Preschool’s Children’s Learning Proclivities:

When the Ritual Stance Trumps the Instrumental Stance

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Acknowledgements

This study was supported by an Australian Research Council Discovery Project Grant (DP140101410).
Abstract

Previous research has demonstrated an efficiency bias in social learning whereby young children preferentially imitate the functional actions of a successful group member over an individual. Our aim in the current research was to examine whether this bias remains when actions are presented as conventional rather than instrumental. Preschool children watched videos of an individual and a group member. The individual always demonstrated a successful instrumental action and the group member an unsuccessful action that was either causally transparent or opaque. Highlighting the selective nature of social learning, children copied the group at higher rates when the demonstrated actions were causally opaque than when they were causally transparent. This research draws attention to the influence of conventional/ritual-like actions on young children’s learning choices and emphasizes the role of this orientation in the development of human-specific cumulative culture.
No other mammal, living or extinct has successfully colonized more diverse environments than *Homo sapiens*. It is often posited that a key component of this success is our unique proclivity for high-level cooperation with others (Shipton & Nielsen, 2015; Whiten & Erdal, 2012). Indeed, as a species, we show strong desire for group cohesion and belonging (Baumeister & Leary, 1995; Deutsch & Gerard, 1955). We are also unique in our tendency and willingness to imitate (Legare & Nielsen, 2015). It could thus be reasonably expected that imitation is an adaptive solution to these social problems, such that we default to copying and accepting everything members of our social ingroup do, even when we know the actions or behaviors engaged in are instrumentally invalid or inefficient.

Several studies have provided empirical support for this, demonstrating that adults and children consistently prefer to copy a majority action or conform to a majority decision (see Haun, Rekkers, & Tomasello, 2012; Haun & Tomasello, 2011). For example, in one of psychology’s classic studies, adults conformed so strongly that they openly agreed with a discernibly incorrect judgment of relative line length made by confederates (Asch, 1951). Subsequent studies have documented this same effect in young children (Corriveau & Harris, 2010; Walker & Andrade, 1996). However, there may be a limit to the boundaries of this conformity bias. Our success as a species also pivots on our capacity for cumulative culture, where innovations are progressively incorporated into a population’s stock of skills and knowledge, generating ever more sophisticated repertoires via a process of ratcheting (Tennie, Call, & Tomasello, 2009). However, as Kandler and Laland (2009) propose, an extreme bias towards following the majority limits the potential for the wide-spread adoption of innovation, thereby restricting cumulative culture (see also Carr, Kendal, & Flynn, 2015). What then are the circumstances where we choose not to follow the herd?
Seston and Kelemen (2014) found that 3 and 4 year-old children will agree with a two-person majority over an individual on the function of a novel artifact if both functions are equally plausible. However, when the majority claimed an implausible function, 4-year-olds actively eschewed their opinion for the plausible minority function. Hence, while there may be a baseline majority bias in social learning endeavors, it may be trumped by a proficiency bias: The tendency to copy the individual who is most competent or proficient in a given context. Brody and Stoneman (1985) provide empirical support for this, demonstrating that 7 year-old children prefer to copy peer models who appear more competent than those who are not (see also Buttelmann, Zmyj, Daum, & Carpenter, 2013).

Recently, Wilks, Collier-Baker, and Nielsen (2014) pitted the majority bias against the proficiency bias in young children who were shown two methods of opening a puzzle box: One performed by an individual and another by a group of three. The individual always demonstrated a successful action, while the group demonstrated either a successful or an unsuccessful action. Children copied the group – but only when the group’s actions were successful: When the group method was not successful children copied the individual (even when affiliated with the group), suggesting children prioritize proficiency over conformity. However, the actions employed by Wilks and colleagues were functional: They had a clear goal and reward. Their study therefore addressed questions regarding causally transparent, instrumental actions, but not questions of causally opaque, potentially cultural actions (Legare & Nielsen, 2015). Such actions are common in ritual and ritualized behavior (Bulbulia & Sosis, 2011; Kapitany & Nielsen, 2015; Legare & Souza, 2012; Rossano, 2012).

Rituals are a causally opaque series of coherent actions featuring formality, repetition, redundancy, and stereotypy, in which performance is more important than outcome, and little variability is permitted in the action’s execution (Bulbulia & Sosis, 2011; Kapitany & Nielsen, 2015; Legare & Souza, 2012; Rossano, 2012). According to the
ritual stance, when individuals perceive causally opaque actions they tend to attribute a rationale of cultural convention to the actor and the actions, rather than a rationale based on physical causation (Kapitany & Nielsen, 2015; Legare & Souza, 2012; Nielsen, Kapitany & Elkins, 2014). According to Legare and Nielsen (2015), reinforced by a willingness to rely on faith in cultural traditions over personal experience or intuition, the causal opacity and social stipulation of rituals make them ideally suited to high fidelity cultural transmission. As such, we consider that the characteristics of rituals, and causal opacity in particular, may align with the inherent motivation behind children’s imitative fidelity.

Children interpret behavior instrumentally if the physical-causal basis is potentially knowable, even if it is currently unknown. Conversely, if actions cannot be understood via potentially knowable physical causal processes, children instead see them as social and rely on a conventional interpretation Herrmann, Legare, Harris & Whitehouse, 2013; Kapitany & Nielsen, 2015; Legare, Wen, Herrmann & Whitehouse, 2015, Watson-Jones, Legare, Whitehouse & Clegg, 2014). This leads us to ask whether children will prioritize efficiency over group belonging if they are presented with an action that lacks a clear practical goal or reward?

Following Wilks et al. (2014), here children saw an individual performing a successful, instrumental action and a group member performing a series of unsuccessful actions, which were either causally transparent or causally opaque. If children routinely adopt the ritual stance they will copy group actions that do not lead to a reward when the modeled actions are instrumentally opaque. Conversely, if children favor the instrumental stance (Legare & Nielsen, 2015; Legare & Souza, 2012; Nielsen, Kapitany & Elkins, 2014) they will copy the successful individual action in all conditions. There is a wealth of research showing that children have a strong tendency to copy successful group actions in practical contexts (Corriveau & Harris, 2010; Turner, Nielsen, & Collier-Baker, 2014; Wilks et al.,
2014) and as such, we chose not to include a condition where children were exposed to a successful group.

Method

Participants

A total of 83 children participated in the experiment. Thirteen children were excluded, seven due to shyness, three due to technical issues and three due to experimenter error. Our final sample included 70 children (34 female), between 4-5 years of age (M = 56 months, SD = 179 days), split approximately evenly between the four conditions described below. All participants were recruited from a database of parents who had previously agreed to participate in developmental research with their children. The majority of participants were Caucasian, from middle-class socioeconomic backgrounds. All participants received a small gift and certificate for participation.

Apparatus and test environment

Testing was carried out in a dedicated child-friendly test room of a university-based child development research facility. The room contained a chair and a desk for the participant, which faced an 80cm flat-screen television. The child sat approximately 75cms from the television. Sessions were videotaped using a camera mounted on a tripod positioned in the right hand corner of the room (see Figure 1.)

Two distinct wooden puzzle boxes (all 20cm x 20cm x 20cm) were used throughout testing. Each box had two distinct operating mechanisms; one that opened the box and one that did not (See Table 1). Each mechanism was painted a unique color, and the remaining sides of each box were also painted a different color. The experimenter revealed a toy reward
inside the box when successfully opened (either a zebra or platypus soft plush toy). The
apparatuses were concealed behind a black curtain next to the experimenter when not in use.

To test for any potential relationships between levels of sociability and willingness to
engage with a group's actions, parents of all children were asked to complete the Child Social
Preference Scale (see Coplan, Prakash, O'Neil, & Armer, 2004). The CSPS is an 11-item
questionnaire, comprising 7 items assessing shyness (e.g., “My child seems to want to play
with other children, but is sometimes nervous to.”) and 4 items assessing social disinterest
(e.g., “My child is just as happy to play quietly by his/herself than to play with a group of
children.”). For each item, parents respond on a 5-point Likert scale to the question “How
much is your child like that?” (ranging from 1 – Not at All, to 5 – A Lot).

Stimulus

Wilks et al. (2014) demonstrated actions using live actors; however, due to practical
constraints, video stimuli were used here. Children watched four videos two times each
during the experiment. The videos ranged from 12 to 28 seconds in length, with an average
length of 20.93 seconds. Each video showed footage of demonstrators acting on one of the
apparatuses. All demonstrators were Caucasian women aged 19 – 22 years and of similar
height. The demonstrators were divided into an individual and a group (of three), and
consistent with the individual condition, only one member of the group acted on each box.
Individuals and groups were differentiated by the color of their shirt - group members wore a
yellow shirt while the individual wore green. The experimenter also wore a yellow shirt to
further highlight the majority group and to enhance the associated social pressure. However,
children were not aligned directly with the group in any way.

Children watched each video of the individual and a group member acting on each
box twice. In the videos the individual always acted on the mechanism that could open the
box, while the group member always acted on the mechanism that could not. The
demonstrators faced the camera during all videos, with the individual on one side and the
group on the other (see Figure 2a). This physical separation was to further enhance the
distinction between the group and individual. In all videos, a close up of the model’s hands
and the apparatus was shown to enhance clarity (see Figure 2b). The presentation order of the
boxes and demonstrator (individual first or group member first) was randomized for each
participant, as was the location of each demonstrator relative to the boxes (standing on the
left or right). In each condition a different combination of videos was presented to the
participant, as detailed below.

In Conditions 1 and 3, children saw the individual demonstrator open the box and
retrieve a toy. Viewing the model retrieving the reward emphasized the goal of the action,
and as such, indicated success. As this could influence children’s behavior, Conditions 2 and
4 cut the video as the model began to open each box’s door (i.e., success was only implied).
Further, we did not include a condition where children saw the unsuccessful group action
endorsed by other group members. Prior research has demonstrated that group endorsement,
even with live actors, has little impact on children’s imitative behavior when faced with
decisions regarding the efficacy of copying specific actions (Turner et al., 2014). Given this,
we felt that examining the impact of endorsement of unsuccessful group actions was
unnecessary, both from a practical perspective and theoretically as it addresses a separate
research question.

*Condition 1 – Conventional, Explicit Success*

*Individual Video*: The individual stepped forward and successfully manipulated the
mechanism to open the box. The individual then conveyed success, exclaiming “yes”. The
individual then used the handle to open the box, retrieved the toy and placed it on the table
and returned to her original position.
Group Video: The group members all stood side-by-side holding hands. This emphasized group membership in this condition. One group member stepped forward to engage with the apparatus. The group member did not open the box, but acted on it in a purposeful manner (i.e. tapping on each of the operating mechanisms). The group member then placed her hands together in a praying motion, and hummed briefly while making a short bow. The group member then placed two fingers on the front of the box and paused for approximately 2 seconds. She then turned to the other members of the group and all three repeated the pray/bow/hum action. The group member then rejoined her group and linked hands with them.

Condition 2 – Conventional, Implicit Success

Individual Video: The individual stepped forward and successfully manipulated the mechanism to open the box. The individual then conveyed success, exclaiming “yes”. The individual then reached down and placed her hand on the handle to open the box, but the video is cut before the door handle is physically opened, so success is not explicitly demonstrated and the toy is not seen.

Group Video: As per Group Video in Condition One.

Condition 3 – Instrumental, Explicit Success

Individual Video: As per Individual Video in Condition One.

Group Video: The group members all stood together with their hands dropped at their sides. One group member stepped forward to engage with the apparatus. The group member tried to open the box by manipulating the non-opening mechanism and failed. The group member then raised her hands in a shrugging motion and made a confused “hmm” sound with an upward inflection. The group member then rattled the handle of the box, attempting to open it. She then turned to the other members and all three members
the shrug and confused sound. The group member then rejoined her group, standing again with their hands at their sides.

Condition 4 – Instrumental, Implicit Success

*Individual Video:* As per Individual Video in Condition Two.

*Group Video:* As per Group Video in Condition Three.

A core aspect of ritual action is that it is causally opaque, and as such the conventional condition does not have an obvious practical outcome (i.e., it has start-end-state equivalency). Therefore, the current study did not include a condition where both groups are successful as, in terms of ritual cognition, having a ‘practical conventional condition’ would be paradoxical

**Procedure**

After arriving at the university, the research assistant escorted children and their parent(s) to a warm up room, where the children were familiarized with their environment. During this time, parents were briefed and filled out a consent form, demographic information questionnaire and the CSPS. Once children appeared comfortable, everyone moved to an adjacent test room.

Upon entering the test room the child was asked to sit at the desk and face the television, which showed a blank screen. Children were presented with the first box, and told they could look but not touch. The box was placed in the center of the desk, approximately 28cms from the child. The experimenter explained: “Here is the first box we are going to play with. See how there are two sides you can play with?” while gesturing at each side. The box was then placed behind the curtain and the experimenter said: “Let’s see how everyone in the videos plays with the box, then it will be your turn to have a go.”

A still of the first video was presented on the screen, ready to be played. Before
pressing play on the first video the demonstrator would say “See the three girls in yellow and
the one girl in green. See how I have a yellow t-shirt too, they’re my friends. See how they’re
all standing together. Let’s see how everyone wants to play”. The experimenter then played
the first video once, then said: “Let's watch that one again” and played it a second time. The
experimenter then said “Okay now let’s see how the other people play”, and then played the
second video twice, with the same methodology as the first video. After completion of the
videos the experimenter said: “Okay, now it’s your turn to have a go”. The experimenter then
retrieved the box from behind the curtain and placed it in the same position on the desk, while
saying: “Show me how you want to play”.

If children were shy or reluctant, parents and researchers gave non-directive verbal
encouragement. The experimenter also provided verbal praise when each trial was completed.

Four criteria dictated the end of a trial, (1) If the child successfully opened the box; (2) If the
child refused to participate or touch the box after 60 seconds, or verbally expressed that they
would not play; (3) If the child was unsuccessful in opening the box within 60 seconds; or (4)
If the child copied the action demonstrated and then stopped interacting (at which point the
experimenter would ask: “Do you want to keep playing or are you finished?” and if they
responded that they were finished the trial was terminated).

The first box was placed back behind the concealing curtain and the above process
was repeated for the second box. After completion of both trials the parent and child were
escorted back to the warm up room where they received a certificate and small gift for
participation.

Coding

Scores on the CSPS were calculated for each subscale by summing the relevant items
and dividing by the number of items in each subscale. Higher scores represent higher levels
of shyness and social disinterest. Children's responses for each of the two boxes were coded
and aggregated if they performed the group action (no = 0 and yes = 1): Thus, scores ranged between 0 (copied individual twice) and 2 (copied group twice). To evaluate whether the time children spent engaging with the apparatus varied as a function of condition (i.e., whether any of the condition-based manipulations inadvertently led to differential levels of engagement with the apparatuses) we also measured the duration in seconds from when each apparatus was first touched to (a) when it was opened, or (b) when the child stopped engaging with it for more than 10s, or (c) if the 60s response period expired. A second coder blind to the study aims and hypotheses coded 20% of the sample. According to intra-class correlation coefficients, inter-rater reliability was high for both dependent variables; first action selected $k = 90, p < .001$ and total time engaged with apparatus, $r = .88, p < .001$.

Results

Due to the limited range of scores associated with copying the group action statistical analyses for this variable were conducted using logistic regression. Preliminary analyses revealed no effect of sex or box type on either of the dependent variables, thus, these factors were not analyzed further. There were no association between the Shyness or Social Disinterested subscales of the CSPS and any of the other measures of interest - they are not considered further.

A linear regression revealed that neither video type (explicit vs. implicit), ($\beta = 11.07, p = 0.092$), nor demonstration type (conventional vs. instrumental), ($\beta = -2.240, p = 0.730$) statistically accounted for children’s time spent engaging with the apparatuses. Following this, the overall equation was found to be non-significant, $F(2, 61) = 1.54, p = 0.222$, indicating that the model did not provide good fit for the data.

The mean response rates of the children across conditions are presented in Figure 3. Due to the categorical nature of the dependent variable, and the linear relationship between
levels of the DV, an ordinal logistic regression was used to determine which factors predicted children’s willingness to engage in the group action. All analyses presented met the assumption of proportional odds. Pearson’s Goodness-of-fit statistics did not fall below the threshold for rejection (p < .05). We did not find an effect of Video type (explicit vs implicit) in predicting children’s likelihood of engaging with the group action, $\chi^2 (1) = .289, p = 0.591$. However, we did find an effect of demonstration type (conventional vs. instrumental) significantly predicting children’s willingness to engage with the group action, $\chi^2 (1) = 6.71, p = 0.010$. That is, children in the conventional condition were 3.38 times more likely to copy the methods of the group than those in the instrumental condition (95% CI, -2.142 to -.297). Pseudo-$R^2$ values range from .048 (McFadden) to to .106 (Nagelkerke). Overall the model provided good fit for the data, $\chi^2 (1) = 7.035, p = .030$.

Discussion

Cumulative culture relies on the high fidelity transmission of group-specific instrumental skills and social conventions to future generations (Dean, Kendal, Schapiro, Thierry, & Laland, 2012; Nielsen, 2012; Schillinger, Mesoudi, & Lycett, in press; Tennie et al., 2009; A Whiten, McGuigan, Marshall-Pescini, & Hopper, 2009). As part of this process, children need to learn how to perform the kinds of functional tasks required for survival and success alongside the group-specific practices that function to increase cohesion and cooperation among group members (Legare & Nielsen, 2015). Children’s capacity for doing so develops early, a capacity that is context-dependent and requires early-developing flexibility in social learning (Herrmann et al., 2013; Legare et al., 2015; Watson-Jones et al., 2014). A key component of this learning is knowing when to copy and from whom. Past research has found that children favor learning from a competent individual over a member of an incompetent group (Wilks et al., 2014). This could be interpreted as evidence that the
proficiency bias trumps the majority bias in young children. However, our data paints a more nuanced picture.

Children will copy a group member’s actions over an individual’s so long as the group actions lead to success. Indeed, this bias is so robust that even reduced efficiency does not eradicate it (Haun, Rekers, & Tomasello, 2014; Haun, Rekkers, et al., 2012; Haun, van Leeuwen, & Edelson, 2012; Turner et al., 2014; Wilks et al., 2014), although an ultimate lack of success will (Wilks et al., 2014). The current experiment showed that when children saw a lone individual achieve an instrumental goal and a group member who did not, children were more inclined to copy the individual than when the group member’s actions were causally opaque, even though the individual’s actions remained more causally efficacious. Importantly, under the latter circumstances, children were less inclined to copy the causally transparent over the causally opaque actions (e.g., when the actions of both models were instrumental 65% of those tested copied the individual on both trials whereas when the actions of the group member were instrumental this dropped to 33%). In essence, children showed a willingness to engage in conventional, normative behavior rather than acquire a functional skill. We argue that, consistent with the ritual stance, children interpret causally opaque actions as socially informative and normative, and will opt to copy these when they are performed by the group rather than copying explicitly successful causally transparent actions of individuals.

The performance of rituals can help distinguish devoted in-group members from imposters or interlopers (Ensminger, 1997; Henrich, 2009; Irons, 2001), and facilitate group cohesion and cooperation (Ruffle & Sosis, 2007; Sosis & Ruffle, 2003; Wiltermuth & Heath, 2009). Engagement in and commitment to ritual action has thus become a fundamental feature of our behavioral repertoire, something highlighted by the children in the current experiment: When faced with the choice of copying a group-oriented but failed action and an
individual-specific, functional and successful action a child’s inclination towards adopting the former was increased when the demonstrated action was made ritual-like.

It is notable that in this experiment children observed actions performed by videotaped models. It is possible that their behavior would be different if the models were live actors, and if the models either remained in the test room or left (McGuigan, Gladstone & Cook, 2012; Nielsen & Blank, 2011). It is also possible that the children tested here may have responded differently if the experimenter had not conveyed affiliation with the group by wearing a t-shirt of the same color and nominating them as ‘friends’. That is, children may have felt an expectation to align themselves with the experimenter. However, if children were simply motivated to appease or affiliate with the experimenter rates of copying the group should have been similar across conventional and instrumental conditions, and they were not. In addition, Bernard, Proust, and Clément (2015) found that when cues of reliability and consensus conflict 4- and 5-year-olds prioritize consensus, whereas 6-year-olds prioritize reliability. This highlights the trajectory of children’s discerning judgements of the value of imitation models. Children older than those tested here might therefore be expected to respond differently, possibly prioritizing success over the value of copying the group (see also Oostenbroek & Over, in press). Finally, there is the possibility that different outcomes would be found if this experiment were replicated in a community where conformity and group belonging is culturally prioritized over individuality and personal expression (Mesoudi, Chang, Murray, & Lu, 2015). Exploring each of the issues outlined above is beyond the current work and hence remain important topics for future research, research that promises to further our understanding of core features of the human mind.

Children develop in environments where they are perpetually exposed to new information, both social and otherwise, and they must choose which aspects of this new information are most critical to learn. The current study adds to what is now a large corpus of
research showing children are indeed selective imitators, evaluating what to copy and from whom across a wide range of contexts (see Koenig & Sabbagh, 2013). We show here that in an instrumental context, if given a choice between an unsuccessful group action and a successful individual action, children default to the individual’s action. However, when the actions are ritualized (characterized by a normative interpretation, as per the ritual stance), children are more inclined to follow the group. The human social world is always changing and challenging, and navigating this environment successfully necessitates a flexible, adaptive response. To have a discriminating strategy for changing circumstances is an immensely valuable tool for children, and indeed adults, and likely forms a cornerstone of cumulative culture.
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Figure 1. Schematic representation of the experimental setup.
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Figure 2. Screen shots of group demonstration (2a) and close up shown during action modeling (2b)
Figure 3. *Children’s mean preferences for selecting the group or individual as a function of condition.*
### Table 1. Two puzzle box apparatus and descriptions of standardized actions associated with them.

<table>
<thead>
<tr>
<th>Apparatus</th>
<th>Successful Action</th>
<th>Unsuccessful Action</th>
<th>Ritual Action</th>
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<tbody>
<tr>
<td>Apparatus One</td>
<td>Acting on purple side (first picture), spin each disc until the horizontal line of the disc faces the lid. Use handle to swing door open and attain reward inside.</td>
<td>Acting on pink side (second picture), spin each disc two full circles. Attempt (and fail) to open door using the handle; illustrate by rattling door.</td>
<td>Acting on pink side (second picture), spin each disc forward and backwards using two fingers of each hand. Place two fingers on the front of the handle and hold for one second.</td>
</tr>
<tr>
<td></td>
<td>Note: In Conditions 2 and 4 the video was stopped when the demonstrator placed her hand on the handle.</td>
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<td></td>
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<tr>
<td>Apparatus Two</td>
<td>Acting on green side (first picture), lift each dowel consecutively from position and place on the table. Use handle to swing door open and attain reward inside</td>
<td>Acting on blue side (second picture), attempt to lift each dowel consecutively from position; attempting (and failing) to lift dowel out of position. Rattle dowel slightly during the process. Attempt (and fail) to open door using the handle; illustrate by rattling door.</td>
<td>Acting on the blue side (second picture), place two fingers on top of each dowel consecutively. Place two fingers on the front of the handle and hold for one second.</td>
</tr>
<tr>
<td></td>
<td>Note: In Conditions 2 and 4 the video was stopped when the demonstrator placed her hand on the handle.</td>
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