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Enhancing same-gender imitation by highlighting gender norms in Chinese pre-school children

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Children selectively imitate in-group over outgroup individuals under certain experimental conditions. We investigated whether this bias applies to gender in-groups in China. Three- and five-year-olds were shown how to operate novel objects by same-gender and opposite-gender models. Results indicate that the combination of verbally highlighting the gender identity of the model (e.g., 'I am a girl') and making gender norms explicit (e.g., 'girls play this way') significantly enhances high-fidelity imitation. This 'double social effect' was more robust in 5-year-olds than 3-year-olds. Our results underscore how language about gender and the norms for gender-based groups influence behavioural imitation. The pattern of findings enhances our knowledge about pre-schoolers' social learning and imitation as well as the powerful influence of language and group norms on children's voluntary actions and learning.

Statement of contribution

What is already known

- Children preferentially attend to and copy in-group models in certain situations.
- These social preferences have been reported for same-gender versus other-gender models.

What the present study adds

- First test of same-gender imitation with and without linguistic statements about gender-specific norms.
- Conjoint emphasis on both gender identity and gender-norms significantly enhances own-gender imitation.
- This 'double social effect' is stronger in 5- versus 3-year-olds, in line with theorizing about social norm development.

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Background

Human cultural evolution is driven by the transmission of both instrumental skills and conventional knowledge within and across generations (Legare & Nielsen, 2015). Central to cultural evolution is learning based on observation or interaction with other people, commonly referred as social learning (Tomasello, 2016). Critically, children do not imitate all the behaviours they see performed by others indiscriminately, but rather, govern who, when, and what they imitate (Meltzoff & Marshall, 2018). Social factors that modulate children's imitation are of interest to developmental theories in general and to theories of social learning and imitation in particular.

It has been documented that so-called 'collectivist' cultural groups tend to display stronger conformist tendencies than 'individualistic' cultural groups (e.g., Toelch, Bruce, Newson, Richerson, & Reader, 2014). Recent developmental evidence suggests that Asian children may be more sensitive to cues about social groups than Western children. For example, in experiments in which a single adult demonstrated a behaviour that was inefficient (or ineffective), and a viable option was available, neither Asian nor Western children strongly conformed; however, the conformity rates of Asian children, but not Western children, significantly increased when the same behaviour was demonstrated by a consensus group (Corriveau et al., 2017; Corriveau & Harris, 2010; Corriveau, Kim, Song, & Harris, 2013; DiYanni, Corriveau, Kurkul, Nasrini, & Nini, 2015). This is likely driven by the tendency of Asian cultures to explicitly identify and emphasizing group memberships and relationships (Barragan, Brooks, & Meltzoff, 2020; Taras, Kirkman, & Steel, 2010) and to highlight and value similarities among group members (Hofstede & McCrae, 2004). In line with this, it has been documented that Asian cultures tend to have many strong social norms (termed 'tight' cultures) and treat non-conformity as a form of social deviance in comparison to 'loose' Western cultures (Gelfand et al., 2011).

We employed a previously established paradigm of over-imitation (Hoehl et al., 2019; Wang & Meltzoff, 2020) to examine the effect of heightened social cues on children's imitation of non-efficient actions in Chinese children. Specifically, we examined the degree to which an own-gender model coupled with a linguistic affirmation of gender norms (e.g., 'girls play this way') would influence children's high-fidelity imitation of causally unnecessary, novel acts that were not needed to reach an instrumental end but were demonstrated by a model. Our findings provide insights into how generic language about social groups and group norms can influence children's high-fidelity imitation and in so doing advances theories about language, categorisation, and social learning and development in early childhood.

Social bias and preferences

Pre-schoolers' imitation is selective in a variety of ways. For example, they show preferential imitation of an adult who has received favourable treatment rather than an adult who was the target of prejudice (Skinner, Olson, & Meltzoff, 2020). Children's imitation has also been shown to be increased if a model speaks a native versus foreign language (Howard, Henderson, Carrazza, & Woodward, 2015; Kinzler, Shutts, & Correll, 2010) or speaks with a foreign accent (Kinzler, Corriveau, & Harris, 2011).

The gender of people is one of the earliest and most salient social categories for young children (e.g., Martin, Ruble, & Szkrybalo, 2002; Quinn, Yahr, Kuhn, Slater, & Pascalis, 2002; Serbin & Sprafkin, 1986; Slaby & Frey, 1975). From about 12 months of age, children distinguish male from female faces (Leinbach & Fagot, 1993) and from as early as

18 months of age, children can perceptually differentiate stereotypical male and female artefacts (Serbin, Poulin-Dubois, Colburne, Sen, & Eichstedt, 2001). By 2 years of age, they start to identify and label their own gender (Campbell, Shirley, & Caygill, 2002; Stennes, Burch, Sen, & Bauer, 2005).

Experiments combining both implicit and explicit measures demonstrate that 4.5- to 5-year-old children show robust in-group favouritism based on gender, such that both girls and boys show significantly stronger positive attitudes towards others who are 'like me' (Meltzoff, 2007) based on gender (Cvencek, Greenwald, & Meltzoff, 2011, 2016). In line with this, Taylor (2013) found that 4- to 7-year-olds showed stronger preference towards a same-gender model over an opposite-gender model in studies of selective trust, in which children decided whom to consult when naming objects and in judging who was better at a task. Similarly, young children are also likely to follow same-gender models' choices of toys, activities, clothes (Shutts, Banaji, & Spelke, 2010), and food (Frazier, Gelman, Kaciroti, Russell, & Lumeng, 2012). Children also rapidly acquire gender-linked norms (Martin, Wood, & Little, 1990) and are sensitive to violations of these norms such that they negatively evaluate and devalue non-conformity of gendered norms (Giles & Heyman, 2005; Poulin-Dubois, Serbin, Eichstedt, Sen, & Beissel, 2002; Ruble, Martin, & Berenbaum, 2006).

Motives and high-fidelity imitation in an over-imitation paradigm

As children age, they become increasingly inclined to replicate entire action sequences modelled to them, including redundant or counterproductive components at the expense of task efficiency, which has been dubbed 'over-imitation' (Lyons, Young, & Keil, 2007). This phenomenon has generated a large body of associated research (for a review, see Hoehl et al., 2019). By pre-school age, children will over-imitate even though they verbally acknowledge that such actions are unnecessary (Kenward, 2012) and in competitive conditions resulting in them losing desirable rewards (Lyons, Damrosch, Lin, Macris, & Keil, 2011). Increasingly, studies have been devoted to testing over-imitation in diverse populations. For instance, studies conducted in South Africa and Botswana (Nielsen & Tomaselli, 2010), Vanuatu (Clegg & Legare, 2016), Japan (Taniguchi & Sanefuji, 2017), and China (Wang & Meltzoff, 2020; Wang, Zhu, Fong, Meng, & Wang, 2020) have demonstrated that children's propensity for over-imitation is not limited to Western cultures.

It was originally proposed that over-imitation is automatic (e.g., Lyons et al., 2007), but more recent findings indicate several conditions that modulate over-imitation. There are many situations in which children omit redundant and irrelevant acts and directly and efficiently duplicate the instrumental outcome by leaving out or skipping over novel and unnecessary actions en route to the goal. For example, in Clegg and Legare (2016), children replicated irrelevant actions as part of making a bead necklace (e.g., using each bead to touch the forehead before stringing it on the necklace) only when the task was coupled with normative framing (e.g., the statement that 'everyone here always does this'). Similarly, it has been reported that children tend not to over-imitate when the demonstrator is a puppet (McGuigan & Robertson, 2015), when the demonstrator is absent (Nielsen & Blank, 2011), when a more efficient approach has been shown to them (Schleihauf, Pauen, & Hoehl, 2019), when the efficient approach has been experienced through prior self-action (Wang & Meltzoff, 2020; Williamson & Meltzoff, 2011), or even when the demonstrator has previously displayed anti-social behaviours (Wilks, Kirby, & Nielsen, 2019). Indeed, children's decision about whether to imitate causally irrelevant

acts in a high-fidelity manner (over-imitation) versus directly achieving the causal outcome in an efficient way is now thought to be context dependent, and governed at least in part, by cues that inform the child to attend to social conventions (Krieger, Aschersleben, Sommerfeld, & Buttelmann, 2020; Legare, Wen, Herrmann, & Whitehouse, 2015). Without the appropriate framing, pre-schoolers often tend to re-enact the more efficient way of obtaining a causal outcome instead of duplicating an inefficient way (i.e., by repeating the causally unnecessary actions).

One prevailing view is that duplication of the causally unnecessary actions in the over-imitation paradigm is motivated by social affiliation and conformity to social norms (Nielsen, 2018; Over & Carpenter, 2012). At a broader theoretical level, it has been theorized that imitation functions to enhance the social relationship between two individuals because each perceives another as 'like me' – acting in a way that reflects a similarity or equivalence between the two (Meltzoff, 2007). In line with this view, Wood, Kendal, and Flynn (2013) reported that children show heightened imitation of models who resemble themselves and brain studies have uncovered specific neural responses in the child's brain when they see others act like them (Saby, Marshall, & Meltzoff, 2012).

Current study

There is increasing interest in examining the interplay between the social (e.g., group memberships) and instrumental (e.g., task efficiency) factors that prompt and support children's over-imitation. So far unexamined is the potential role of gender-related norms and gender identity in modulating this behaviour. If a boy is given information that boys tend to do behaviour-X, will this heighten their imitation of behaviour-pattern-X, even if it consists of unnecessary actions and when an obviously more efficient alternative is shown? If so, what is the required context to maximize such gender-based responses?

Researchers have reported increased attention and imitation of same-gender adults (e.g., Grace, David, & Ryan, 2008), but such work should not be assumed to be generalizable to the case of over-imitation of causally irrelevant acts or to non-WEIRD (Western Educated, Industrialized, Rich, Democratic; Rad, Martingano, & Ginges, 2018) populations. Further, this previous work did not assess the potential differences between types and levels of gender cues.

Here, we investigated these questions by systematically increasing the salience of gender through three experimental manipulations: (1) same-gender models (with no verbal cues) versus (2) same-gender modelling with the addition of explicit gender labelling (e.g., the model saying 'I am a boy') versus (3) the further addition of linguistically stated gender norms ('boys play like this'). We chose to focus on gender and gender norms because they have far-reaching sequelae in children's social-cognitive and academic development, not only for behavioural imitation, but farther downstream for academic stereotypes and interests concerning which gender is normatively associated with which school-related discipline/characteristic. Three prominent examples are children's gender-related beliefs about which gender is more associated with 'brilliance' (Leslie, Cimpian, Meyer, & Freeland, 2015), math (Cvencek, Meltzoff, & Greenwald, 2011), and STEM (Master & Meltzoff, 2020).

In line with previous studies of pre-schoolers' imitation (Clegg & Legare, 2016; Corriveau et al., 2017; DiYanni et al., 2015), we expected to find significantly greater high-fidelity imitation of unnecessary/novel acts when social cues were strongest – which in the context of this study means that when *both* gender identity and gender norms were highlighted. We also designed the study during a developmental window which might

show age-related differences. We targeted 3- and 5-year-olds because several studies have reported age-related changes in over-imitation during this period (e.g., McGuigan & Robertson, 2015; McGuigan, Whiten, Flynn, & Horner, 2007). Moreover, although children begin to verbally express certainty about their own gender by 3 years of age (Thompson, 1975) – and thus even our youngest group should be cognizant about gender categories – it has been suggested by Clegg and Legare (2016) that children's imitation begins to be influenced by social conventional cues more solidly at about 5 years of age than at 3 to 4 years of age. Taking all this together, we targeted at 3- and 5-year-olds and expected a stronger effect of the gender norm manipulation within 5-year-old children.

EXPERIMENT 1

METHOD

Participants

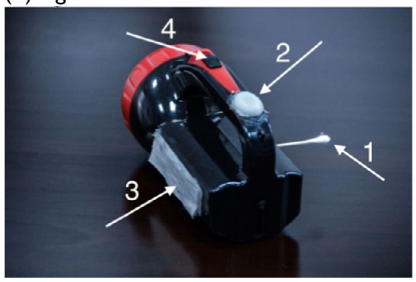
Participants were recruited through a local school situated in a medium city in eastern China. All accessible children who had expressed interest were tested in a quiet room within the school. The sample was comprised of 123 3-year-olds (M = 42.39 months, SD = 3.05 months, 62 males) and 148 5-year-olds (M = 64.24 months, SD = 4.67 months, 73 males; see Table S1, for full age distribution). A post hoc power analysis indicated that this sample size provided a 94.40% chance of detecting a medium sized effect (f = 0.25, α = .05). All children were from middle-class socioeconomic backgrounds and of Han ethnicity. The experimental protocol was reviewed and approved by Jiangsu Normal University. All children received stickers for their participation.

Materials and procedure

All testing was undertaken with two experimenters (a male and a female) sitting opposite the child, such that one adult matched the child's own gender and one did not. Over a series of four trials, children were presented with four novel objects and shown how to operate each of them. For each trial, the same-gender model demonstrated using a series of three unnecessary actions followed by one necessary action for achieving the goal (see Table 1). None of the three unnecessary acts depended on each other and none was needed for achieving the outcome (e.g., retrieving the object from the container). To achieve the outcome, only the fourth action was necessary (this series of three unnecessary actions was termed the 'inefficient' method). The opposite-gender experimenter directly demonstrated only the final outcome act that produced the desirable result (hence was termed the 'efficient' method). Thus, we used a paired-comparison between two models to pit direct imitation of an efficient/instrumental act versus imitation of an *in*efficient series of acts, see Krieger, Möller, Zmyj, and Aschersleben (2016) for a similar methodological strategy. In this Experiment 1, the same-gender model always performed the inefficient approach, but in the next experiment this was systematically varied, as described in Experiment 2.

Presentation order of the objects and the experimenters were counterbalanced across subjects. Test sessions were recorded using a video camera. Both models maintained neutral facial expressions and minimal eye contact with the participants throughout the entire session. Children were randomly assigned to one of four independent test groups, as described below. For ease of communication, we describe the behaviour of the same-gender model in detail.

Table 1. Four experimental objects (A-D), along with corresponding unnecessary/novel and outcome acts [Colour table can be viewed at wileyonlinelibrary.com]

Object	Action type and sequence
(A) Container 	Unnecessary/Novel acts: 1. *lift* handle 2. *press* top brown button 3. *rotate* white side cylinder shape Outcome act: 4. lift open to retrieve toy inside
(B) Light 	Unnecessary/Novel acts: 1. *remove* white cotton swab 2. *apply* index finger to white cap 3. *unpeel* white Velcro from side Outcome act: 4. push black button to turn on light
(C) Canister 	Unnecessary/Novel acts: 1. *touch* tool to lid 2. *move* up silver lever on side 3. *press* white toggle switch on front Outcome act: 4. lift open to retrieve toy inside
(D) Doorbell 	Unnecessary/Novel acts: 1. *brush* doorbell object with tool 2. *squeeze* & *remove* clip 3. *press* button on right side Outcome act: 4. push panel to activate doorbell

Group 1: Demo + gender + norm

In this group, we made it highly salient that the gender of the experimenter matched the gender of the child and *also* that the modelled behaviours were gender normative. For example, depending on the gender of the child (and counterbalancing), the experimenter who was the same-gender as the child brought out the first object and said, 'I am a boy/girl; boys/girls play this way', and then, he/she demonstrated a series of four distinctive acts, including the *three unnecessary/novel acts* and then *one outcome act*. Following this (counterbalanced in order within the group), the other experimenter who was the opposite gender of the child said, 'I am a girl/boy; girls/boys play this way', and then performed only the outcome act and efficiently acquired the desired goal. The child was then given a turn to operate the object in any way he/she liked and was given a maximum of 30 s to do so (this response period duration was identical for all groups). The object was then removed from the table and the procedure was repeated for the remaining three objects.

As a manipulation check at the end of the session, children were asked two simple questions to confirm their understanding of gender categories: 'Are you a boy or a girl?' and 'Which one of us is a boy and which one is a girl?'

Group 2: Demo + gender

The procedure was identical to that used for the Group 1 except that the explicit normative expression 'boys/girls play this way' was not used. Before the demonstration, the models only said, 'I am a boy/girl'. The goal was to examine whether activating gender in-group alone (without the explicit marking of a gender-related norm) was sufficient to induce children to imitate the series of unnecessary/novel actions of the same-gender model.

Group 3: Demo-only

The procedure was the same as Group 2, except that the models demonstrated the actions without saying anything. The purpose was to examine the degree to which children would imitate the unnecessary/novel actions of the same-gender model without activating either gender in-group or gender-related norms.

Group 4: Baseline (no demo)

In this group, children received no demonstration. Both male and female experimenters were present, just as in the other groups. Each of these experimenters presented children with two of the four objects (with order of objects and experimenter's gender counterbalanced). The goal was to assess what children did spontaneously with the objects.

Response period

The response period for all four groups was the same. Children were presented with the object, and their responses video-recorded for a 30-s response period, which was subsequently scored. Neither verbal nor non-verbal feedback was given during this period. Children were given the same mild praise (e.g., 'well done') at the end of each task regardless of their response.

Coding and dependent measures

The child received a score of 1 if he or she reproduced the *outcome act* for each of the four objects (whether or not they actually retrieved the toy from the container). Thus, the total scores ranged from 0 to 4. Most important to the issues under test, we also measured children's tendency for producing high-fidelity imitation of the unnecessary/novel acts. Coders assigned one point for each *unnecessary/novel* act imitated. Thus, the total score for the high-fidelity (unnecessary/novel) imitation for each child ranged from 0 to 12 (three *unnecessary/novel* acts for each of four test objects, see Table 1).

In order to assess reliability, a research assistant who was blind to the study aim, design, and hypotheses scored a random 20% of the sample. The coders achieved 100% agreement for the outcome act scores (Cohen's kappa = 1.00). There was also high agreement for the unnecessary/novel acts scores, Cohen's kappa = .95, $p < .001$.

RESULTS AND DISCUSSION

All children passed the two gender manipulation check questions; thus, no data were excluded. Preliminary analyses showed no significant effects of presentation order; we also confirmed that males and females were similarly likely to imitate the same-gender model (see Table S2). Thus, we collapsed across these factors in subsequent analyses. Below, we first report the data for the reproduction of the outcome act and then the data for the reproduction of the series of unnecessary/novel acts. For a complete list of mean scores, *t*-test values and effect sizes for post hoc follow-up tests, see Supporting Information.

Outcome act

We employed a 2 (Age: 3- vs. 5-year-olds) × 4 (Test Groups: 1–4) analysis of variance (ANOVA) on the outcome act measure. Results revealed a main effect of Age, $F(1, 263) = 11.05$, $p = .001$, partial $\eta^2 = .04$, with 5-year-olds ($M = 3.61$, $SD = 0.90$), producing more of the outcome acts than the 3-year-olds ($M = 3.28$, $SD = 1.13$). Similarly, there was a main effect of Test Group, $F(3, 263) = 67.48$, $p < .001$, partial $\eta^2 = .435$, with significantly lower scores in Baseline ($M_{\text{Baseline}} = 2.36$, $SD = 1.36$) than the other three groups, which all approached ceiling ($M_{\text{Demo+gender+norm}} = 3.79$, $SD = 0.60$, $M_{\text{Demo+gender}} = 3.83$, $SD = 0.42$, and $M_{\text{Demo-only}} = 3.91$, $SD = 0.28$; Tukey pairwise comparisons vs. Baseline control, ps $< .001$). This pattern of results shows, as expected, that children in each of the three demonstration groups (Groups 1–3) were highly likely to imitate the outcome act, as indicted by the fact that they performed it significantly more often than did children in the Baseline group (Group 4). There was also a significant Age × Test Group interaction, $F(3, 263) = 3.55$, $p = .015$, partial $\eta^2 = .04$, driven by significantly higher scores within 5-year-olds ($M = 2.74$, $SD = 1.37$) versus to 3-year-olds ($M = 1.91$, $SD = 1.23$) only within Baseline group ($p = .010$). We conjecture that this reflects a greater cognitive ability within older children to achieve the outcome independent of any demonstration.

Unnecessary/Novel acts

For our key experimental test, we employed a 2 (Age: 3- vs. 5-year-olds) × 4 (Test Group: 1–4) ANOVA to analyse the reproduction of unnecessary/novel acts. Results revealed no

significant main effect of Age, $F(1, 263) = 2.95, p = .087$, partial $\eta^2 = .011$. As predicted, there was a highly significant main effect of Test Group, $F(3, 263) = 18.54$, $p < .001$, partial $\eta^2 = .175$. Follow-up Tukey tests showed that there were significantly more of the unnecessary/novel acts produced in the Demo + gender + norm group ($M = 7.89$, $SD = 3.42$) compared to each of the other three groups (respectively: Demo + gender, $p = .007$; Demo-only, $p < .001$; Baseline, $p < .001$). Children in the Demo + gender group ($M = 6.11$, $SD = 3.42$) re-enacted significantly more of the unnecessary/novel acts than those in Demo-only ($M = 4.69$, $SD = 3.72$; $p = .043$) and Baseline ($M = 4.13$, $SD = 1.70$; $p = .002$). There was no significant difference between the Demo-only and the Baseline ($p = .720$).

There was also a significant Age × Test Group interaction, $F(3, 263) = 2.80, p = .041$, partial $\eta^2 = .031$. Follow-up tests indicated that this was attributable to the fact that 5-year-olds ($M = 9.03$, $SD = 3.29$) had significantly higher imitation scores for the unnecessary/novel acts than the 3-year-olds ($M = 6.61$, $SD = 3.15$) only in the Demo + gender + norm group ($p = .003$). No significant differences were found between 3- and 5-year-olds in any of the other groups (ps > .300; Figure 1). In the general discussion, we examine the idea, which has also been raised by Clegg and Legare (2016) and is in line with Cvencek, Greenwald, et al. (2011) and Cvencek et al. (2016), that 5-year-olds may be more sensitive than younger children to normative information about how their in-group (in this case others of their own gender) are expected to act.

The results revealed that a demonstration that incorporated verbal cues highlighting gender identity (e.g., 'I am a girl') and marking gender norms (e.g., 'girls play this way') significantly enhanced the re-enactment of unnecessary/novel acts: That is, Group 1 (especially the 5-year-olds in this group) had the highest scores. We label this the *double social effect*, because the most significant effect derives from the fact that the model is *both* highlighting gender and stating gender norms. Our confidence in the effect is high, because it was charted across multiple test groups (the experimental groups

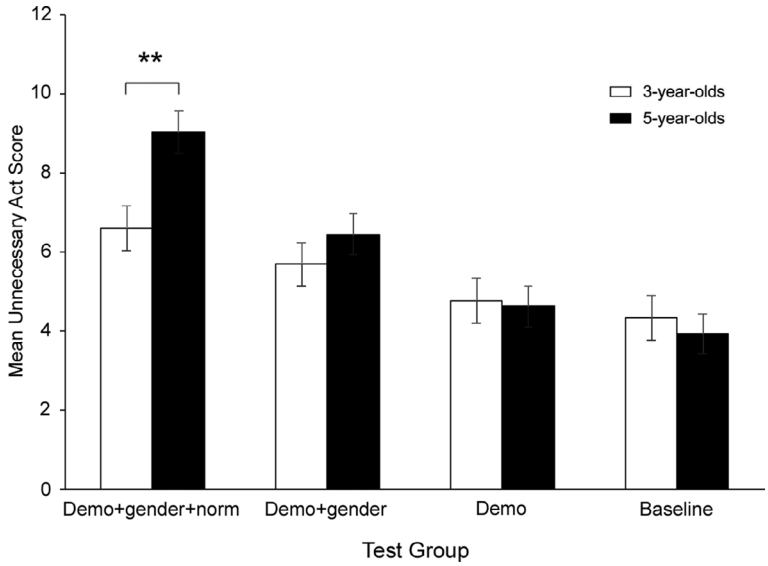


Figure 1. Mean number of unnecessary/novel acts for 3- and 5-year-olds across four test groups. Significant difference as a function of age, $^{**}p < .01$, error bars show ± 1 *SE*.

systematically increased from no gender labelling, to gender labelling alone, to gender labelling + gender norms) and yielded a very systematic effect (see Figure 1), using a large sample size (exceeding the conventional size in developmental psychology). However, a possible limitation of the study is that the inefficient series of actions was always shown by a same-gendered model. We thus conducted Experiment 2 in which we had the opposite-gender model showed the inefficient series of actions.

EXPERIMENT 2

In this experiment, Group 1 was identical to Experiment 1, Group 1. This was done to assess whether the key effect would replicate. We also added a new, independent control group. In this new group, the opposite-gender adult presented the inefficient method (i.e., the series of causally ineffective/novel actions). This was done to assess whether children would produce the same level of high-fidelity imitation of the causally ineffective/novel actions if they were produced by the opposite-gender model in this paradigm as they do when these actions are produced by the same-gender model. Because the key effect was found 5-year-olds, we used this age group in this experiment.

METHOD

Participants

Participants were recruited through a local school situated in a medium city in eastern China. To closely match the cell size of Experiment 1 (and facilitate comparisons across the studies), 64 new 5-year-old children (30 males; $M = 64.48$ months, $SD = 3.29$ months) were tested in this experiment. An independent sample t-test confirmed that there was no age difference between the 5-year-olds used in Experiment 1 and in Experiment 2, $t(210) = 0.38$, $p = .708$. As in Experiment 1, all children were from middle-class socioeconomic backgrounds and of Han ethnicity. Children were randomly assigned to the two experimental groups, preset to have equal numbers of children per group ($n = 32$), with order of objects and experimenter's gender counterbalanced within groups. The procedure for the two groups is described below.

Procedure

Group 1: Same-gender, demo inefficient + gender + norm

This first group constituted a replication attempt of our Group-1 'double social effect' in 5-year-old children. All procedures and linguistic cues were the same as described in Experiment 1, Group 1. As before children were presented with a pair of adult experimenters, one from each gender. The adult who was the same gender as the child demonstrated the *in*efficient method for obtaining the goal (*three unnecessary/novel acts* and then *one outcome act*) while identifying their own gender (e.g., for female participants, a female experimenter said, 'I am a girl') and also stated the gender norm (e.g., 'girls play this way'). The opposite-gender model demonstrated the *efficient* method to obtain the goal (*only the outcome act*) while identifying their own gender (e.g., 'I am boy') and the gender norm (e.g., 'boys play this way'). We expected that children in this group would produce responses that were similar to that found in Experiment 1. For shorthand, we refer to Group 1 as the 'Same-gender inefficient' group.

Group 2: Opposite-gender, demo inefficient + gender + norm

Procedures were similar to those in Group 1, except for one crucial change: The two gendered models switched their respective demonstrations. The opposite-gender model now demonstrated the *inefficient* method, and the same-gender model demonstrated the *efficient* method to acquire the goal. For shorthand, we refer to Group 2 as the 'Opposite-gender inefficient' group.

Coding and dependent measures

Children's responses were scored in the same way as in Experiment 1. A second coder scored a random 20% of the sample. The coders achieved 100% agreement for the outcome act scores (Cohen's kappa = 1.00). There was also high agreement for the unnecessary/novel acts scores, Cohen's kappa = .98, $p < .001$.

RESULTS AND DISCUSSION

Consistent with Experiment 1, for the reproduction of the outcome act there was no significant difference between the Group 1 ($M = 3.97$, $SD = 0.18$) and Group 2 ($M = 3.91$, $SD = 0.30$), $t(62) = 1.03$, $p = .309$. More importantly, and as expected, the children in Group 1 (Same-gender inefficient) produced significantly more of the unnecessary/novel acts ($M = 8.53$, $SD = 3.03$) than those in Group 2 (Opposite-gender inefficient; $M = 1.13$, $SD = 2.11$), $t(62) = 11.36$, $p < .001$, $d = 2.83$ (Figure 2).

These findings support the view that children will produce high-fidelity imitation of unnecessary/novel behaviour of an in-group model (in the context of our study, gender).

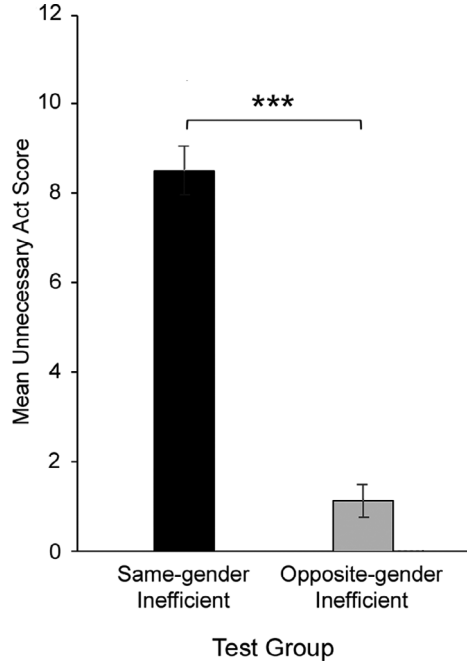


Figure 2. Mean number of unnecessary/novel acts in the two test groups of Experiment 2. ***$p < .001$, error bars show ± 1 *SE*.

More specifically, in Experiment 2 we showed that when the inefficient series of actions was exhibited by the *same*-gender model (Group 1), the children reproduced these behaviours at significantly higher levels compared to when those same behaviours were produced by the *opposite*-gender model (Group 2). Importantly, we also successfully replicated the high level of responding in the critical cell in Experiment 1. As predicted, there was no significant difference in the imitation of the unnecessary actions between the 5-year-olds in Experiment 1: Group 1 (M = 9.03, SD = 3.29) and Experiment 2: Group 1 (M = 8.53, SD = 3.03), $t(65) = 0.64$, $p = .523$, which makes sense because the second experiment directly replicated the procedures used in the first one. In both cases, the same-gender model demonstrated the inefficient approach and used verbal cues to highlight gender and norms, and in both cases, the children produced a high number of the unnecessary/novel acts. That is, they engaged in high-fidelity imitation.

GENERAL DISCUSSION

We investigated social influences on imitation among 3- and 5-year-old children, in the context of gender in-group and gendered norms. Experiment 1 tested imitation of two different types of acts (instrumental outcome acts vs. unnecessary/novel acts) under three different experimental conditions plus a baseline. Intriguingly, despite high rates of producing the instrumental outcome act in all three experimental groups, children's tendency to perform *high-fidelity imitation of the unnecessary/novel acts* varied significantly as a function of the social cues presented. Our findings of Experiment 1 suggest that linguistically labelling that the adult is the same gender as the participant (e.g., 'I am a girl') and verbally noting gender-related norms ('girls play like this') amplifies the social value of the demonstration and elicits increased high-fidelity imitation of the unnecessary/novel actions, perhaps for social reasons (as discussed below).

In the group that only experienced the demonstration without labelling either the demonstrator's gender or of the gender norms (Experiment 1, Group 3), high-fidelity imitation of the unnecessary/novel acts was low; indeed, children's imitative decisions about doing these acts were not significantly different from that of Baseline. Consistent with previous research (e.g., DiYanni & Kelemen, 2008), the Demonstration-only group tended to eschew the inefficient method in favour of an efficacious course of action to achieve the goal. Thus, without highlighting the gender of the demonstrator and the gender norms, children seemed to make judgments based on their intuitions about overall task efficiency and/or irrelevant aspects of the display rather than fully conforming to the details of what the same-gender model did.

This pattern of results was altered when own-gender-membership of the demonstrator was verbally highlighted (Experiment 1, Group 2). Specifically, we found that verbally stating the gender of the person who was demonstrating, and thus making it salient that he/she belonged to the same-gender group as the participant, enhanced the imitation of the unnecessary/novel actions, perhaps because this activated in-group processing based on gender. Crucially, it was when the gender marking of the demonstrator was *coupled* with additional normative framing that we saw the highest level of high-fidelity imitation (Experiment 1, Group 1) – for example, not only 'I am a girl' but also 'girls play like this' – which was replicated with an independent sample of children in Experiment 2.

This supports the notion that normative framing adds significantly to children's high-fidelity imitation, perhaps by conveying that the learning instance was primarily about demonstrating a conventional norm (which presumably involved the performance of the

unnecessary/novel actions; Kenward, 2012). Combining these results with others about the power of normative framings (Clegg & Legare, 2016; Moraru, Gomez, & McGuigan, 2016), we speculate that coupling two social motivators – to affiliate with in-group members and to conform to group-specific norms – *amplifies the social value* of reproducing the modelled behaviours, even when they are causally unnecessary/novel, and thus enhances high-fidelity imitation of these arbitrary acts. Thus, we uncovered a kind of 'double social effect' (which was replicated with nearly identical levels of responding in Experiment 2).

The 'Double Social Effect'

The 'double social effect' (combining gender labelling + gender norms) was significantly stronger in 5-year-olds compared to 3-year-olds, which fits in with literature suggesting that conventional norms begin to have more influence in older rather than younger preschoolers (e.g., Clegg & Legare, 2016). Taken at face value, it suggests that 3-year-olds may not as readily integrate normative cues about the gender appropriateness of an action into their imitative learning judgements as the older children. Based on the current work and other studies on norms (e.g., Taylor, 2013), it seems that 5 years of age may be a period of heightening sensitivity for valuing and adhering to highlighted social norms. Relatedly, it is of interest that the youngest age demonstrating attitudinal positivity towards one's own-gender group (i.e., my *own-gender group = good*) using implicit and explicit measures has been 4.5 to 5 years of age (Cvencek, Greenwald, et al., 2011; Cvencek et al., 2016).

According to cognitive-developmental theories of gender, children first begin to develop a nascent understanding of gender stereotypes by around 3 to 4 years of age (e.g., Cox, Abramson, Devine, & Hollon, 2012; Liben, Bigler, Ruble, Martin, & Powlishta, 2002). Gender-stereotypic views are reported to become more rigid at about 5 to 6 years of age when children start to incorporate such understanding into their daily behaviours and cultural expectations about gender-related norms are being reinforced (Chrisler & McCreary, 2010; del Río, Strasser, Cvencek, Susperreguy, & Meltzoff, 2019; Serbin, Powlishta, Gulko, Martin, & Lockheed, 1993). This is a likely contributor to why we also obtained an age-related result and found the key effect within 5-year-olds but not 3-year-olds. It is, however, relevant to note that children seem to begin to display gender-stereotype flexibility by 7 years of age (Trautner et al., 2005), whereby gender-stereotypic bias can be attenuated by a large set of contextual factors and experiences (Martin et al., 2002; Master, Cheryan, Moscatelli, & Meltzoff, 2017). It would be worthwhile to investigate under what circumstances children with higher gender-stereotype flexibility choose to imitate a less-efficacious method when it is demonstrated by a same-gender model.

A potential more overarching account of the current findings is that societal expectancies about one's own social group, and acting in a way – even an arbitrary or conventional way – that fits with the norms for one's own social group, may become an important *social goal in itself* that can trump the efficient achievement of more instrumental goals (Meltzoff & Marshall, 2018; Over, 2020). By about 5 years of age and with increased social exposure, children may become increasingly selective about whom they want to affiliate with and imitate. They may begin to value social relationships, group identity, and norms even more than being efficacious at reaching an instrumental physical goal. In order to further explore this developmental idea, future research could include measures of prior social exposure (e.g., childcare attendance, outdoor activities involving social interactions, such as sport teams) and parental attitudes towards conformity or

autonomy (e.g., encouraging children following choices made by others vs. making independent choices).

Broader implications and future directions

By employing a previously established paradigm involving over-imitation, this study addressed the call for replicating previous research (Lindsay, 2015). Furthermore, we embedded a replication within our own work by re-testing the Experiment 1, Group 1 effect within Experiment 2. An added value of this work is that we studied participants in a non-WEIRD (not Western, Educated, Industrialized, Rich, and Democratic) culture. This addressed recent calls in psychology (Rad et al., 2018), and developmental psychology in particular (Nielsen, Haun, Kärtner, & Legare, 2017), that researchers should strive to gather data from a broader range of cultures than the Western ones, which have been used in the majority of published studies. We chose to test pre-schoolers from China, a traditional, east-Asian Chinese culture which contains almost one-fifth of the world's population – and this broadens our knowledge about children's imitation within a country in which children's social behaviour has rarely been studied using experimental methods (for exceptions see, Li, Liao, Cheng, & He, 2019; Wang & Meltzoff, 2020; Wang, Williamson, & Meltzoff, 2015; Wang et al., 2020).

At the same time, however, it should be noted that the children we tested were from middle socioeconomic (SES) families. Whether or not the current finding is generalizable to children from lower SES families remains uncertain. It has been reported that lower SES families tend to possess stronger gender-stereotypic views (del Río et al., 2019; Serbin et al., 1993). Hypothetically, in certain cultures, children from lower SES backgrounds might engage in more same-gender imitation of normative behaviour or do so with more minimal cues. Future research is needed to clarify whether the conjoint effect of gender labelling plus gender norms generalizes to non-Chinese samples and how children from diverse cultures and demographics respond to different levels of social group cuing and normative pressures.

This study also affords insights into the power of language, specifically generic normative language, in influencing children's social categorizations, decision-making, and imitative actions. It underscores how linguistic marking can shift children's decision of whom to learn from and imitate, even when the modelled behaviour is potentially idiosyncratic and not the most efficient way of doing things. Taking our results in conjunction with work on the effect of counter-stereotyping descriptions on children's toy preferences (King, Scott, Renno, & Shutts, 2020), there is convergence suggesting an important role of language in the development of a range of gender-related preferences and stereotypes (Rhodes, Leslie, Yee, & Saunders, 2019). Our findings build upon and extend the discovery that subtle, generic, simple linguistic cues strongly shape the development of social categorization (e.g., Rhodes, Leslie, Bianchi, & Chalik, 2018) by demonstrating how pre-schoolers' imitation systematically varies across experimentally manipulated levels of verbal cues (see also Loucks, Mutschler, & Meltzoff, 2017 for related work on the role of language on imitative behaviours).

Children are raised in cultures, and they may come to realize (either implicitly or explicitly) that many customs, conventions, and practices are motivated and sustained primarily because of their *social functions*, even when they do not aim to efficiently accomplish any particular instrumental physical goal (Legare et al., 2015; Meltzoff & Williamson, 2013; Over, 2020). Language is often used to mark such endeavours, and so, linguistic statements about social norms may come to have particular force for children.

Research has uncovered a range of social cues that figure into children's social categories and in-group norms (race, authority level, language, accent), which children use when deciding whose approach to adopt (e.g., Hoehl et al., 2019; Schleihauf & Hoehl, 2020). However, different social categories are rarely pit against each other in experimental studies. Which category children would prioritize when multiple, competing social markers are present within a social learning context, remains unknown.

The current pattern of findings underscores the value of future work comparing children's sensitivities about gender versus other social groupings as regards their readiness to learn, imitate, and conform to a range of culturally sanctioned behaviours, attitudes, and beliefs. Such work promises to yield insights into children's remarkable, perhaps uniquely human, flexibility, and adaptability in being reared in diverse cultural ecologies (e.g., Lee, Meltzoff, & Kuhl, 2020). Adults' use of language about both social identity and social norms – the *double social effect* reported here – may be more impactful than anticipated in influencing the developing minds and behaviour of children.

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Conflicts of interest

All authors declare no conflict of interest.

Author contribution

Zhidan Wang (Conceptualization; Formal analysis; Investigation; Methodology; Validation; Visualization; Writing – original draft; Writing – review & editing) Frankie T. K. Fong (Conceptualization; Formal analysis; Methodology; Validation; Visualization; Writing – original draft; Writing – review & editing) Andrew N. Meltzoff (Conceptualization; Formal analysis; Methodology; Supervision; Validation; Visualization; Writing – review & editing).

Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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Supporting Information

The following supporting information may be found in the online edition of the article:

Table S1. Age in Months, Mean Unnecessary/Novel Act Scores, and Number of Children by Experiment (E1, E2) and Test Group.

Table S2. Mean Unnecessary/Novel Act Scores for Males versus Females by Experiment (E1, E2) and Test Group, with Accompanying Statistical Values.

Table S3. Post Hoc Comparisons (Tukey) in Experiment 1 with Accompanying Statistical Values.