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Model similarity cues cultural selection of ritualized actions

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ABSTRACT

Previous research suggests that ritualistic imitation is affiliative, functioning as a re-inclusion behaviour in response to ostracism threat. The Bifocal Stance Theory (BST) predicts that model similarity activates affiliative motivations and increases adoption of ritualized traits during cultural transmission, while prestigious models promote adoption of traits interpreted as causally efficacious. In a preregistered experiment, adult participants completed a two-block food choice task in which items were subjected to either causally opaque or causally transparent action sequences. Participants were paired with a social partner whose perceived similarity and prestige were experimentally manipulated. Choices were made privately in the first block and publicly in the second. Ritualized options elicited a robust choice preference in social contexts. When choices were made publicly, participants were more likely to select the ritualistically treated option when it had been chosen by a similar partner than when it had been chosen by either a prestigious or control partner, whereas having a prestigious partner did not reliably increase selection for instrumentally treated options compared to the other two partner conditions. We discuss implications for future work on similarity and prestige judgments in cultural evolution.

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Social learning; cultural evolution; similarity; prestige; ritual

1. Introduction

Humans learn from each other selectively. In environments where potential models are abundant and attentional resources are limited, individuals cannot copy indiscriminately but must instead rely on heuristics that guide whom to attend to and which traits to copy (Boyd & Richerson, 1985; Cavalli-Sforza & Feldman, 1981; Enquist et al., 2010; Rendell et al., 2011; Richerson & Boyd, 2005). These heuristics, often referred to as learning biases, optimize social learning by prioritizing particular sources of information based on cues such as skill, age, social status or perceived similarity that are probabilistically associated with adaptive outcomes (Atkisson et al., 2012; Mesoudi, 2008, 2011). For this reason, learning biases are widely regarded as central contributors to processes of cultural evolution and selection, shaping which cultural traits persist, spread or disappear over time.

Despite an extensive empirical literature documenting the behavioral consequences of such biases, surprisingly little attention has been paid to the psychological motivations that govern how learners engage with different kinds of cultural information in the first place (Heyes & Pearce, 2015). Much of the social learning literature has been described as "behaviorist" in orientation, in

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the sense that it focuses primarily on observable learning outcomes while treating the motivational processes that generate them as a black box (Heyes, 2012). This limitation becomes especially salient when considering that the same behavioral strategy may plausibly be driven by qualitatively different motivations, such as the desire to acquire instrumentally useful knowledge on the one hand or to affiliate with others and adopt shared norms on the other.

Previous experimental work suggests that social learning and cultural transmission may indeed be guided by distinct motivational learning profiles (Watson-Jones et al., 2014; Watson-Jones et al., 2016). Accordingly, the Bifocal Stance Theory (BST; Jagiello, Heyes, & Whitehouse, 2022a; Whitehouse, 2021) proposes that social learners adopt distinct interpretive stances toward observed actions, most notably a *ritual stance* and an *instrumental stance*, depending on whether an action is perceived as conventional or causally efficacious respectively. While the *instrumental stance* is characterized by goal-directed reasoning and sensitivity to causal structure, the *ritual stance* is associated with affiliative, normative, and conventionally oriented motivations, in which actions are interpreted as socially meaningful rather than effective for manipulating the environment physically. Importantly, BST posits that stance adoption is not determined by the observable properties of an action alone, but may also be shaped by contextual and social cues that signal to social learners how an action ought to be understood.

From this perspective, characteristics of the model performing an action become potentially powerful stance-triggering cues. Learning biases such as similarity and prestige, which have traditionally been studied as strategies for selecting whom to copy, may also influence how an observed action is construed and why it is selected. Similarity, for instance, may heighten affiliative motivations and thereby increase the likelihood that an action is interpreted through the *ritual stance*, whereas prestige signals technical competence and prompts a more instrumental interpretation. This possibility raises an important but underexplored question within the social learning literature: do model characteristics merely guide attention or do they modulate the underlying motivational states that guide an individual's learning efforts? In order to further explore this question, we briefly discuss how these biases are characterized in the literature and how these characterizations give rise to the competing predictions that we are testing in our design.

1.1. Similarity bias

Similarity bias refers to the tendency to preferentially attend to and learn from individuals who share salient features with the learner, such as age, gender, and shared opinions, in order to guide social learning in effective ways (Jiménez & Mesoudi, 2019; Laland & Brown, 2011). Empirical work on development supports this view, as children express preferences for learning from models who speak in their accent—a cue that is interpreted as signaling shared group membership and ethnicity (Kinzler et al., 2009; Kinzler et al., 2011). Such preferences emerge early and appear robust across contexts, suggesting that similarity functions as a potent signal in structuring attention during learning (Basow & Howe, 1980; Bussey & Bandura, 1984; Shutts et al., 2010). Insights from adult populations come from large-scale social network analyses, which highlight the importance of relational proximity. Christakis and Fowler (2008), for example, demonstrated that behavioral outcomes such as obesity spread more strongly through close social ties than through more distant connections, independent of exposure frequency. Overall, these findings underscore that the characteristics of models that propagate behaviors can be as consequential as the behaviors themselves in determining the traits we selectively attend to and transmit. One limitation of the existing evidence is that similarity cues such as accent frequently bundle together at least two processes: inferred shared group membership and familiarity (processing fluency due to prior exposure). As a result, it can be difficult to tell whether learners prefer a model because the model is socially similar or because the cue is simply familiar. In the present study, we therefore manipulate perceived similarity via matched questionnaire responses (signaling attitudinal overlap), rather than perceptual cues (such as accent or body shape) which are more directly confounded with familiarity.

From an evolutionary perspective, similarity-based learning may facilitate the acquisition of skills relevant to one's anticipated social role or ecological niche (Mesoudi, 2009). Individuals facing similar environmental challenges may possess solutions that are particularly transferable from one to another. For instance, a young male learner who is expected to become a hunter might preferentially learn from role-relevant models (e.g., other hunters) because shared constraints and task demands make their solutions more relevant—even when those models are not necessarily the most prestigious individuals in the group. Indeed, past research has shown that imitating actions from same-sex demonstrators is experienced as more rewarding, both neurologically as well as according to self-reported values (Losin et al., 2012). Equally recent formal work suggests that similarity-biased social learning is adaptive if it directs attention to targets most likely to be performing behaviors that will be useful to the learner (Smaldino & Velilla, 2025). This raises the important question as to what degree similarities between individuals evoke the desire to affiliate or to acquire technically useful information. Does learning from similar others primarily reflect an affiliative motivation, such as reinforcing social bonds and group identity, or does it serve instrumental goals, such as effectively acquiring information tailored to one's own circumstances? Disambiguating between these underlying motivations is critical for understanding how similarity interacts with different types of cultural traits, especially those that lack clear instrumental utility such as rituals, conventions and traditions.

1.2. Success and prestige biases

Another learning strategy is the success bias, defined as the tendency to preferentially copy individuals who demonstrate superior performance or outcomes (Mesoudi, 2011). Experimental studies show that both children and adults selectively learn from models who achieve higher payoffs in domains such as virtual hunting, tool design and problem solving (Atkisson et al., 2012; Mesoudi, 2008, 2011). This bias is thought to facilitate cumulative cultural evolution by allowing learners to move beyond merely functional solutions toward more efficient ones, effectively enabling transitions from local to higher-fitness optima (Mesoudi, 2008). However, direct indicators of success are often unavailable in naturalistic settings so learners have been found to rely on prestige cues—indirect markers of competence such as knowledge in unrelated domains, attention from others or social approval (Henrich et al., 2015; Henrich & Gil-White, 2001; Jiménez & Mesoudi, 2019). The prestige bias has been documented across various species and developmental stages, as exemplified by chimpanzees' observed preferences toward dominant individuals (Horner et al., 2010) or children's inferences of competence from cues such as confidence and social attention (Birch et al., 2010; Chudek et al., 2012; Fusaro & Harris, 2008; Jaswal & Malone, 2007; Rakoczy et al., 2009).

Perceived prestige is assumed to be adaptive by reducing the costs associated with independently evaluating competence: by focusing on models who are attracting the attention of others, a learner can bypass the costs of figuring out who to pay attention to (Henrich & Gil-White, 2001). As with similarity, however, this raises the question to what extent this propensity is rooted in motivations to affiliate with others or to acquire technically useful information. While BST would predict that prestige triggers instrumental reasoning, a more role-focused account might propose that it elicits motivations to affiliate with prestigious models through convention in order to facilitate subsequent acquisitions of instrumentally useful knowledge.

1.3. Importance of selection

While some research on social learning has focused more on imitation and transmission fidelity (e.g., Watson-Jones et al., 2014; Watson-Jones et al., 2016), other works have examined the process of selection—choosing among multiple available models or options (Herrmann et al., 2013; Oláh & Király, 2019; Over et al., 2013; Wilks et al., 2015). Selection is a fundamental aspect of cultural evolution, as individuals are routinely confronted with competing ideas, objects and practices presented

by models that vary in familiarity, similarity and perceived skill. To that end, our study adopts a selection-based approach by extending the choice paradigm developed by Kapitány and Nielsen (2015, 2017) in which participants observe objects subjected to either causally opaque (ritualized) or causally transparent (instrumental) treatments and are then asked to judge whether any option is special and which one they would choose for consumption. In the past, these paradigms have established that causally opaque actions (the ritual options) increase perceived *specialness* and preferential choice, an effect attributed to the adoption of the ritual stance.

However, alternative explanations that do not refer to processes of affiliation remain plausible in interpreting these results. Causal opacity may be cognitively captivating due to violations of expectation (Lienard & Boyer, 2006) or differences in action parsing (Liénard & Lawson, 2008), leading to increased attention and memorability without invoking social motivations. The present work therefore aims to test whether preferences for causal opacity are mediated by social motivations by incorporating manipulations of model similarity and prestige into the existing choice paradigm. We find food choice to be an especially suitable domain for investigating these questions as it naturally incorporates both instrumental and conventional dimensions. Eating is inherently instrumental, with the obvious end goal of ingesting food and satiating hunger, yet it is also steeped in social norms and rituals, such as ceremonial occasions, rules of dining etiquette, and decorative elements. Many food-related practices lack obvious causal justification (for example, the use of specific cutlery for different courses or the lighting of candles on a birthday cake), yet violations of such conventions are immediately noticeable to group members.

2. Selection study

To date, no study has manipulated the prestige and similarity of models in order to investigate how they affect people's preferences for cultural traits attributed to varying degrees of causal opacity. The present study was pre-registered to address this question using a food selection paradigm (https://osf.io/y53aq). We build directly on previous experimental work examining the effects of ritualized versus instrumental actions on perceptions of object *specialness* and choice, drawing on the procedural paradigm developed by Kapitány and Nielsen (2015, 2017).

Participants completed a two-block food choice task in which items were subjected to either causally opaque (ritual) or causally transparent (instrumental) action sequences, with choices made privately in the first block and publicly in the second, following exposure to experimentally manipulated partner characteristics (similarity and prestige). In the private block, participants made their selections without seeing a partner's choice and were not told that their own choice would be shown to the partner, thus providing a baseline preference measure in the absence of social information. In the *public* block, participants were shown the partner's ostensible choice and were told that their own choice would be visible to that partner, thereby introducing a social context in which model-based influence on selection could operate. The *public* block therefore introduces a social-evaluative context in which conformity, impression management and model-based learning biases are expected to operate (as opposed to the *private* block which serves as a baseline condition for comparison).

The study had two primary aims: first, it tested whether causally opaque action sequences increase judgments of *specialness* without increasing perceptions of physical difference, thereby attempting to replicate the dissociation between symbolic valuation and instrumental reasoning observed in earlier work (Kapitány & Nielsen, 2015; 2017). Second, it examined whether the influence of ritualized versus instrumental actions on choice is modulated by the characteristics of a social model (similarity or prestige). Our preregistered hypotheses predict that model similarity primes will cue preferences for ritualized actions whereas prestige will cue preferences for instrumental actions, reflecting distinct pathways of affiliative versus competence-based social learning. For that, we induced perceived prestige using indirect competence cues: participants saw their

partner's apparent performance on a brief knowledge quiz in a domain unrelated to the study's cover story, thus prompting them to infer generalized competence.

In addition, the design allows competing accounts to be evaluated. A purely instrumental account proposes that preferences for causally opaque actions assume hidden functional efficacy rather than affiliative opportunities (Lyons et al., 2007). On this view, prestige cues should generally enhance the appeal of both ritualized and instrumental options, as prestigious models are expected to possess instrumentally valuable knowledge. By contrast, a role-focused account predicts a reversal of the bifocal pattern: similarity cues should preferentially promote instrumental learning relevant to one's anticipated social role, whereas prestige cues may initially motivate affiliative engagement with high-status individuals to facilitate later information acquisition. These competing frameworks generate distinct prediction patterns about how action type and model characteristics interact to guide cultural selection (Table 1).

2.1. Participants

Participants were recruited on Prolific (prolific.com) and offered £1.50 for about 10 min of their time. All participants were over the age of 18 and had normal or corrected-to-normal vision. Recruitment resulted in a sample of $N = 552$ (92 per between-subject condition; 297 female; $M_{age} = 40.59$; $SD_{age} = 14.39$). All study elements (tasks and video presentation) were embedded on Qualtrics. A technical issue during data collection resulted in 26 participants not being able to finish the study. An equal number of participants were recruited to meet the targeted sample size.

2.2. Ethics statement

All procedures for this study were approved by the School of Anthropology and Museum Ethnography Research Ethics Committee (Ref No: SAME_C1A_21_007). Additionally, great care was taken to inform participants afterwards that the partner they had been assigned during the task was computer generated.

2.3. Procedure: priming stage

After providing informed consent, participants were introduced to a cover story in which they were told that the study examined food and drink choices in the context of planning a shared meal with a new acquaintance (see Supplementary Materials *S1* for instruction details, available on https://osf.io/pnr9v/). Participants were informed that they would be paired with another participant, engage in brief introductory activities together, and subsequently make a series of food or drink choices intended to be shared with their partner. In reality, partner assignment and behavior were computer-generated. To support the credibility of this manipulation, participants viewed a simulated matching screen before being "paired" with their partner (*S1.1*, Supplementary Materials). Following assignment, participants completed two activities with their ostensible partner: an ice-breaker task and a trivia quiz. The order of these activities was counterbalanced across participants.

Table 1. Predicted preferences for cultural trait selection across theoretical accounts. Rows are grouped by action type (opaque vs. transparent), with model type (Similar vs. Prestigious) listed in the first column.

	BST	Instrumental	Role-focused
Opaque			
Similar	Higher pref.	No pref.	No pref.
Prestigious	No pref.	Higher pref.	Higher pref.
Transparent			
Similar	No pref.	No pref.	Higher pref.
Prestigious	Higher pref.	Higher pref.	No pref.

The ice-breaker task consisted of 10 multiple-choice questions concerning personal preferences (e.g., leisure activities). After each response, participants received feedback indicating both their own and their partner's selections. In the *similarity condition*, the partner's responses matched the participant's answers on 8 of the 10 questions. In the *prestige* and *control conditions*, overlap occurred on only 2 questions. This manipulation was implemented programmatically and was designed to induce perceived interpersonal similarity without explicitly revealing the manipulation (*S1.2*, Supplementary Materials).

The trivia task consisted of 10 multiple-choice questions presented as a collaborative team activity. A spinning wheel animation was used to create the impression that question topics were randomly selected, though all questions concerned human anatomy (*S1.3*, Supplementary Materials S3). Participants were informed that team scores depended on both players' performance, allowing them to infer their partner's accuracy from shared feedback. In the *prestige condition*, the partner answered 9 out of 10 questions correctly, whereas in the *similarity* and *control conditions*, the partner answered only 2 questions correctly. An instructional attention check ensured that participants understood the scoring system.

Together, these manipulations created three between-subjects conditions. In the *similarity condition*, the partner appeared similar during the ice-breaker task but relatively unknowledgeable during the trivia task. In the *prestige condition*, the partner appeared dissimilar but highly knowledgeable. In the *control condition*, the partner appeared dissimilar and unknowledgeable. This priming stage was designed to manipulate perceived similarity and prestige in an indirect manner, minimizing demand characteristics while establishing the social context for the subsequent choice tasks.

2.4. Procedure: choice task

In the main experimental phase, participants completed a choice task in which they viewed short video clips depicting food and drink preparation and selected between three options (left, center, right). Consistent with the cover story, participants were asked to imagine planning a shared meal with their assigned partner.

The task consisted of two blocks. Participants were informed that choices in the first block would not be visible by their partner (*private* block) and that choices made in the second block were visible (*public* block). Each block contained two trials: one food-choice scenario and one drink-choice scenario (order counterbalanced). In the food trials, participants saw three plates containing cookies (plain and uniform to reduce baseline preference variance and cultural or dietary confounds) alongside three empty plates. During transfer, one option was subjected to an additional action sequence, rendering it the acted-upon (AU) option. In the drink trials, three small glasses containing liquid were poured into three empty glasses, again with one option receiving additional actions (adapted from Kapitány & Nielsen, 2015, 2017). Across both scenarios, the AU option was treated either with a causally opaque (ritual) or causally transparent (instrumental) action sequence, manipulated between subjects (see Table 2). Here, causal opacity refers to action steps whose functional contribution to the outcome is not apparent to an observer (e.g., cloth movements performed without contact with the plate), whereas causal transparency refers to sequences in which each step is visibly and plausibly outcome-directed (e.g., cloth movements performed while maintaining contact with the plate, consistent with a wiping motion). The actions were therefore motorically matched and differed only in their degree of causal opacity. Further, each action type (ritual vs. instrumental) was instantiated in two variants, and the spatial position of the AU option (left, center, right) was counterbalanced. In total, 24 unique videos were created [2 (scenario) × 2 (action type) × 2 (variant) × 3 (position)]. Participants were assigned to one of six between-subjects conditions crossing model type (prestige, similarity, control) with action type (ritual, instrumental).

After each video, participants responded to three core questions adapted from Kapitány and Nielsen (2015, 2017): (i) whether the options were the same, (ii) whether any option was special,

Table 2. Action sequence variants for drinks and food choice scenarios.

	Opaque Condition	Transparent Condition
Drinks		
Variant 1	1. Cloth is moved up and down in front of glass (no contact) 2. Superfluous vertical motion before pouring the liquid	1. Cloth is moved up and down to clean the glass (contact) 2. Direct motion when pouring the liquid
Variant 2	1. Circular motions with finger (no contact) 2. Glass is picked up and bowed to	1. Finger is used to "dust" the glass with circular motions (contact) 2. Glass is picked up and inspected
Food		
Variant 1	1. Cloth is moved up and down in front of plate (no contact) 2. Cookie is superfluously held up before placing it	1. Cloth is moved up and down to clean the plate (contact) 2. Direct motion when placing the cookie onto the plate
Variant 2	1. Hand hovers over the plate making circular motions (no contact) 2. Plate is picked up and bowed to	1. Hand is used to "dust" the plate making circular motions (contact) 2. Plate is picked up and inspected

and (iii) which option they would choose to share with their partner. In the *public* block (Block 2) only, participants were shown their partner's ostensible choice before responding and were also told that their partner would see theirs. Choice responses were coded as selection of the AU option (1) or a non-AU option (0).

To assess their interpretations, participants completed brief follow-up measures probing their understanding of the terms same and special and the reasoning behind their choices in an open-ended question format (see *S2* in Supplementary Materials). Manipulation fidelity such as perceptions of partner similarity and knowledge were rated on Likert scales. Participants were asked to indicate how knowledgeable they perceived their partner to be in both the trivia domain (anatomy) as well as the task domain (food), to test for inferred expertise (since prestige is conceptualized by *indirect* markers of success). Finally, participants completed a causal opacity questionnaire measuring normativity, goal demotion, perceived opacity, and magical thinking, including an embedded attention check.

2.5. Results

2.5.1. Manipulation checks

Model characteristics were successfully manipulated. An ANOVA with model condition (similarity, prestige, control) predicting perceived similarity revealed a strong effect, $F(2, 542) = 121.494$, $p < .001$, $\eta_p^2 = .307$. Participants in the similarity condition rated their partner as more similar than those in the prestige and control conditions (which did not differ from each other).

Perceived knowledge was likewise affected by condition. For anatomy knowledge, an ANOVA showed a large effect of model condition, $F(2, 549) = 295.815$, $p < .001$, $\eta_p^2 = .519$, with partners in the prestige condition rated as substantially more knowledgeable than those in the similarity and control conditions. Ratings in the similarity condition were modestly higher than in the control condition (an unintended but interpretable effect, likely reflecting general positivity toward similar others). Crucially, this competence attribution generalized beyond the manipulation domain: an ANOVA on perceived nutritional knowledge also revealed a significant effect of model condition, $F(2, 549) = 29.852$, $p < .001$, $\eta_p^2 = .098$, with higher ratings in the prestige condition than in the other two conditions. This confirms that participants inferred broader competence from indirect success cues, consistent with a prestige bias. The causal opacity manipulation was likewise successful. Participants in the ritual condition rated action sequences as more opaque than those in the instrumental condition, $t(550) = 5.71$, $p < .001$.

2.5.2. Effects of model characteristics and causal opacity on perceived sameness and specialness

Participants indicated on each trial whether the two options were the same (1) or not (0) and whether either option was special (1) or not (0). Each block contained two trials, so responses were aggregated in each block into an ordinal score ranging from 0 to 2, with "0" indicating that the judgment was made on neither trial (*none*), "1" indicating that the judgment was made on one of the two trials (*once*), and 2 indicating that the judgment was made on both trials (*all*). Ordinal logistic regression (OLR) was used where the proportional odds assumption was met; where this assumption was violated, multinomial logistic regression (MLR) was employed.

Sameness judgments. In the *private* block (Block 1), the proportional odds assumption was violated (test of parallel lines: p = .012), and an MLR was therefore fitted. The model including action type (ritual vs. instrumental) and model condition (similarity, prestige, control) significantly improved fit over an intercept-only model, $\chi^2(6) = 25.25$, $p < .001$. The Pearson's Goodness-of-fit was not significant, $X^2(4) = 6.681$, $p = .154$, indicating an overall good fit. Ritualized action sequences substantially increased the likelihood that participants judged the options as the same, both for judging sameness on *all* trials and for judging sameness at least *once* (odds ratios ≈ 3.8–4.0; Table 3). Pseudo-R^2 values ranged from .059 (Nagelkerke) to .033 (McFadden). No main effects of model condition were observed, and adding an interaction between action type and model condition did not improve model fit.

In the *public* block (Block 2), the proportional odds assumption was met and an OLR revealed a significantly better-fitting model, $\chi^2(3) = 33.80$, $p < .001$, with overall good fit (Pearson's Goodness-of-fit, $X^2(7) = 6.131$, $p = .525$). Replicating the *private* block (Block 1) pattern, ritual actions increased the likelihood of judging items as the same by a factor of approximately 3.3 at each threshold of the dependent variable (Table 2). Pseudo-R^2 values ranged from .081 (Nagelkerke) to .046 (McFadden). Model characteristics showed no main effects, and no interaction with action type was detected. Mean proportions of sameness judgments across blocks and action conditions are shown in Figure 1 (panel A).

Table 3. Ordinal and multinomial logistic regression results for sameness and specialness judgments.

Predictors	Wald's χ^2	*p*	95% CI	Odds Ratio
Sameness judgments				
Block 1 (MLR): Sameness in one trial				
Ritual vs. Instrumental	12.769	< .001	1.865–8.482	3.977
Similar vs. Control	0.643	.423	0.286–1.691	–
Prestige vs. Control	0.548	.459	0.316–1.682	–
Block 1 (MLR): Sameness in both trials				
Ritual vs. Instrumental	19.143	< .001	2.075–6.786	3.753
Similar vs. Control	0.020	.886	0.543–2.029	–
Prestige vs. Control	0.577	.448	0.415–1.475	–
Block 2 (OLR)				
Ritual vs. Instrumental	28.355	< .001	0.762–1.649	3.340
Similar vs. Control	2.009	.156	−0.144–0.898	–
Prestige vs. Control	0.024	.878	−0.528–0.452	–
Specialness judgments				
Block 1 (OLR)				
Ritual vs. Instrumental	11.636	< .001	−0.988 – −0.267	0.534
Similar vs. Control	0.014	.905	−0.408–0.461	–
Prestige vs. Control	0.093	.761	−0.507–0.371	–
Block 2 (OLR)				
Ritual vs. Instrumental	0.324	.569	−0.459–0.252	–
Similar vs. Control	0.571	.450	−0.268–0.605	–
Prestige vs. Control	0.243	.622	−0.328–0.549	–

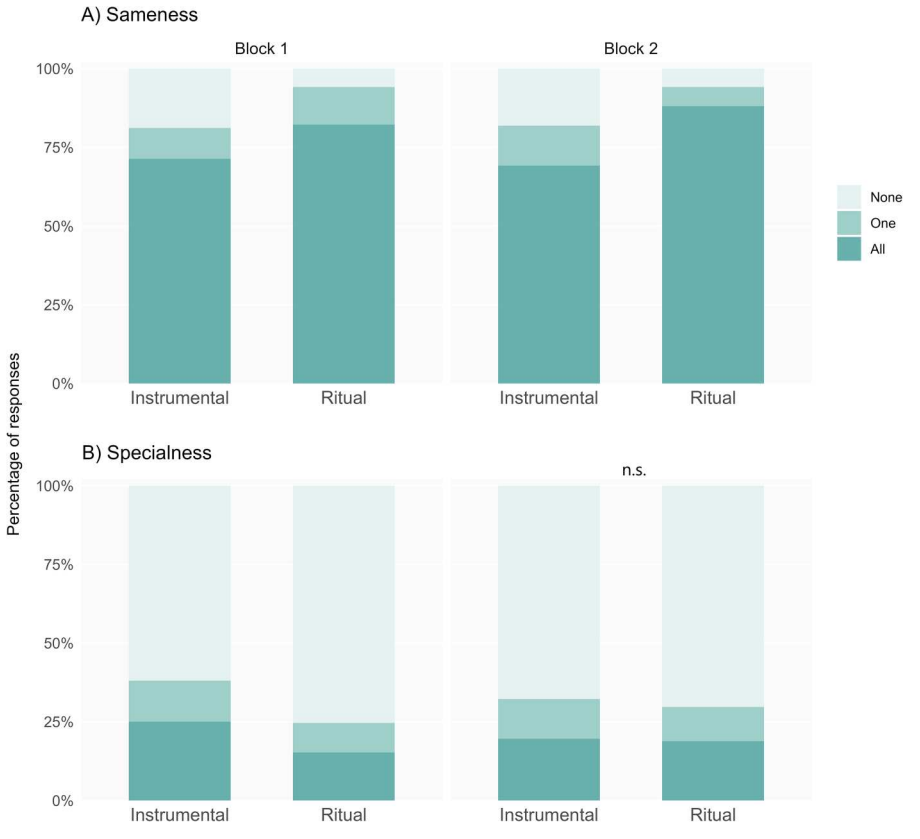


Figure 1. Perceived sameness and specialness as a function of action type: (A) distribution of responses indicating whether food or drink options were perceived as the same, and (B) distribution of responses indicating whether options were judged to be special. For each block (two trials), outcomes are shown as *none* (0/2 trials), *once* (1/2 trials), or *all* (2/2 trials) in which the AU option was judged as *same*/*special*. Block 1 choices were made in *private*, whereas Block 2 choices were made in a social context (*public*). Differences are significant unless marked otherwise (n.s.).

Specialness judgments. Judgments of whether an option was seen as *special* were analysed using OLR. In the *private* block (Block 1), the model including predictors provided a significantly better fit than the null model, $\chi^2(3) = 12.06$, p = .007. The Pearson's Goodness-of-fit was not significant, $X^2(7) = 6.540$, $p = .478$ indicating an overall good fit. Participants were less likely to judge options as special following ritualized action sequences than following instrumental ones (odds ratio ≈ 0.53; Table 3). Pseudo-R^2 values ranged from .027 (Nagelkerke) to .013 (McFadden). Model characteristics again showed no main effects, and no interaction with action type improved fit. In the *public* block (Block 2), the model including predictors did not improve fit over the null model, $\chi^2(3) = 0.92$, p = .821, indicating that neither action type nor model characteristics influenced specialness judgments in this block. Mean proportions of specialness judgments across blocks and action conditions are shown in Figure 1 (panel B).

2.5.3. Effects of model characteristics and causal opacity on choice selection

Participants indicated which food option they would choose on each trial. Blocks differed in whether choices were made privately (Block 1) or were publicly modeled by a partner (Block 2). Block 1 therefore provided a baseline measure of preference in the absence of social influence, whereas Block 2 tested whether model characteristics (similarity, prestige) modulated selection when choices were socially visible. Again, because each block contained two trials, choice outcomes are summarized as *none* (AU chosen on 0/2 trials), *once* (1/2 trials), or *all* (2/2 trials).

Table 4. Breakdown of OLR results for Block 2 on food choice.

	Predictors	Wald's χ^2	p	95% CI	Odds Ratio
Block 2	Ritual vs. Instrumental	86.215	< .001	1.253–1.923	4.894
	Similar vs. Control	0.201	.654	−0.307–0.488	–
	Prestige vs. Control	0.976	.323	−0.197–0.597	–

In the *private* block (Block 1), an ordinal logistic regression (OLR) indicated that the model including action type and model condition did not provide a better fit than an intercept-only model, $\chi^2(3) = 7.03$, $p = .071$ (Table 4). Pearson's goodness-of-fit was non-significant, $\chi^2(7) = 4.72$, $p = .694$, indicating adequate model fit. Thus, when choices were made privately, neither action type nor model characteristics influenced selection behavior.

In the *public* block (Block 2), where partner choices were revealed and participants were aware that their own choices would be seen, an OLR showed a significantly improved model fit, $\chi^2(3) = 93.01$, $p < .001$, with a non-significant Pearson's goodness-of-fit, $\chi^2(7) = 9.19$, $p = .239$. Pseudo-R^2 values ranged from .176 (Nagelkerke) to .079 (McFadden), indicating substantial explanatory power. Participants were 4.9 times more likely to select the acted-upon option when it had been subjected to a ritual action sequence rather than an instrumental one. Model characteristics showed no main effects.

To test whether the influence of ritualized action depended on the type of model, an interaction term between action type and model condition was added. This interaction significantly improved model fit, $\chi^2(5) = 98.52$, $p < .001$, again with good fit to the data (Pearson's $\chi^2(5) = 3.63$, $p = .604$). Pseudo-R^2 values increased to .185 (Nagelkerke) and .083 (McFadden), indicating additional explanatory power beyond the main-effects model. Follow-up analyses revealed that when a choice was accompanied by a ritual action sequence, participants were significantly more likely to select the acted-upon option in the presence of a similar model than in the control condition (odds ratio = 2.62), Wald's $\chi^2(1) = 5.46$, $p = .019$, 95% CI [1.17, 5.90] (Figure 2). Prestige did not significantly modulate choice behavior, Wald's $\chi^2(1) = 1.27$, $p = .259$. In the instrumental condition, neither similarity nor prestige affected selection relative to the control model. Taken together, these findings indicate that ritualized action selectively increases conformity to a model's choice in social contexts, and that this effect is amplified when the model is perceived as similar to the learner. Prestige cues, by contrast, did not reliably influence selection behavior in this paradigm.

2.5.4. Open-ended responses

Participants were asked to explain how they interpreted the terms *same* and *special* when making judgments during the food choice task. We conducted an exploratory analysis for which we coded all responses ($N = 552$) into definitional clusters informed by prior work on ritual cognition and causal opacity (Kapitány & Nielsen, 2017; see Supplementary Materials *S3* for a full breakdown).

With respect to *sameness*, most participants grounded their judgments in perceptual features such as visual appearance, quantity, and observable properties. These categories did not differ across experimental conditions. However, explicit *denials of sameness* occurred more frequently in the instrumental conditions than in the ritual conditions, $\chi^2(1, N = 552) = 14.86$, $p < .001$, consistent with the quantitative results reported above.

Responses to the *specialness* question showed a different pattern. The most common response category involved denying that any option was special, and this did not differ by condition (*S3.2*, Supplementary Materials). Nonetheless, participants in the instrumental conditions were less likely to deny specialness overall than those in the ritual conditions, $\chi^2(1, N = 552) = 4.66$, $p = .031$. Instrumental conditions also elicited significantly more references to cleanliness, $\chi^2(1, N = 552) = 51.32$, $p < .001$, whereas ritual conditions more often prompted normative interpretations of specialness, $\chi^2(1, N = 552) = 25.09$, $p < .001$, including descriptions of the actions as *ceremonial* or *blessing-like*.

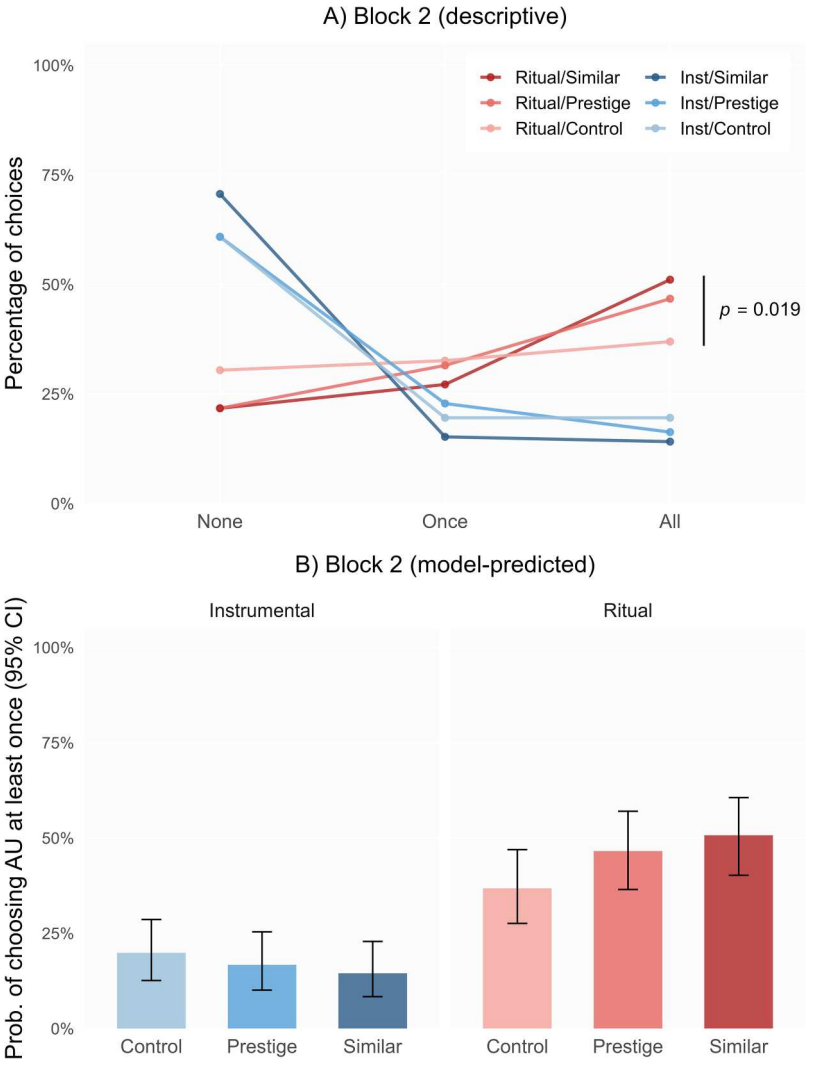


Figure 2. Effects of ritualized action and model similarity on choice behavior in the public block (Block 2). (A) Descriptive proportions of participants selecting the acted-upon (AU) option are shown as *none* (0/2 trials), *once* (1/2 trials), or *all* (2/2 trials) of the Block 2 trials, as a function of action type (ritual vs. instrumental) and model condition (similar, control, prestige). (B) Model-predicted probability of selecting the AU option at least once (95% CI) for each model condition, shown separately for instrumental vs. ritual actions. Participants show the strongest tendency to select the AU option in the ritual condition when paired with a similar model.

Participants were additionally asked to explain the reasoning behind their choice behavior (*S3.3*, Supplementary Materials). In the instrumental conditions, participants frequently cited improved cleanliness as a motivating factor, $\chi^2(1, N = 552) = 65.74$, $p < .001$, though some also expressed concern that prolonged contact might increase contamination risk. This form of *contact aversion* was more prevalent in instrumental than ritual conditions, $\chi^2(1, N = 552) = 36.88$, $p < .001$. By contrast, participants in the ritual conditions more often justified their choices by appealing to the acted-upon option's special status, $\chi^2(1, N = 552) = 21.07$, $p < .001$, and were more likely to provide idiosyncratic justifications unrelated to instrumental outcomes, $\chi^2(1, N = 552) = 7.30$, $p = .007$.

Finally, a subset of participants explicitly referenced conformity or deference to the model's choice, particularly in the ritual conditions, $\chi^2(1, N = 552) = 10.90$, $p < .001$. This mirrors the

quantitative finding that public choice contexts (Block 2) selectively amplified preferences for ritualized options. A smaller number of participants reported deliberately choosing against their partner's choice without articulating a clear rationale (*unspecified contrarianism*), which occurred more frequently in ritual than instrumental conditions, $\chi^2(1, N = 552) = 5.42$, $p = .020$.

3. Discussion

Our results provide evidence that choice selection in our transmission paradigm is moderated by affiliative motivations. Specifically, when food choices were made publicly and participants had the opportunity to copy another individual's selection, preferences for ritualistically treated options were amplified by perceived model similarity. This pattern is consistent with predictions derived from the Bifocal Stance Theory (BST; et al., 2022a), which proposes that similarity functions as a conventionality cue that increases the likelihood that an action is interpreted as an affiliative marker through the lens of the ritual stance. In contrast, no evidence was found to support the complementary prediction that prestige serves as an instrumentality cue, as it did not alter choice behavior relative to a control model. This null effect deviates from our prediction that prestige primes expectations of instrumental learning from more technically competent models. One possible explanation is that the instrumental action sequences employed in the present design were not sufficiently complex to elicit a need for expert guidance (a possibility that is discussed in more detail below).

Moreover, the observed interaction between ritual action and model similarity in the public choice context aligns most closely with our predictions when contrasted with competing accounts of cultural selection (as outlined earlier in Table 1). For instance, we did not find support for a purely instrumental account assuming that prestige increases choice preferences for both ritual and instrumental options. Likewise, a role-focused account predicting that similarity preferentially enhances the selection of instrumentally useful traits, while prestige might promote affiliative engagement via ritual in order to facilitate later knowledge extraction from competent individuals, was also not observed. This suggests that the findings most closely match the view that affiliative motivations, rather than generalized or role-based instrumental expectations of hidden utility, guide cultural selection in this context.

Further support for this interpretation comes from the exploratory analysis of participants' open-ended responses. Participants in the ritual condition more frequently justified their choices in conformist and normative terms, such as expressing a desire to align with their partner's preference or to act in a socially appropriate way. These patterns complement the quantitative findings by showing that the selection of ritualized options was sometimes guided by explicitly social reasoning, rather than by instrumental considerations like utility or hygiene. Interestingly, instrumentally treated objects were not preferentially selected despite references to cleanliness appearing frequently in participant responses. This mismatch also challenges a purely instrumental account in which selection is guided by expectations of usefulness.

3.1. Prestige and the absence of instrumentality effects

In contrast to model similarity, neither a main effect of prestige nor an interaction between prestige and action type were observed. One plausible explanation is that the instrumental actions used in the current paradigm were too simple to warrant deference to expert opinion. The cleaning motions were perceptually obvious and easily interpretable, making goal inference relatively trivial. When the costs of inferring an actor's intentions are low, learners may rely less on social cues such as prestige and more on direct assessment of causal efficacy. This interpretation is consistent with previous work suggesting that the trade-off between goal inference and blind copying depends on task complexity (Lieder & Griffiths, 2020; Wu et al., 2022). When action sequences are complex and intentions are difficult to infer, learners may either invest cognitive resources to understand the action or

defer to socially informative cues. In simple tasks, however, the benefits of consulting prestige cues may be outweighed by the ease of independent evaluation. Future research that systematically varies task complexity could help determine whether prestige effects emerge only under conditions of increased inferential difficulty.

We also note that our model manipulation operationalized prestige via an indirect competence cue, consistent with the idea that learners rely on observable success signals outside the focal domain when direct "scoreboard" information is unavailable (Henrich & Gil-White, 2001). However, learners may preferentially weight prestige cues that are clearly diagnostic of the relevant performance domain when such a mapping is available (Brand et al., 2021). This preference could also explain why prestige did not reliably amplify preferences for instrumentally treated options in the present design: even if participants inferred broader competence (as suggested by our manipulation checks), they may not have treated the cue as sufficiently diagnostic for the specific choice context. Future work could therefore contrast domain-general versus domain-specific prestige cues by varying whether a model's apparent success is directly tied to the focal domain.

Additionally, different types of prestige cues likely matter for copying and selection too. Recent work has examined how children weigh cultural awareness and instrumental competence when deciding whether to imitate a demonstrated action or innovate an alternative solution (Minogue & Nielsen, 2026). This distinction maps closely onto the present contrast between ritualized and instrumental actions: instrumental actions should make technical competence especially relevant, whereas ritualized actions may make cultural awareness, affiliation, or norm-relevance more salient. Past work also distinguishes between competence-based and popularity-based forms of prestige (Birch et al., 2010; Chudek et al., 2012; Fusaro & Harris, 2008; Jaswal & Malone, 2007; Rakoczy et al., 2009), and those two routes may plausibly carry different downstream implications for social learners. A competence-based cue (as operationalized in the present design) should matter most when learners are trying to extract technically useful information. By contrast, a popularity-based prestige cue may be more tightly coupled to affiliation and norm psychology as a function of signaling what is socially appropriate (thus potentially favoring the adoption of ritualized options in socially evaluative contexts). An insightful next step for future research would therefore be to explicitly separate these pathways by orthogonally manipulating the prestige source (competence vs. popularity) and the task affordances (higher vs. lower difficulty) to further test whether prestige shifts selection toward instrumentally treated versus ritualized options.

3.2. Absence of replication and pandemic-induced avoidance

An important limitation of the present study is the failure to replicate the patterns of *sameness* and *specialness* judgments reported by Kapitány and Nielsen (2015, 2017). Contrary to these previous findings, instrumental actions increased perceived *specialness* in Block 1 (where choices were made privately) and reduced perceptions of *sameness* across both blocks. This pattern is inconsistent with the expectation that ritual actions increase perceptions of imbued symbolism while leaving perceptions of physical difference unchanged.

One possible explanation is that broader contextual factors influenced participants' perceptions in the present study. While Kapitány and Nielsen's data are now a decade old, our data were collected after the COVID-19 pandemic, a period when concerns about hygiene and disease transmission were highly salient. This timing may be relevant, as psychological responses are not necessarily invariant across historical contexts (Bronfenbrenner, 1977; Muthukrishna, Henrich, & Slingerland, 2021). Pandemics are known to activate the behavioral immune system and increase sensitivity to cues of cleanliness and contamination (Ackerman et al., 2021; Schaller & Park, 2011). Indeed, our explorative qualitative analysis lends tentative support to this interpretation given that participants frequently referenced cleanliness when defining *sameness* and *specialness*. Moreover, instrumental actions seemed to have elicited two opposing reactions: some participants interpreted cleaning motions as positive, signaling improved hygiene, while others viewed prolonged contact

between the actor and the object either as increasing contamination risk or a sign that the object might have been contaminated in the first place. This ambivalence suggests that pathogen concerns might have disrupted intuitive judgments of *sameness* and *specialness* in unforeseen ways. Interestingly, however, these disruptions did not translate into changes in selection: when choices were made publicly and modeled by another individual, ritual options were preferred regardless of pathogen-related reasoning. This dissociation indicates that social motivations may override perceptual biases induced by temporary concerns.

Nevertheless, the presence of pathogen avoidance suggests that future replications might benefit from using domains less directly associated with disease transmission. One such promising alternative might be the domain of clothing. Like food, clothing integrates instrumental and conventional dimensions, providing protection and insulation while also signaling social identity and status. Any domain that facilitates the emergence of affiliative and instrumental learning motivations is a suitable candidate for testing whether the current results generalize beyond the ones we report here.

3.3. Deliberation and conformism

The present findings also contribute to ongoing debates about whether stance adoption is driven primarily by fast and intuitive processing or by slower and reflective deliberation (Jagiello et al., 2022a; 2022b). Participants' verbal reports indicate that affiliative motivations were sometimes consciously articulated, with individuals explicitly stating that they deferred to their partner's preference. This suggests that stance adoption need not be purely automatic or associative, but can involve reflective reasoning and theory-of-mind processes. The selection task employed here may have facilitated such deliberation: compared to imitation paradigms, which require encoding and reproducing complex action sequences, selection tasks impose lower mnemonic demands and allow more time for conscious reflection. Under these conditions, slow, effortful cognitive processes associated with System 2 reasoning (Evans & Stanovich, 2013; Tversky & Kahneman, 1974) may play a larger role in guiding decisions. These observations raise the possibility that the cognitive mechanisms underlying stance adoption vary across task contexts. For instance, when time and resources are limited, stance adoption may rely more heavily on fast and intuitive processes but when demands are low and deliberation is possible, learners may engage in explicit social reasoning. Understanding how task structure modulates stance adoption is therefore an important avenue for future research.

The finding that participants deferred to a similar model's preference for ritual options also has implications for theories of ritual and conformism. Because rituals lack clear instrumental justification, their preservation depends on a learner's willingness to comply with social norms and replicate actions precisely. As such, rituals may function as *compliance training devices*, which are habituating individuals to follow group preferences even in the absence of causal justifications. While cognitive dissonance theories have emphasized the role of effort and justification in ritual-induced cohesion (Aronson & Mills, 1959; Whitehouse, 2018), this might constitute an additional mechanism whereby commitment to arbitrary action lowers the overall threshold for unquestioning conformism. Future designs might investigate whether exposure to ritualized content increases conformism in classic social psychology paradigms such as Asch's line judgment task (Asch, 1956). If exposure to causal opacity increases general compliance, individuals who engage in ritualistic imitation could become more likely to conform to group norms even in unrelated perceptual tasks. This would constitute another process through which rituals "pay their way" in the selective landscape of cultural evolution.

3.4. Conclusion

Our work provides novel insights into how social learners use contextual cues to select among competing cultural traits. By demonstrating that model similarity amplifies preferences for ritualistically treated objects in public choice contexts, the findings support the view that affiliative motivations

play a central role in cultural selection. These results challenge purely instrumental accounts of ritual transmission and align with BST's prediction that similarity signals conventionality. These advances also highlight the importance of studying cultural transmission as a process that involves both selection and imitation. While limitations remain, particularly regarding the possible influence of pathogen avoidance and task complexity, the present findings open new avenues for investigating how ritual, conformism, and social learning biases interact in cultural transmission and evolution.

Author contributions

Robert Jagiello: Conceptualization, Methodology, Data collection, Data analysis, Writing – original draft, Writing – review and editing. Harvey Whitehouse: Supervision, Conceptualization, Methodology, Writing – review and editing, Funding acquisition.

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Data and code availability statement

Both data and the code of the analysis are provided here: https://osf.io/pnr9v/

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