Watch me, watch you: ritual participation increases in-group displays and out-group monitoring in children

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Collective rituals serve social functions for the groups that perform them, including identifying group members and signalling group commitment. A novel social group paradigm was used in an afterschool programme ($N = 60$ 4–11-year-olds) to test the influence of participating in a ritual task on in-group displays and out-group monitoring over repeated exposures to the group. The results demonstrate that ritual participation increases in-group displays (i.e. time spent displaying materials to in-group members) and out-group monitoring (i.e. time spent looking at out-group members) compared with a control task across three time points. This study provides evidence for the processes by which rituals may influence children's behaviours towards in- and out-group members and discusses implications for understanding the development of ritual cognition and behaviour.

This article is part of the theme issue 'Ritual renaissance: new insights into the most human of behaviours'.

1. Introduction

Rituals are a pervasive feature of human social group activity that vary in complexity, intensity, and form within and across populations [1–6]. Examples of rituals range from elaborate religious ceremonies to secular rites of passage. Rituals are socially-stipulated conventions [7] that serve powerful functions for groups. These functions include identifying group members, demonstrating commitment to the group, facilitating cooperation with coalitions and maintaining group cohesion [8]. We define rituals as conventional, causally opaque procedures, uninterpretable from the perspective of physical causality because they lack an intuitive or observable causal connection between the specific action performed and the desired outcome or effect [7,9].

Engaging in a ritual allows individuals to determine group membership by visually distinguishing those who know the behaviours (the in-group) from those who do not (the out-group). Identifying in-group members allows individuals to determine who is likely to share their beliefs and values, and thus may be a trustworthy reciprocator. Rituals are hard-to-fake group-specific behaviours, often consisting of costly actions that symbolize group commitment [10]. Those who know the ritual rules and actions (the in-group) are easily distinguished from those who do not (the out-group). Thus, rituals serve as reliable signals to group membership. For example, Sosis & Ruffle [11] found that religious adult members of an Israeli kibbutzim were more likely to cooperate with other anonymous members of the kibbutzim if they had greater attendance at the communal prayer. Ritual actions also act as credible behavioural displays that signal adherence to in-group values and shared beliefs, leading to greater transmission and persistence of the shared values of a group among adults [12–14].

Individuals performing rituals demonstrate to other in-group members that they have competency in a shared behavioural repertoire of group-specific information. Engaging in a ritual allows individuals to determine group membership

by visually distinguishing those who know the behaviours (the in-group) from those who do not (the out-group). The lack of 'insider' knowledge of rituals associated with particular groups may help identify individuals who are out-group members and thus more likely to be free riders or competitors [15]. Thus, ritual group members should want to display their own knowledge of the ritual to other group members and should pay attention to any differing actions of potential out-group members.

Rituals have a number of social functions [8]. They provide shared experiences among group members, and thus provide a behavioural mechanism for social coordination and cohesion. There are several features of rituals that we hypothesize make them ideal candidates for increasing social group affiliation and cohesion. Rituals are socially scripted, are frequently accompanied by normative or conventional language and involve behavioural coordination or synchrony within groups [16–19]. Behaviours that are the product of individual-level innovation and done in the context of individual behaviour, we would argue, are habits. Here, we are interested in group-based collective rituals.

Recent work has demonstrated that the ability to identify and acquire rituals is early-developing [20–23]. Children acquire rituals through the process of imitation [24–28]. Furthermore, children are sensitive to whether rituals are demonstrated by in-group members and are more likely to imitate in-group members [29], particularly when faced with the threat of ostracism [30]. These findings point to an affiliative function of imitation; children imitate others in order to affiliate with in-group members [31,32].

What is the impact of ritual participation on children's social group cognition and behaviour? Recent research has demonstrated that participating in a ritual changes children's preferences and attitudes towards the in-group. Ritual participation increases self-reported preferences for in-group members above and beyond group membership alone. For example, children who participate in a collective ritual over a two-week period select the in- over the out-group when allocating privileges, retaining group identity markers and making group preference choices [33]. While this research provides evidence that children readily engage in and identify cues to rituals, there is a lack of experimental research examining the impact of ritual participation on children's behaviours towards group members.

The aim of the current study was to examine the extent to which ritual participation changes children's behaviours towards in- and out-group members over multiple exposures to a collective ritual. Studies examining both effects of minimal groups in children [34] and the limited studies on children's experience with group-specific rituals [30,35] typically use a single exposure to a minimal group. We aimed to examine behaviour—specifically, engagement, in-group displays and out-group monitoring—over multiple days of exposure to both a novel group and collective activities. To do this experimentally, children were placed in novel groups and participated in either a ritual necklace-making task or a matched control task. The purpose was to create a more ecologically valid experiment that more accurately represents children's actual experiences in a real social group and to empirically examine if any initial effects of ritual sustain over time.

Our first objective was to examine the impact of participating in a collective ritual on the extent to which children display

markers of group-specific information to other in-group members. To demonstrate in-group membership, we predict ritual participants will be vigilant at signalling their participation to other groups. While anthropological and psychological research on ritual as a group signal has predominantly sampled adult populations [11–14], information about whether children are sensitive to ritual as a cue to group membership is currently lacking. To measure signalling group membership, we used the time spent displaying group materials to in-group members. We predicted greater time spent displaying materials to in-group members in the ritual versus control condition and that this effect would sustain over time.

Our second objective was to examine whether engaging in a ritual increases attention to or monitoring of out-group members. We predict ritual participants will attend to the actions of the out-group in order to identify out- from in-group members. Children demonstrate in-group biases but do not consistently show out-group biases [33,36,37]. Changes in attitudes towards out-group members may depend on the type of social information (e.g. out-group members deemed as threatening) that is given to children [38–40]. Children's attitudes towards out-group members have typically been examined using self-report measures and scales of group preference and have primarily focused on ethnic or racial prejudice [39,41,42]. Previous research did not show evidence for changes in preferences for or bias towards out-group members after participating in a ritual; however, it is possible that examining this question using behavioural measures may provide a more comprehensive picture of interactions towards both in- and out-group members [33]. We predicted increased looking time at out-group members in the ritual versus control condition that would remain over time.

2. Method

(a) Participants

Sixty children (40% female, 60% male; M_{age} = 7 years, 3 months; range = 4 years, 2 months to 11 years, 5 months) were recruited at two afterschool programme locations in Austin, TX, USA. Most participants came from working-class families based on school district records (i.e. eligible for free or reduced-price lunch or other public assistance). The sample was ethnically diverse. See electronic supplementary material, table S1 for a detailed breakdown of demographic information by condition and location.

Sample size was determined prior to data collection via power analysis using a predicted effect size of $f = 0.4$. There is no precedent for looking at similar behavioural variables of interest with novel groups paradigms with children, so we chose a conventional sample size that is sufficient to detect a medium effect size. The power analysis suggested a sample size of 26 subjects per group, power = 0.80. We attempted to obtain consent for as many children from the locations as possible and collected data from all individuals for whom consent had been given, so as not to exclude children who wished to participate.

(b) Materials

Across conditions, yellow and green wristbands were used to demarcate novel social groups. We provided each child with a bag of materials including a yellow string, a green string, and 24 yellow, green, and orange beads. Each colour of bead included two star-shaped beads, two heart-shaped beads, two circular beads and two square beads.

(c) Procedure and coding

In a between-subjects design, children from two locations of the same afterschool programme participated in this study. Children were placed in novel groups and participated in either a ritual necklace-making task or a matched control task. The activity across conditions lasted 10 min, and was repeated six times over a two-week period.

One location participated in the ritual condition and another in the control condition. We ran each condition in different locations to ensure that children did not transmit information between conditions. The afterschool programmes were both run by the same company at the different sites. The curricula, structure of the daily activities and teacher training were identical across sites, ensuring equivalency between conditions. The locations were matched for ethnic diversity, sex and socioeconomic status. Across conditions, children were randomly assigned to either the yellow or green group.

In each condition, wristbands were introduced, 'In this programme, we have two groups of children, the green group and the yellow group! You are in the yellow [green] group. Each day you'll put this on to remind you that you are in the yellow [green] group and you'll take it off at the end of the day. Neither group is better than the other; there are just two separate but equal groups. Now each colour group is going to use their objects in the special way. I want the yellows to learn together over here, and the greens to learn together over there. Yellow group line up to get your objects, and green group line up to get your objects.' In each condition, children were presented with identical bags of beads and string.

Across conditions, children wore in-group coloured wristbands daily for two weeks. During this period, they participated in six social group activities of their in-group within their condition. A two-week time period was selected to allow for repeated exposure to the social group activity. In each condition, two confederate adult females (matched for age and ethnicity) acted as group leaders. The group leader was dressed in a yellow or green T-shirt and a corresponding yellow or green visor. In the ritual condition, the group activity was a ritual task (i.e. scripted group necklace-making task). In the control condition, the group activity was a non-scripted necklace-making task with the same materials.

(i) Social group activity

Across conditions, group leaders asked their group to sit in front of them on the corresponding coloured lines taped to the floor and passed out materials. In the ritual condition, the green group leader said, 'Okay green group, we are going to play with these beads in a special way, the way the green group does it! Watch what I'm doing!' [Picked up a green star.] 'First, hold up a green string. Then, touch a green star to your head. Then, string on a green star.' [Touched a green star to head and strung it on. Picked up a green circle.] 'Next clap your hands 3 times. Then string on a green circle.' [Clapped hands 3 times and then strung the green circle on. Picked up a green square.] 'Next, touch a green square to your head. Then, string on a green square.' [Touched a green square to head and strung it on. Picked up a green heart.] 'Next clap your hands 3 times. Then string on a green heart.' [Clapped hands 3 times and then strung the green heart on. Picked up a green star.] 'Next, touch a green star to your head. Then, string on a green star.' [Touched a green star to head and strung it on. Picked up a green circle.] 'Next clap your hands 3 times. Then string on a green circle.' [Clapped hands 3 times and then strung the green circle on. Picked up a green square.] 'Next, touch a green square to your head. Then, string on a green square.' [Touched a green square to head and strung it on. Picked up a green heart.] 'Next clap your hands 3 times. Then string on a green heart.' [Clapped hands 3 times and then strung the

green heart on.] 'Now, take the beads off and do it again!' [Removed beads from string and repeated ritual as scripted.] Children were asked to put away the beads and the bags were collected from them. 'Okay, we're all done! You did it the way the green group does it! Good job!' The scripted activity was done in synchrony with the children (i.e. verbal instructions were given and the children performed the instructed behaviours simultaneously with the group leader), was modelled twice per session, and took approximately 10 min to complete. See electronic supplementary material, table S2 for a detailed description of the scripted tasks by colour group. Children participated in this activity six times over a two-week period.

In the control condition, the leaders said, 'Okay yellow [green] group, we are going to play with these beads in a special way, the way the yellow [green] group does it!' [Children engaged in unstructured necklace making and bead stringing.] After 10 min, children were asked to put away their materials. 'Okay, we're all done! You did it the way the yellow [green] group does it! Good job!' Children participated in this activity six times over a two-week period.

Across conditions, children were allowed to interact with the materials during the group activity for 10 min. After the 10 min period, they were instructed to put all the materials back into their bags, which the group leader collected. Across conditions, the group leaders always supervised the group activity and children heard the word 'group' three times per session.

(ii) Coding

Each child's behaviour in their novel social groups was video-recorded and was coded by six independent coders using Data-vyu coding software. Different outcome measures collected with these same participants at the end of the six experimental days were previously published [33]. For the purposes of this study, we examined behaviour during (rather than after) the experimental days to assess change in behaviours across time. We chose to code the first, third and sixth (and final) group activities in order to examine behaviour across more evenly distributed but distinct time points (at the beginning, middle and end of the study). The first 4 min of each video was coded in order to assess behaviours during the start of the group activities. For all variables, we calculated the proportion of time spent performing any behaviour to maintain consistency across variables and time points. This was calculated as the sum of milliseconds spent doing each variable divided by the total amount of milliseconds the child's head was visible in the frame.

Engagement with in-group tasks. To measure children's engagement with in-group activities, we coded for the proportion of time children spent looking at task-related things. This was the sum of the total time spent looking at their own materials, at in-group peers, or at in-group leaders, divided by the total amount of time the child's head was visible in the frame. Onset of looking at their own materials began when the child looked towards their beads or string and ended when the child shifted focus elsewhere. Onset of looking at in-group peers began when the child looked at an in-group peer and ended when the child shifted focus. Onset of looking at in-group leaders began when the child looked at an in-group leader and ended when the child shifted focus.

In-group displays. To measure children's in-group displays, we coded for the proportion of time spent displaying group materials to an in-group member. This was the sum of the total time children spent making an intentional gesture to demonstrate their materials to an in-group leader or in-group peer divided by the total amount of time the child's head was visible in the frame. Onset of displaying to an in-group leader began when the child held up their materials to the group leader and ended when the child returned the materials to their lap or the floor. Onset of displaying to an in-group peer began when the child held up their materials to an in-group peer and ended when the child returned the materials to their lap or the floor. We collapsed the

proportion of time spent displaying across all in-group members (leaders or peers) because there was inevitable overlap with simultaneous displays to both.

Out-group monitoring. To measure children's awareness of the out-group, we coded for the proportion of time children spent looking at out-group members divided by the total amount of time the child's head was visible in the frame. Onset of this behaviour began when the child looked towards the out-group and ended when the child shifted focus towards a person or object in another category. At each site, the colour groups were seated with the children's backs facing the out-group, so looking at out-group members was a very salient motion (e.g. the child turning to look over their shoulder).

Interrater reliability. Six research assistants coded the behaviours and a seventh research assistant independently coded 26% of the dataset (39 of 149 files) for interrater reliability coding. Reliability between coders was calculated across 1 s time steps and the independent coder was in near-perfect agreement ($\kappa = 0.98$–1.00) with all six of the other coders.

3. Results

Multi-level linear regressions were performed to determine the effects of condition and time point on the average proportion of time children spent engaging in group tasks, in-group displays, and out-group monitoring. Random intercepts were included for each participant to account for multiple observations per participant. There were no predicted effects of age, sex, colour group, and the proportion of days wristbands were worn previously, but these components were retained in the model to control for any variance due to these factors. All analyses reported are two-tailed with $\alpha = 0.05$. We included descriptive statistics by individual time point in electronic supplementary material, table S3 and linear regressions by individual time point in electronic supplementary material, table S4. Additionally, exploratory analyses and descriptive statistics can be found in electronic supplementary material, tables S5 and S6.

(a) Engagement with in-group tasks

There was not a significant effect of condition on the average proportion of time spent engaged with in-group tasks. Children in the ritual condition did not spend a significantly different proportion of time engaged with in-group tasks ($M = 0.94$, s.d. $= 0.05$) from children in the control condition ($M = 0.94$, s.d. $= 0.06$). There was a main effect of sex, indicating that males spent a larger proportion of time engaged with in-group tasks ($M = 0.95$, s.d. $= 0.05$) than females ($M = 0.92$, s.d. $= 0.06$). There was a main effect of colour group, with the yellow group spending a larger proportion of time engaged with in-group tasks ($M = 0.95$, s.d. $= 0.05$) than the green group ($M = 0.93$, s.d. $= 0.06$). We did not have predictions about the effects of sex or colour group on engagement and these effects were not consistent across time points (see electronic supplementary material, table S4 for a breakdown by time point). There was no effect of age, proportion of days wristbands were worn, or time point (time 1, $M = 0.95$, s.d. $= 0.05$; time 2, $M = 0.94$, s.d. $= 0.05$; time 3, $M = 0.93$, s.d. $= 0.07$) (table 1).

(b) In-group displays

There was a significant main effect of condition on the average proportion of time spent displaying materials to an in-group member. Children in the ritual condition spent a larger proportion of time displaying materials to an in-

Table 1. Linear regression analyses for predictors of the average proportion of time participants spent engaging in behaviours of interest.

predictors	engagement with in-group tasks			in-group displays			out-group monitoring		
	β (s.e.)	p	95% CI	β (s.e.)	p	95% CI	β (s.e.)	p	95% CI
constant	0.90 (0.04)	<0.001	[0.82 to 0.98]	−0.01 (0.02)	0.710	[−0.05 to 0.03]	0.07 (0.02)	<0.001	[0.03 to 0.10]
condition (ritual)	−0.01 (0.01)	0.328	[−0.03 to 0.01]	0.01 (0.01)	0.043	[0.00 to 0.03]	0.02 (0.01)	0.002	[0.01 to 0.03]
time (versus time 1)									
time 3	−0.01 (0.01)	0.620	[−0.03 to 0.01]	−0.01 (0.01)	0.241	[−0.02 to 0.00]	−0.01 (0.01)	0.032	[−0.02 to 0.00]
time 6	−0.01 (0.01)	0.178	[−0.04 to 0.01]	0.00 (0.01)	0.692	[−0.01 to 0.01]	−0.01 (0.01)	0.025	[−0.02 to 0.00]
age (months)	0.00 (0.00)	0.537	[0.00 to 0.00]	0.00 (0.00)	0.957	[0.00 to 0.00]	0.00 (0.00)	0.080	[0.00 to 0.00]
colour group (yellow)	0.02 (0.01)	0.021	[0.00 to 0.04]	−0.01 (0.01)	0.148	[−0.02 to 0.00]	−0.01 (0.01)	0.339	[−0.01 to 0.00]
sex (female)	−0.03 (0.01)	0.007	[−0.05 to −0.01]	−0.01 (0.01)	0.102	[−0.02 to 0.00]	0.01 (0.01)	0.271	[0.00 to 0.01]
wristbands worn (proportion of days)	0.03 (0.03)	0.359	[−0.03 to 0.10]	0.03 (0.02)	0.069	[0.00 to 0.07]	−0.03 (0.02)	0.042	[−0.06 to 0.00]

group member ($M = 0.02$, s.d. $= 0.04$) than children in the control condition ($M = 0.01$, s.d. $= 0.02$). There was a marginal effect of the proportion of days wristbands were worn, but no effect of age, sex, colour group or time point (time 1, $M = 0.02$, s.d. $= 0.03$; time 2, $M = 0.01$, s.d. $= 0.02$; time 3, $M = 0.02$, s.d. $= 0.04$) (table 1 and figure 1).

(c) Out-group monitoring

There was a significant main effect of condition on the average proportion of time children spent looking at the out-group. Children in the ritual condition spent a larger proportion of time looking at the out-group ($M = 0.02$, s.d. $= 0.03$) than children in the control condition ($M = 0.01$, s.d. $= 0.02$). There was a main effect of time point where children were less likely to monitor the out-group in time 3 ($M = 0.01$, s.d. $= 0.02$) compared with time 1 ($M = 0.02$, s.d. $= 0.03$), as well as time 6 ($M = 0.01$, s.d. $= 0.03$) compared with time 1. There was a main effect of the proportion of days wristbands were worn, indicating children were less likely to monitor the out-group as they spent more days in the in-group. There was a marginal effect of age, but no effect of sex or colour group (table 1 and figure 2).

4. Discussion

This study provides novel evidence for how repeated experience with a collective ritual impacts children's behaviours towards in- and out-group members. Our data build upon previous research demonstrating that participating in a ritual increases children's self-reported in-group preferences [33] by providing behavioural evidence that ritual has social functions in the context of group activity.

Our first objective was to examine the impact of ritual on the extent to which children display markers of group-specific information to other in-group members. Children who participated in a ritual spent more time displaying their materials to the group leader and other members of the group than children in a free-play task, and this effect was sustained over time. This suggests that children in the ritual condition were more concerned with other group members' knowledge of their participation in and knowledge of the ritual task. These results are consistent with the proposal that collective rituals can signal one's group membership and convey evidence of group commitment [10]. In-group display is consistent with another function of ritual: to transmit group norms to new group members [12]. The behaviours found in rituals function as credibility enhancing displays or as honest signals of commitment to the beliefs and values of the group. This, in turn, increases the rate of adoption and maintenance of those beliefs in others and in future generations [13,14].

Our data provide evidence that participation in low cost rituals (i.e. limited investment of time, resources and effort) increases in-group display behaviour relative to a control condition that was carefully-matched for group experience across multiple time points. It is possible that these effects would be even stronger for costlier rituals. Previous research has demonstrated that the more costly rituals are, the more likely they are to signal displays of commitment to group values and intensify prosocial behaviours and attitudes [43–45]. Future research should systematically examine the impact of the costliness of ritual participation on display behaviour in children.
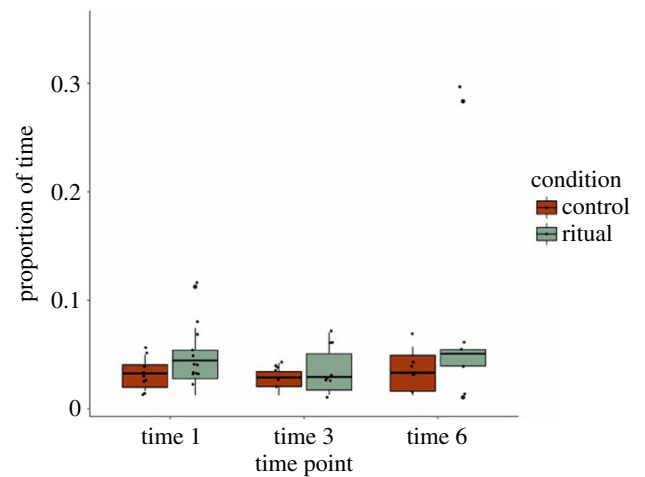
Figure 1. The box-and-whisker plots show the proportion of time spent displaying materials to in-group members by condition and time point. The boxes indicate the first and fourth quartiles (50% of all values in the group). The solid horizontal lines inside the boxes represent the medians. The solid vertical lines capture the location of extreme values, with the exception of outliers (shown as circles) that exceeded the inter-quartile distance by more than 1.5. (Online version in colour.)
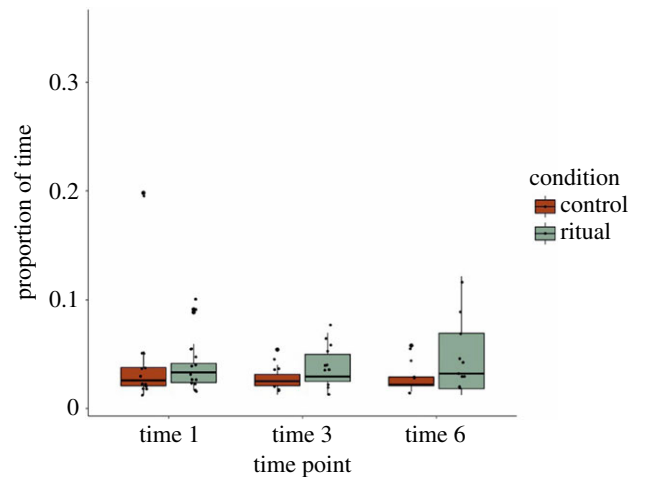
Figure 2. The box-and-whisker plots show the proportion of time spent monitoring out-group members by condition and time point. The boxes indicate the first and fourth quartiles (50% of all values in the group). The solid horizontal lines inside the boxes represent the medians. The solid vertical lines capture the location of extreme values, with the exception of outliers (shown as circles) that exceeded the inter-quartile distance by more than 1.5. (Online version in colour.)

Our second objective was to examine whether engaging in a ritual impacts attention to or monitoring of out-group members. Children in the ritual condition engaged in more out-group monitoring than children who participated in a free-play task, an effect that was sustained over time. The novelty of the scripted-task instructions in the ritual compared with the control condition may explain greater out-group monitoring initially (at the first time point), but is unlikely to explain why these conditional differences persist at later time points when the group activities are no longer novel (electronic supplementary material, table S4). Notably, in both conditions, children were told that they were engaging in shared behaviour that was unique and special to their group, which could have increased interest in

out-group behaviour across both conditions. Increased monitoring of out-group members could indicate increased salience or awareness of the boundaries between the in- and out-group. Across conditions, children were most likely to monitor out-groups in the first time point compared with the latter time points. Emphasizing group boundaries helps to identify who is more likely to cooperate and who could be a potential free rider or even a threat to the group [15].

We argue that the control condition is an exceptionally strong test of our hypotheses. The instructions, materials and amount of group experience were identical and children were familiar with one another in both conditions. Detecting these effects between conditions that were carefully matched for group experience among children who were familiar (and friendly) indicates that these effects can be produced even among children who would otherwise be 'in-group' members. Differences in children's in-group signalling and out-group monitoring behaviours between conditions cannot be explained by differences in overall engagement. There were no differences in the level of engagement in the group activity by condition.

Our experimental manipulation is meant to simulate the experience of ritual in real world contexts, and we would expect our effects to be smaller than rituals embedded in complex and meaningful group practices. There are a number of theories of ritual, such as Whitehouse's modes of religiosity theory that high-frequency, low arousal rituals have unique psychological effects [46]. We argue that our study provides unique evidence for the effects of repeated exposure and familiarity with rituals on psychological and behavioural outcomes. A key feature of this paradigm is multiple exposures to a collective ritual. Our data demonstrate differences in our variables of interest between conditions across multiple time points; however, more research is needed to examine the robustness of these effects and to further understand how the content and amount of ritualistic activity impacts both cognition and behaviour.

We did not find an effect of age on in-group displays, out-group monitoring, nor levels of engagement. This finding may be due to the nature of the sample, which included 100% of classroom participation, resulting in a wide age distribution. Given evidence that children become more sensitive to inter-group biases [41,47] and cues to ritual [24–26] with age, future work should more systematically examine the effects of age on ritual participation and intergroup behaviours.

This research demonstrates that engaging in a ritual increases children's awareness of out-group members, yet we lack evidence for how ritual participation might lead to out-group biases, hostility or even prejudice. Children show prejudice towards out-group members when in-group norms encourage exclusion or when out-group members are deemed threatening [39]. Future research should examine how ritual influences bias or hostility against out-group members. For example, studies could manipulate whether the rituals presented encourage exclusion and how costly the ritual behaviours are. If greater costliness of ritual behaviour leads to increased longevity of religious groups [45], perhaps costliness also leads to greater in-group cohesion and out-group biases. This could provide additional insight into understanding intergroup conflict.

The development of ritual cognition and behaviour is a topic of growing interdisciplinary social scientific study. This study is the first to our knowledge to demonstrate that ritual participation influences children's in-group signalling and out-group monitoring. Our results enrich our understanding of the empirically-documented and early-developing tendency to prefer in-group members to out-group members [36,38] by demonstrating how participating in collective rituals impacts behaviours directed at in- and out-group members over time. We provide behavioural evidence to support that rituals serve psychological functions for group cognition in children by using an ecologically valid design with groups of children engaging in coordinated activities.

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