text{action.type.code} \mid \text{ID})$$

In the main model containing a three-way interaction between condition, phase and action type, this interaction was not significant. Therefore, the model was reduced to contain only a two-way interaction between condition and phase, with action type as a separate predictor, while keeping gender as a control variable. In the reduced model, the interaction between condition and phase was significant ($p = .048$), and action type was also a significant predictor of overimitation scores ($p < .001$). Gender, however, was not a significant predictor ($p = .405$).

Regarding model assumptions, an absence of collinearity was confirmed using the ‘vif’ function from the r package ‘car’ (Version 3.0-12). While testing for model stability, we found a very high model estimate for one participant in particular. Upon closer inspection of the data, we concluded that this happened because the participant showed a unique behavior pattern in the second phase, being the only one in the parent.stranger condition who continued to copy a no-contact action on their second turn. It should also be noted that this issue in model stability arose only in the original full model, while the reduced model showed normal model estimates, indicating that the one participant was no longer a problem. Therefore, the team agreed that the participant should remain in the sample.

Protesting behavior

In the second phase of the experiment, 35% of children (9 out of 26) in the stranger.parent condition protested against the demonstration, while no children did so in the parent.stranger condition. The 2x2 Chi-Square test revealed that this difference was statistically significant ($N = 52$, $\chi^2 = 8.599$, $df = 1$, $p < .001$), indicating that children protested significantly more in the stranger.parent condition. Because none of the children in the parent.stranger condition showed protesting behavior, we used Yate’s continuity correction.

Discussion

The results at hand are quite intriguing, as children did not behave according to our predictions. We predicted that children would initially imitate both models equally, and that they would only continue to overimitate their parents but not the stranger in the second phase. Interestingly they did not show such a pattern. Instead, five-year-old children overimitated both models equally in the first phase, with a small (but, according to baseline comparisons, non-significant) preference for their parents, and then decreased their overimitation in both conditions during phase 2. However, they continued to overimitate above baseline levels in the stranger.parent condition, while the overimitation scores in the parent.stranger condition dropped to baseline levels. This interaction effect was not predicted, as children's overimitation of their parents dropped further than their overimitation of the stranger.

The behavior pattern during phase 1 was expected in so far as children did not differ statistically in their overimitation of parents and strangers (although due to the significant interaction effect, this result should only be considered in the context of the main model findings). Additionally, overimitation rates in the first phase were relatively high. Children especially overimitated those actions that were aligned with the contact-principle and were harder to identify as inefficient than the no-contact actions. At this point, children did not have any alternative strategies available to them, and they tended to automatically copy the actions that were not easily identifiable as having no effect. Such results might, as standalone, be explained by the causal reasoning approach, i.e. children did not deliberate further on whether the demonstrated contact-actions had any effect. According to both this account and the dual-process theory of overimitation, the observation of an alternative, more efficient strategy in the second phase would trigger critical thinking and evaluation of the necessity of the actions involved. Now, children entered a phase of deliberate consideration, deciding which actions to imitate. Generally, children tended to adapt the efficient demonstration, however they did appear to consider the identity of the model. Their overimitation only dropped to baseline after observing the efficient demonstration from a stranger, but remained slightly above baseline when children observed the efficient strategy from their parents.

The switch from using blanket copying in phase 1 to considering who to copy deliberately in phase 2 is in accordance with the dual-processing theory on overimitation (Schleihauf & Hoehl, 2021). Once children had observed two different strategies for solving the puzzle box, they appeared to use type-2 processing, which is more cognitively demanding, to determine which actions to copy and whether to drop the inefficient actions

from the first phase. Still, it is important to consider which factors influenced children's decision-making on whether or not to copy during deliberate consideration. As suggested by the dual-process theory on of overimitation, there might be different explanations for children's decisions that could align with either the social or normative accounts on overimitation. Additionally, since model identity had an effect on children's overimitation rates, it is important to disentangle whether familiarity or other factors led this effect.

One possible explanation for the effect of model identity could be that children view the two models (parent or stranger) differently, therefore triggering different levels of cognitive evaluation. In line with findings that familiarity matters in imitation, children might be more inclined to trust their parents more 'blindly', inviting blanket copying. In turn, they tended to overimitate them slightly more than the stranger in the first phase. Especially during the first phase, when children had not seen alternative strategies to solve the task, familiarity might be the easiest way to decide whether to copy the model due to the lack of available comparisons with either a different model or an alternative strategy. The unfamiliar stranger, on the other hand, might be viewed with more (subconscious) skepticism. Therefore, the lack of familiarity could already induce a stronger tendency to deliberate on the observed strategy. This might be the case especially if they consider the stranger, who is an experimenter associated with the study, to be someone to learn from or conform to. Children might either interpret the inefficient actions as norms and perform them anyways, or perhaps feel like they are being tested and drop the inefficient actions because they could see that they are not necessary.

While familiarity could explain why children tended to overimitate their parents more than the stranger in the first phase, an interpretation of the stranger as an authority figure or expert might also explain the observations in the second phase. It could explain that children in the stranger.parent condition tended to stick with overimitation more in the second phase, as they might have reasoned that the expert, E2, would show them the correct way to solve the task. When their parents used a different strategy in phase 2, children might have assumed that they simply did not know the correct strategy, as parents were not present during the first phase in this condition. If children see the inefficient actions performed by the stranger as normative, this might explain why some of the children turned into protesters during phase 2, when their parents attempted to show them the efficient strategy. The analysis of protesting behavior showed that children protested only in the second phase of the stranger.parent condition, i.e. against their parent demonstrating the efficient strategy, sometimes even telling

them that they were doing the task wrong or attempting to correct them. This would be in accordance with the finding that children who overimitate use more normative language when teaching game rules to others, while those who do not overimitate use less normative language (Stengelin et al., 2022). Additionally, if children viewed E2 as an expert, it could explain why children in the parent.stranger condition dropped to baseline levels of overimitation after observing the stranger by adapting the efficient routine instead of sticking to their parents' strategy. Again, children might have assumed that E2 "knew better" than their parents and that the efficient solution would be better. While children's overimitation of experts vs. parents has never been tested, Lucas et al. (2017) found that children at age five actually prefer to imitate their mothers rather than an "expert" stranger. If our results should be explained by children interpreting the stranger as an expert, this would stand in contrast to these prior findings. Nevertheless, there are some differences between the studies that might be relevant. Most importantly, the stranger in our study was always present from the beginning of the study and was introduced as a colleague of the leading experimenter, while Lucas et al. (2017) introduced the stranger/expert as another random person who had volunteered spontaneously. In our study, children might therefore see the stranger as not only an expert but also as an authority or even someone who might test them, which could influence their behavior. It is also important to note that the stranger in our study was never named as an expert by anyone, and if children made such an assumption, it would be based on the context clues rather than explicit verbalisation. Additionally, unlike Lucas et al. (2017) who presented two different but equally efficient strategies, the two strategies presented to children in our study were not equally efficient, although they both led to the goal.

While the main finding of the study was surprising, the effect of action type on overimitation scores is in line with previous research. Prior studies have shown that actions which involve contact with the reward container (contact actions) are overimitated more often than no-contact actions, like clapping (Hoehl et al., 2019). Accordingly, children in our study copied contact actions more often than those without contact. The phenomenon of the preference for contact actions can be explained by the contact principle proposed by Spelke (1990), who explains that in order for an action to have an effect on an object, there needs to be contact of some kind between the actor and the object.

As already briefly discussed above, the protesting behavior that children showed only in the second phase of the stranger.parent condition might be explained by normative accounts, which assume that children saw the inefficient actions as "rules" or part of the

game, and they wanted their parents to conform. As the parent was not present when the stranger demonstrates their strategy (and vice versa), children might have assumed that their parent does not understand the normative significance of the game, leading to protest or an attempt to correct them. Introduction of the task as a game might have led children to expect that some things may adhere to a game logic that would not be applicable to the real world. It is important to note that they were also told some rules about the game which might increase such expectations, such as that they should watch the demonstrator closely during their turn. In the stranger.parent condition, children first witnessed the stranger perform the inefficient strategy, which could have led them to believe that E1 would show them the “correct” way to solve the game task. Keupp et al. (2015) found that, if children perceive actions as normative, they should protest when actions are omitted, and similarly Rakoczy et al. (2008) have named spontaneous protest as a reaction to perceived norm violations. Interestingly, our findings show that children protested only against their parents, but never against the stranger. Two explanations might be plausible for this – either, children in the two different groups interpreted the inefficient actions differently based on the model they saw, or children in the parent.stranger condition might have not felt confident enough to protest against the stranger, who could be perceived as an authority figure while children in the other condition felt comfortable enough to protest against their parents.

When taken together, the results at hand paint an interesting picture of who children choose to learn from, and under which circumstances they might prefer one model over another. In the first phase, after having observed only one strategy from one of the models, children who had observed their parents trusted them more and adopted their strategy with less second-guessing than those who had observed the stranger. Here, familiarity appears to be a significant influence, and benefits overimitation as children adopted the observed strategy more readily from the familiar demonstrator (their parent). However, after children had the opportunity to witness a second, more efficient strategy from another model, the pattern shifted, and in the second test phase, children in both conditions preferred the strategy that had been demonstrated by the stranger. With new information available now, namely the fact that the task can be solved differently, children’s preferences changed. Now, perceived expertise might be a more relevant factor, leading children to adopt the apparent expert’s strategy rather than their parents’, and even protesting against their parents when they demonstrated the efficient strategy. When looking at theories of cultural learning, specifically Henrich and Broesch’s (2011) theory, the current findings could be an indicator of how

children's shift in cultural learning preferences occurs. The theory suggests that children initially obtain cultural information from their parents, but slowly become more selective in who they learn from throughout development and seeking out experts rather than familiars. Our results show that children at age five were already capable of adapting their preferences based on clues of expertise and efficiency. This suggests that children at this age might be during a stage of development where shifts from familiarity-based preferences to expertise-based preferences occur. Such a pattern can easily be applied to children's learning opportunities in the real world. Especially during their first years of life, children spend most of their time with their parents, observing and adopting their behaviors as well as receiving explicit knowledge from them. Therefore, their parents and other close, familiar adults are often a primary source of learning for young children. However, in a variety of settings and especially when children enter kindergarten or the school system, they are exposed to situations where their parents might not know the correct solution to a problem, while another, "expert" adult might. In Austria, five-year-olds are usually already enrolled in kindergarten and should therefore already have experienced such situations. As the experimental context is not an everyday situation for most children (or their parents), it is plausible that the setting had some part in children preferring the stranger, as context clues might have lead children to assume E2 to be an expert. Again, it should be noted that the stranger was never named as an expert and any explanation based on this assumption must be tested explicitly.

Overall, as revealed by our primary analysis, children did not behave as hypothesized. Instead, we found an interaction effect for the experimental phase and the condition, as children appeared to switch their preference for the demonstrators between phases – in the first phase, they initially copied their parent more, but in the second phase, despite an overall decrease in overimitation, children copied the stranger more than their parents. Although this interaction effect was not predicted, the overall pattern of high overimitation scores in the first phase and decreased overimitation in the second phase was predicted according to the dual-process theory of overimitation (Schleihauf & Hoehl, 2020). The interaction effect itself could be explained by a switch in children's perception of the demonstrators. Children initially preferred their parent based on familiarity, but then tended to follow the stranger's demonstration after observing a second strategy, perhaps due to assuming they were an expert or knew the rules of the game better. These findings align with theories on cultural learning, suggesting a shift from preferring familiar models to seeking experts. Still, the current study

cannot rule out other explanations for the results at hand, and further research is needed to extend this initial study.

Limitations

While this study used a well-established paradigm to test the hypothesis, there are some aspects that might have limited the results. First and foremost, due to the limited time available for testing each parent-child dyad, parents usually had around 10 minutes time to practice the action sequence they were assigned to. Although all parents were asked to practice at least three times and were encouraged to ask questions or practice more often if necessary, some parents seemed more nervous or insecure in their demonstration than others and especially the stranger. Since the stranger was part of the research team and usually had much more practice in performing the action sequences, children might have picked up on a difference in certainty between their parent and the stranger. Prior research has shown that children prefer to imitate self-confident models over insecure models (Birch et al., 2010), which might have affected results in the present study. Still, it should be noted that following this logic, parents who learned the easier, efficient demonstration, should have been more confident in their demonstration – nevertheless, children in the first phase showed a tendency to copy their parent's inefficient demo more than the stranger's. Considering the observed results, it is unlikely but not impossible that differences in demonstrators' confidence affected children's behavior.

Regarding the assumption that children saw the stranger as an expert and changed their overimitation behavior accordingly, it must be kept in mind that the stranger was only introduced as a colleague of the lead experimenter, E1, but not as an expert. While the explanation of the results at hand based on such perceived expertise is plausible, it was not part of the original experimental design and limits this explanation to some degree.

Additionally, of course, the study was conducted in a laboratory setting that the participants were not used to, which might lead to certain expectations or affect children's behavior. Consequently, we cannot be sure that our results translate to more naturalistic, every-day settings or experiences in children's lives, but we can nevertheless get an impression of who children choose to learn from.

Directions for future research

In order to further the knowledge on the role that familiarity might play in overimitation preferences beyond the current study, the phenomenon should be investigated

in different ways. Firstly, it might be interesting to vary the context of the task, for example by explaining it in a way that emphasizes learning goals rather than framing it as a game, which might shed more light on who children chose to learn from when they are explicitly invited to learn. While studies like Nielsen et al. (2012) or Herrmann et al. (2013) have looked at overimitation in different framings, they have not incorporated familiarity as a variable – however, investigating the influence of familiarity in different contexts could shed more light on how it affects children’s overimitation behavior.

Another option could be to use other models, for example a familiar kindergarten teacher and unfamiliar teacher (like Corriveau & Harris, 2009). This would also make it possible to have both the familiar and the unfamiliar model practice sufficiently, therefore reducing possible influences of uncertainty as well as both models being perceived as experts. Furthermore, carrying out the study in a space that is familiar to children, like their kindergarten, might reduce possible expectations induced by the experimental context in our study. By using kindergarten teachers, who are not explicitly associated with the lead experimenter, might reduce the feeling that the unfamiliar model could be different from the familiar model in some way, or that one is more of an expert than the other.

An interesting approach might be to have children play with and observe either a friend or an unfamiliar child performing inefficient actions on the puzzle box. A similar study by McGuigan et al. (2011) found that children were less likely to imitate another child than an adult, however they did not investigate the effect of familiarity of the demonstrator. Assessing familiarity between children as a factor in overimitation is sensible as play between children of the same age could reduce pressure or expectations. Additionally, children should view their peers as less of an authority figure than an adult, which could make them more at ease and perhaps lead them to experience the study in an even more game-like way.

Finally, the influence of perceived expertise, i.e. children perceiving the demonstrator as an expert, should be investigated further. As the current study suggests, children might choose to learn based on familiarity in situations where there is only one solution two equally efficient solutions, but could factor in expertise in situations where two strategies with different levels of efficiency are demonstrated. A study explicitly investigating the influence of an expert demonstrator on overimitation could especially help to solidify the current findings and help to better understand the results of this study.

Conclusion

In this study, we aimed to investigate whether five-year-old children prefer to overimitate their parents rather than a stranger. We hypothesized that, due to the influence of familiarity, children would choose to overimitate their parents more than a stranger after observing two ways of solving a task. Using a two-phase design, we found that children initially copied their parents slightly more than the stranger in the first phase. However, after observing the second, efficient demonstration, children overimitated the stranger more than their parents. These results are not in line with the hypothesis that children who watched their parents demonstrate the inefficient strategy would continue to overimitate at a higher level in the second phase than the children who saw the stranger perform the inefficient demonstration. The findings might be explained by differences in children's perception of the demonstrators. While only one solution is available, children trust their parents more easily than the stranger based on their familiarity with them. However, once a second solution is shown, they might have compared the models and felt that the stranger was an expert in this setting, indicating that they should conform more closely to the actions shown by the stranger. This explanation could be supported by children's protesting behavior against their parents in phase 2. Therefore, our findings are twofold: in unequivocal situations, familiarity matters, but it is overruled by expertise once two different solutions are available. Our findings align with cultural learning theories that suggest a shift from seeking familiar models to preferring expert models throughout development. At age five, children might be in a phase of transition from familiarity to expertise-based learning. Overall, it appears that children at this age do differentiate between familiar and unfamiliar models when it comes to overimitation but do not necessarily prefer familiar models. Future research should expand on how and why children do so, using different contexts as well as different models.

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Appendix

Appendix A: Abstract (English)

When children or adults copy another's actions exactly, even if some of those actions are easily identifiable as being inefficient, it is called overimitation. While there has been a large number of studies investigating the phenomenon, most studies have used a stranger as a demonstrator for children. We aim to understand if familiarity plays a role in overimitation and whether children prefer to imitate their parent over a stranger. 52 children observed first an inefficient and then an efficient way of solving a task demonstrated by their own parent or a stranger, using a two-phase paradigm. Each demonstration was followed by an opportunity for the child to solve the task. Children were assigned to one of two conditions, determining which solution (inefficient or efficient) the demonstrators would show. Using a Generalized Linear Mixed Model, we found an interaction effect between phase (inefficient or efficient) and condition (parent.stranger or stranger.parent), indicating that children overimitate more in the first phase if they saw the inefficient demonstration from their parent instead of the stranger, but after the second demonstration, children overimitated more if they saw the inefficient demonstration from the stranger. Results imply that children might trust familiar models more if there is no reason to second-guess their behaviors, but rely more on perceived expertise once they see that there are more efficient ways to solve a task.

Appendix B: Abstract (German)

Overimitation beschreibt das Phänomen, ineffiziente oder gar unnötige Handlungen anderer Personen zu kopieren. Obwohl viele Studien sich mit dem Thema Overimitation beschäftigt haben, haben die meisten Studien fremde Personen als Modell eingesetzt. Somit gibt es kaum Befunde zum Einfluss von Bekanntheit oder Nähe auf Overimitation oder dazu, ob Kinder lieber ihre Eltern imitieren als eine fremde Person. In dieser Studie beobachteten 52 Kinder in einem zwei-Phasen Design zuerst eine ineffiziente Handlungsstrategie und dann eine effiziente Strategie zur Lösung einer Aufgabe. Je eine Strategie wurde entweder von einem Elternteil des Kindes oder einer fremden Person vorgeführt. Jedes Kind wurde einer Bedingung zugewiesen, um festzulegen, welche Handlungsstrategie (effizient/ineffizient) die Eltern bzw. fremde Person jeweils vorführen. Nach jeder Demonstration konnte das Kind selbst versuchen, die Aufgabe zu lösen. Mithilfe eines Generalized Mixed Models (GLMM) fanden wir einen Interaktionseffekt von Bedingung (stranger.parent / parent.stranger) und Phase (ineffizient / effizient). Kinder tendierten also in der ersten Phase eher zum überimitieren, wenn sie die ineffiziente Strategie von ihren Eltern sahen, nach der zweiten Demonstration überimitierten Kinder allerdings eher, wenn sie zuvor die ineffiziente Strategie von einer fremden Person gezeigt bekommen hatten. Die Ergebnisse implizieren, dass Kinder eher ihren Eltern vertrauen, wenn sie ihr Verhalten nicht hinterfragen, sich jedoch eher auf wahrgenommene Expertise verlassen, wenn sie erkennen, dass es alternative Lösungsmöglichkeiten gibt.

Appendix C: Script for experimenters and parents (translated from German)

E1: „Wow, you already collected so many stickers! You know, we have another game that we want to play now, and you can also collect stickers there. Let’s go over to the table, okay? You can sit on this chair here, and I will quickly get our next game from the other room.”

E1 leaves the room and comes back with the experimental box or E2 brings the box in.

E1: “You know, for this next game we’ll need two other players, and I think your mom/dad and my colleague can play with us, okay?”

E2 and parent enter the room.

E1: “Now, I’m going to explain the rules of the game so we all know what it is about. Do you see those green marbles in there? The goal of the game is to get them out of the box, and for every marble that you get, you can exchange it for a sticker. But it is important that you can only get one marble during your turn, okay? And everyone can try to get the marble out the way they want, and you cannot interrupt someone during their turn. Now, I think E2/your parent can play the first round.”

First demonstrator sits down in front of the box while the other demonstrator waits outside the room and E1 stands aside, turned away from the table.

E2 / parent: “Are you watching?”

First demonstrator performs the inefficient action sequence.

E2 / parent: “Look, I got one!”

The demonstrator hands the marble to E1 and leaves the room.

E1: “Now it’s your turn, and you can do it however you want. While you’re playing, I will wait outside and you can get me once you’re done, okay?”

E1 leaves the room, and comes back either when the child opens the door, calls for them or if children take a long time.

E1: “Wow, you’re done already! Great, you can give me the marble and then you can pick another sticker, okay?”

After children have picked out a sticker, E1 invites the next demonstrator in – same script (starting at “Are you watching?”).