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Reshaping social structure through performances: Emergent solidarity between actors and observers☆

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ABSTRACT

Based on the interactive model of identity formation (Postmes, Haslam, & Swaab, 2005) we investigate whether displays of coordinated actions foster feelings of solidarity. Participants were randomly assigned to roles of actors and observers in two experiments (N = 191 and 276). Actors performed in an "airband" in which all played air-guitar (enacting mechanical solidarity) or each member played different air-instruments (enacting organic solidarity). In the control condition actors *imagined* playing (Study 1) or performed individually (Study 2). As predicted, displays of solidarity led to elevated levels of experienced solidarity among actors and observers. As predicted, experiences of organic solidarity were mediated by having a sense of personal value to the group, whereas experiences of mechanical solidarity were not. Interestingly, exploratory evidence suggests that groups who enacted organic solidarity, remained more active throughout a subsequent behavioural task relative to other conditions. This research shows that performing arts are more than just entertainment; performing arts can bring individuals together and shape social structure.

1. Introduction

In social psychological terms, a performance (whether in sports, religion, culture or politics) is successful when it transforms a set of loosely connected individuals into a social entity. This may occur during a Christmas church service, the World Cup football, or the Woodstock festival. At events such as these, loosely connected people make their way to a performance for personal reasons and by personal means. But during the performance, people can come to feel connected with the performers and with each other. In terms of group dynamics this is a remarkable process: despite the fact that the performers (football players, actors, musicians, politicians) are active and the crowd is separated from them and not participating in the core actions, the actions "on stage" are capable of rousing the audience so that a strong sense of solidarity can emerge that transcends boundaries between performers and observers. This process is central to the current research: How do the coordinated actions of a set of performers affect passive observers so that a sense of solidarity emerges that transcends the boundaries between performers and observers?

Our hypothesis is that a process of psychological group formation can explain this phenomenon. That is to say, the same processes that are at play in (interactive) group formation (i.e., interactive model of identity formation; Postmes, Haslam, and Swaab, 2005), might also be able to explain how passive observers come to experience a sense of solidarity, even though they do not take active part. In this way, performers and spectators can psychologically merge into one overarching entity. In cultural research, dance, music, theatre, and other spectacles are seen as instruments which express shared identity and reinforce a sense of community among those who act and those who observe (Beeman, 1993; Evans-Pritchard, 1928; Seeger, 1994; Spencer, 1985). Thus far, empirical research has studied how participation in such events affects identification among core actors (e.g., Khan et al., 2016; Páez, Rimé, Basabe, Wlodarczyk, & Zumeta, 2015) or among people related to the actors as friends or family (e.g., Konvalinka et al., 2011; Xygalatas et al., 2013). The current research investigates emergent bonds among total strangers. The central purpose is to shed light on psychological group formation between passive observers and active performers.

We study group formation by focusing on the emergence of solidarity. Solidarity is an umbrella term for the experience of groupiness and has three components; identification, entitativity, and belonging (see also Koudenburg, Postmes, and Gordijn, 2017, 2013).

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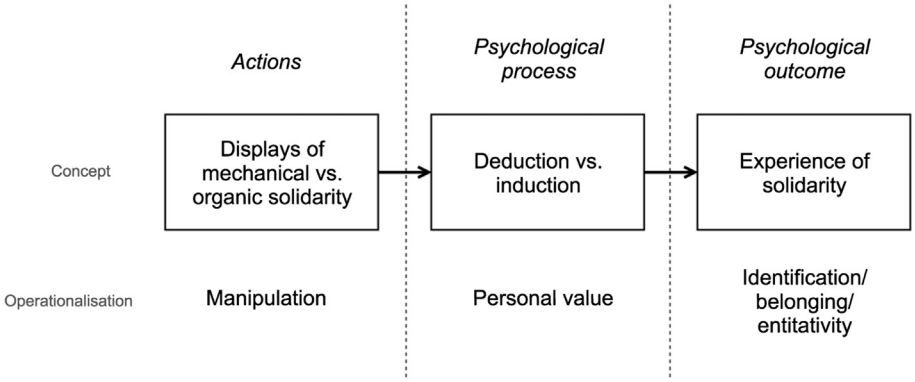

Fig. 1. Overview of concepts, hypothesized process, and operationalisations.

Identification refers to the incorporation of the group into the self-concept, entitativity refers to the unity of the group as a whole, and belonging refers to the relationship between the group and the self. Together, we think these variables can capture the psychological group formation between an active group of people and passive observers.

1.1. Two pathways to solidarity

In the group formation literature, the interactive model of identity formation suggests there are two pathways to forming groups (Postmes, Haslam, et al., 2005). In most groups elements of both pathways co-exist. Nevertheless, within specific situations one pathway may be dominant: Groups can deduce a shared identity from the similarities between individuals, such as pursuing the same goals or values, looking similar or performing the same actions. This similarity can form the basis for identification with a group (deductive social identity formation; Postmes, Spears, Lee, & Novak, 2005). Similarity can be due to shared features such as nationality, profession or politics, but also due to coordination in behaviour that is executed in a mechanical and similar way (Koudenburg, Postmes, Gordijn, & Van Mourik Broekman, 2015). In groups performing such mechanical behaviour willingly and consciously, group members are essentially conforming to behavioural norms which makes individual deviation undesired. That is to say, in such groups individual differences are pushed to the background as they interfere with the similarity of its members (cf. Durkheim, 1984).

However, many of the groups we belong to do not arise from an overarching commonality, but instead are formed *organically* around individuals who complement one another's actions. Because of this, individuals can collaborate towards a common outcome and this can form the backbone of an emergent sense of identification too (inductive social identity; Postmes, Spears, et al., 2005). Think for example about a small community in which there is a mailman, a butcher, a farmer, etc. In such communities, the differences between the members of the group, the coordination of their (inter)actions, and the fact that individuals feel personally valuable to the group, contribute to an emergent sense of unity and solidarity (Jans, Postmes, & Van der Zee, 2011, 2012; Koudenburg et al., 2015). In sum, although there are inductive and deductive pathways to developing a shared identity and although the role of individual group members is very different in each, both pathways ultimately can lead to a strong sense of identification (and more broadly, solidarity) with the group as a whole. The main difference between the two pathways, is that in groups in which the bottom-up, inductive process dominates, the sense of personal value is positively related to the degree of identification and unity that group members experience (Jans et al., 2011; Koudenburg et al., 2015), whereas in groups that operate more top-down and where deductive processes dominate, it is the group as an entity that is central to the process of group formation.

1.2. Enacting organic and mechanical solidarity

In the current work, we use the terms mechanical and organic solidarity in two different ways. On the one hand, when we talk about *mechanical and organic displays of solidarity* we refer to the group behaviour that gives rise to deductive and inductive group formation. So, while deduction and induction refer to the cognitive processes by which the psychological representation of the group is formed (see Postmes, Spears, et al., 2005), displays of mechanical and organic solidarity refer to the actual group dynamics: the social interactions among group members and, in the present research, their movement (see also Koudenburg et al., 2015). When we look at the physical processes, we see that the psychological experience of solidarity (identification, belonging, entitativity) can be enacted via behavioural coordination in groups. When people are asked to behave similarly, e.g., to move in synchrony, the group displays mechanical solidarity that may give rise to an emergent sense of groupiness through a deductive process (i.e., we are all behaving the same, we are as one). Conversely, when participants are asked to behave in a complementary way (e.g., they take turns performing a particular movement) they are displaying organic solidarity that may give rise to an emergent sense of groupiness which is induced from group members' personal contributions to the group (i.e, everyone is making a valuable contribution and thus we are united, Koudenburg et al., 2015).

On the other hand, when we mention the *experience of mechanical and organic solidarity* we refer to the psychological outcomes of the respectively deductive and inductive group formation process: the sense of group identification, entitativity and belonging that represent three facets of experienced solidarity in small interactive groups (see also Koudenburg, Postmes, et al., 2017, 2013). On the experiential side, the key difference between mechanical solidarity and organic solidarity is that in the former individuality is in the background, whereas in the latter personal value of individual group members' contributions is central (see Fig. 1 for the conceptual overview).

There is a large body of literature indirectly supporting the first process: Acting in synchrony together with others leads to social bonding, (generalized) pro-sociality, and cooperation (Fischer, Callander, Reddish, & Bulbulia, 2013a; Good & Russo, 2016; McNeill, 1995; Reddish, Tong, Jong, Lanman, & Whitehouse, 2016a; Valdesolo & Desteno, 2011; Wiltermuth & Heath, 2009, and music can reinforce these effects, see Stupacher, Maes, Witte, & Wood, 2017). Strict forms of synchrony, when movements are exactly matched in time and expression can strengthen togetherness among actors. Examples are marching soldiers, dance forms such as line-dancing, or choral singing. In the army this has a clear function; you lose your sense of individuality and feel part of stronger and harmonious unit (McNeill, 1995). Collective rituals also involve synchronized movement and express a sense of community and commitment. Synchrony affects perception of unity among actors, while observers report that groups moving in synchrony appear to be more united (Ip, Chiu, & Wan, 2006; Lakens, 2010; Lakens

& Stel, 2011; Miles, Nind, & Macrae, 2009). Given the anthropological and cultural literature on how performing arts can instil a sense of community among actors and observers (Beeman, 1993; Evans-Pritchard, 1928; Seeger, 1994; Spencer, 1985), we believe that mechanical expressions of solidarity among a group of performers can rouse passive audiences, too.

There is less evidence regarding the second process of the psychological effects of displays of organic solidarity. Some studies suggest that such displays can elevate experienced commitment among actors (Koudenburg, Postmes, et al., 2017; Koudenburg et al., 2015). The research suggests that when movements are complementary, a sense of solidarity can emerge because members experience their own and others' contributions to the interaction to be valuable. Thus, in expressions of organic solidarity, individual contributions become central to experiencing a sense of unity—unity and individuality are positively interdependent (see also Jans et al., 2011; Koudenburg, Jetten, & Dingle, 2017; Postmes, Spears, et al., 2005). However, we know of no published research that examined effects of observing the expression of organic solidarity. We hypothesize that organic expressions of solidarity of a group of actors can also instil a sense of solidarity among observers.

In sum, we predict that acts of solidarity, either mechanical or organic, can reinforce the experience of solidarity among actors and observers alike, and consequently transcend the boundaries between actors and observer. For expressions of organic solidarity, compared to mechanical solidarity, we predict that experiencing personal value to the group will be central to the experience of solidarity. There is some evidence for these hypotheses with regard to the *within* group processes among actors, but little or no evidence for observers. So far, the actor-observer relationship has received very little empirical attention in group formation. In the present paper, we fill this empirical gap by using current knowledge on within group processes to explain how group boundaries can psychologically blur when observers feel solidarity in line with an interacting group. The findings from this research could make an important contribution to the field by shedding light on how groups can expand beyond the boundaries of its active members.

1.3. Current research

In two experiments, we induced solidarity by letting actors co-act in a musical task. They were asked to perform for an audience in an imaginary band (by pretending to play “air” instruments). We manipulated enactments of mechanical and organic solidarity by manipulating the composition of the band across conditions: all played air guitar or everyone played different instruments. Actors had to physically coordinate with each other and the music to produce a coherent performance. The task was designed to recreate a concert situation; a context in which the relationship between actors and observers is likely to be affected. However, no musical skills were required because actors played imaginary instruments. This allowed us to study performance effects among a random sample of participants who had no previous training.

In two experiments, we investigated the development of a relationship between actors, who perform in a musical task, and observers in the controlled environment of a laboratory. By studying the social impact of different forms of coordinated action among *both* actors and observers, we can compare effects on actors and observers and gain a complete picture of how relationships between actors and observers are formed. In Experiment 1, an organic and mechanical condition were compared to a control condition with no action. Experiment 2 compared these conditions with a control condition in which actors acted individually. Experiment 2 also investigated the impact of performances on post-performance behaviour of actors and observers during a joint group task.[1]

[1] We report all measures, manipulations, and exclusions in these studies. Raw data from the research is retained for a minimum of 5 years after publication and available upon request via the first author.

We believe that observers will, in line with the actors, experience solidarity when the actors display solidarity. More specifically, we hypothesize that participants in the mechanical and organic condition will experience more solidarity than the participants in the control condition (H1a). We expect no difference with respect to solidarity between the mechanical condition and organic condition (H1b). Also, we predict that the solidarity effect will be present for both actors and observers (H2). Furthermore, we predict that actors will experience more personal value than observers (H3a). More importantly, we hypothesize that actors in the organic condition will experience more personal value than actors in the mechanical condition (H3b), whereas this effect will not be present for observers. Finally, we hypothesize that, because of the heightened sense of personal value among actors in the organic condition, personal value will mediate the experiences of solidarity in the organic condition, but not in the mechanical condition (H4).

2. Study 1

2.1. Method

2.1.1. Participants

Data was collected from 191 participants (133 female, 58 male, M_{age} = 20.92, SD = 2.47).[2] The participants were mostly (international) students from the University of Groningen (Dutch, n = 70, German, n = 95, and other, n = 26, only two participants were not a student), who participated in return for course credits or a small monetary reward. The study was a 2 (role: actors vs. observers) × 3 (group formation: organic solidarity vs. mechanical solidarity vs. control) between-subject design. Participants came to the lab and were allocated to a group with three to five other participants. Each group consisted of one or two observers and three to four actors. Each group was assigned to one of the three group formation conditions, organic (n = 11), mechanical (n = 13), or control (n = 11). The experiment was advertised and conducted in English so that both national and international students could participate.

2.1.2. Procedure and materials

After participants entered the lab they were randomly assigned a number between 1 and 6. Each participant was placed behind a laptop with their corresponding participant number. Via a questionnaire[3] participants filled in demographic information such as gender, age, nationality, study, and English proficiency.

After the pre-questionnaire the participants received the written instructions to a musical task. Participants were randomly assigned the role of actor or observer; participant 1 and 2 were observers and participant 3 till 6 were actors. To increase comparability between conditions, participants in the control condition got assigned to these numbers too, even though the instructions were similar for both actors and observers. Participants in all conditions were asked to stand on the numbered positions on the floor corresponding to their participant numbers. In the organic condition the actors were instructed to form an “airband” with the other actors in the group. They were asked to play imaginary (pretend) instruments together with the other actors in the

(*footnote continued*)

[2] The sample size was not increased after analysis. Power was calculated post hoc using the design effect to correct for the interdependence of the data (Snijders, 2005). To calculate the design effect, we used the average ICC of the dependent variables which was 0.09 and an average cluster size of 5 (participants per group). The power for detecting differences between conditions with a medium effect size (f = 0.25) is 0.75.

[3] The present study was part of a larger research. We only describe the measures relevant to the current paper. Measures not further reported in the paper were Individual value orientation, the Big Five Personality Inventory, some questions assessing what groups participants belonged to, need to belong, shyness, and uniqueness. Data from these measures are available via the first author.

group. They could pick any imaginary instrument as long as it was not the same as one of the others in the group. The observers were instructed to be the audience; they were positioned on the side line and merely observed the actors perform. In the mechanical condition actors were instructed to play "air-guitar" together; imaginary (pretend) guitars. The observers were again instructed to merely watch the actors perform. In the control condition, all participants (both actors and observers) were instructed to think about playing an instrument in a band without making actual movements. In other words, there was no role distinction in this condition. In all three conditions, the musical task was performed to "Are you gonna be my girl" by Jet (2003) and actors (in the organic and mechanical condition) were instructed to play in time to the rhythm. The experimenter first played a fragment from the song so that participants were familiar with the rhythm before they started. The experimenter left the room when the musical task was performed; the task was filmed to ensure that each group had performed the task according to the instructions.

After the task participants were seated behind a laptop to fill in the questionnaire. First, participants were asked with one item each to indicate how *comfortable* they felt during the musical task, how much *effort* they had put into the musical task, and how *difficult* they perceived the musical task to be on 10-point scale. The subsequent items were included to measure the components of solidarity (belonging, identification, and entitativity). Furthermore, personal value among the group was measured to establish whether there are different pathways to solidarity for the mechanical and organic solidarity conditions. All these items were measured on a 7-point Likert scale from 'strongly disagree' to 'strongly agree'. First, all participants were presented with questions regarding the whole group; that is, the group of actors and observers together. Five items were included to measure *belongingness* with the whole group, e.g., 'I had the feeling that I belonged to the group during the musical task.' (Cronbach's $\alpha = 0.79$, Need Threat Scale, Van Beest & Williams, 2006). Ten items assessed *identification* with the group ($\alpha = 0.88$, Leach et al., 2008). Three items measured *personal value* to the group; e.g., 'I believe I am indispensable to the group' ($\alpha = 0.76$, Koudenburg et al., 2015).

The next items were measured among actors and observers within the experimental, but not in the control condition: Four items measured *entitativity* with the actors (measured only for actors), e.g., 'I feel there is a sense of togetherness between the other participants and me' ($\alpha = 0.92$, Jans et al., 2011). Here 'other participants' was specified as the participant with whom actors performed in the airband. Observers in the experimental conditions, but not participants in the control condition, received similar items to measure their *perception of entitativity* among the actors, e.g., 'I feel the individuals are a unit' ($\alpha = 0.84$, Jans et al., 2011).

Following this, every participant was asked to what extent they knew all of the other participants in the group on a 4-point scale, ranging from 1 = not familiar at all to 4 = very familiar. For each participant, we calculated a mean *acquaintance* score from this.[4]

2.2. Results

The descriptive statistics from all the dependent variables per condition can be found in Table 1. Given that the participants were nested within groups, data were analysed via multilevel modelling using the 'nlme' package in R (Pinheiro, Bates, DebRoy, Sarkar, & R Core Team, 2017). Two contrasts were used to compute (1) the difference between the control conditions and the experimental conditions ($\psi 1$: control $= -2/3$, mechanical $= 1/3$, organic $= 1/3$) and (2) the difference between the mechanical and the organic condition ($\psi 2$: control $= 0$, mechanical $= -1/2$, organic $= 1/2$). The group level contrasts and individual level role (actor or observer) plus their cross-level interaction terms were included in the multilevel model for belonging, identification, and personal value. Even though the control condition had no distinction between actors and observers, for the ease of analysis the data was treated as if it did. That is to say, even though in the control condition there was no role distinction, statistically participant 1 and 2 in this condition were treated as observers and the remaining participants as actors. Furthermore, to statistically control for comfort, effort, difficulty, and acquaintance these individual level variables were included in the model. Because these variables are not of main interest, the outcomes of these variables will not be presented in this paper. Analyses were done with and without outliers. Results including all cases are presented here, but when different effects were obtained when outliers were excluded, this is mentioned.[5]

Because we do not hypothesize an interaction effect between role and the contrasts for the solidarity measures (belonging and identification) – indeed, we expect the effects to occur for actors and observers alike – we tested the model fit with and without the interactions. When including the interaction terms did not improve the model, we only tested the model with main effects. For the improvement of the model fit, we used a more lenient cut-off value of $p = .10$ instead of $p = .05$ in order to not exclude interaction effects that were a result of potentially meaningful differences between effects for actors and observers. Because we were interested in comparing the size of the effect of actors and observers separately, we tested the simple main effects per role, also when the interaction term between contrast and role was not significant ($p > .10$).

Comparing the model fit with and without the interaction terms for identification showed that the interaction terms did not significantly improve the model fit, $\Delta AIC = -2.88$, *logLikelihood ratio* χ^2 (2) $= 1.12$, $p = .572$. The analyses without the interaction terms showed the hypothesized effect (H1a); participants in the mechanical and organic conditions identified more with their group than participants in the control condition, $b = 0.67$, $SE = 0.12$, $t(33) = 5.37$, $p < .001$, 95% CI [0.43, 0.92]. There was no difference between the mechanical and the organic condition, $b = -0.05$, *ns* (H1b). Furthermore, we found no effect of role, suggesting that there is no difference in experienced identification between actors and observers, $b = 0.06$, *ns*. To confirm test our hypothesis (H2) about the similar pattern for actors and observers, we analysed these separately. Actors in the mechanical and organic condition identify more with their group than actors in the control condition, $b = 0.67$, $SE = 0.15$, $t(33) = 4.50$, $p < .001$, 95% CI [0.38, 0.96]. As expected, there was no difference between the mechanical and the organic condition, $b = -0.12$, *ns*. As predicted, also the observers in the mechanical and organic conditions identify more with their group than observers in the control condition, $b = 0.58$, $SE = 0.19$, $t(33) = 3.06$, $p = .004$, 95% CI [0.22, 0.94]. Again, no difference was found between the mechanical and the organic condition, $b = 0.14$, *ns*.

For belonging, we found that including the interaction terms improved the model fit only marginally significantly, $\Delta AIC = 1.03$, *logLikelihood ratio* χ^2 (2) $= 5.03$, $p = .081$. We analysed the model with the interaction terms and the simple main effects for actors and observers separately. We found a main effect of role on belonging; actors felt they belonged more with the group than observers did, $b = 0.72$, $SE = 0.13$, $t(145) = 5.53$, $p < .001$, 95% CI [0.47, 0.98]. The main effects for the contrasts and the interaction effect between the organic vs. mechanical contrast and role were not significant, all $|ts| < 1.53$, *ns*. However, we found a marginally significant interaction between the experimental vs. control contrast and role; the difference in feelings of belonging between the experimental conditions and the control

[4] After this questionnaire, the groups continued with a creativity task and a decision-making task. No differences in performance on these tasks were found between conditions. Therefore, we do not present the details of this part of the research here. However, data is available via the first author.

[5] Output from all analyses (with and without covariates) can be found in the supplementary material.

Table 1
Means and standard deviations per condition for all dependent variables (Study 1).

	Condition											
	Control				Mechanical				Organic			
	Observer (n = 21)		Actor (n = 41)		Observer (n = 20)		Actor (n = 40)		Observer (n = 25)		Actor (n = 44)	
	M	(*SD*)	*M*	(*SD*)	*M*	(*SD*)	*M*	(*SD*)	*M*	(*SD*)	*M*	(*SD*)
Belonging	3.65	(0.92)	3.75	(0.88)	4.06	(1.07)	4.61	(0.80)	3.53	(1.08)	4.45	(0.81)
Identification	3.69	(0.77)	3.59	(0.73)	4.16	(0.56)	4.36	(0.63)	4.20	(0.63)	4.13	(0.93)
Solidarity (aggr.)	3.67	(0.72)	3.65	(0.70)	4.13	(0.63)	4.44	(0.62)	3.98	(0.62)	4.24	(0.83)
Personal value	2.63	(1.04)	2.55	(1.00)	2.82	(0.92)	3.02	(1.17)	2.51	(1.00)	3.48	(1.21)
Entitativity	–		–		–		4.41	(1.11)	–		4.29	(1.30)
Perceived entitativity	–		–		3.88	(0.86)	–		4.13	(1.01)	–	

condition was different for observers and actors, $b = 0.47$, $SE = 0.27$, $t(145) = 1.73$, $p = .085$, 95% CI [−0.06, 1.00]. The simple main effect showed that, in line with our hypotheses (H1a, H2), actors in the mechanical and organic condition felt more belonging than actors in the control condition, $b = 0.81$, $SE = 0.15$, $t(33) = 5.37$, $p < .001$, 95% CI [0.52, 1.11]. There was no difference between the mechanical condition and the organic condition, $b = -0.05$, *ns* (H1b, H2). In line with our hypothesis (H1a, H2), we find the same pattern for the observers, observers in the mechanical and organic conditions felt more belonging to their group than the observers in the control condition, $b = 0.56$, $SE = 0.26$, $t(33) = 2.12$, $p = .042$, 95% CI [0.04, 1.07]. There was no difference between the observers in the mechanical and observers in the organic condition, $b = -0.43$, *ns* (H1b, H2).

For personal value the model fit improved significantly when the interaction terms were included, $\Delta AIC = 3.22$, *logLikelihood ratio* $\chi^2(2) = 7.22$, $p = .027$. We therefore analysed the model with the interaction terms. We found a main effect for role; actors feel more personally valuable than observers, $b = 0.38$, $SE = 0.17$, $t(145) = 2.23$, $p = .028$, 95% CI [0.05, 0.72] (H3a). Furthermore, we found a significant interaction effect for the organic vs. mechanical contrast and role; the difference between the mechanical and organic condition is different for actors and observers, $b = 0.82$, $SE = 0.40$, $t(145) = 2.05$, $p = .042$, 95% CI [0.04, 1.60]. We found no evidence for any other effects, all $|ts| < 1.59$, *ns*. When we analyse actors alone, we find that actors in the mechanical and organic conditions feel more personally valuable to the group than actors in the control condition, $b = 0.75$, $SE = 0.24$, $t(33) = 3.16$, $p = .003$, 95% CI [0.29, 1.22]. More importantly, in line with our hypothesis (H3b), actors in the organic condition feel more personally valuable to the group than actors in the mechanical condition, $b = 0.57$, $SE = 0.27$, $t(33) = 2.09$, $p = .045$, 95% CI [0.04, 1.11].[6] For the observers, we found no significant effects, $|ts| < 1.06$, *ns*.

As expected (H1b) we found no difference between the mechanical and organic condition with respect to feelings of entitativity among the actors, $b = 0.11$, *ns*. Nor did we find a difference in the extent to which observers perceived entitativity among the actors, $b = 0.34$, *ns*.

2.2.1. Mediation

To test whether personal value mediated the relationship between the organic condition (vs. control) and the dependent variables belonging and identification (H4), multilevel mediation was performed (2-1-1 model, traditional MLM; Preacher, Zyphur, & Zhang, 2010). Two dummy codes were created to compare the mechanical condition and the organic condition with the no solidarity condition (D1: no solidarity = 0, mechanical solidarity = 1, and organic solidarity = 0 and D2: no solidarity = 0, mechanical solidarity = 0, and organic solidarity = 1).

The model for identification is displayed in Fig. 2. In the mechanical (vs. control) condition we found no indirect effect feelings of personal value on identification, indirect effect = 0.13, SE = 0.07, $p = .109$, 95%CI [−0.03;0.26]. However, in the organic (vs. control) condition, we found an indirect effect of personal value on identification showing a partial mediation, indirect effect = 0.17, SE = 0.06, $p = .007$, 95%CI [0.05;0.30]. The same mediation emerges for belonging, see Fig. 3. In the mechanical (vs. control) condition, there was no significant indirect effect between D1 and belonging through personal value, indirect effect = 0.09, SE = 0.07, $p = .170$, 95%CI [−0.04;0.22]. In line with our hypothesis, in the organic solidarity (vs. control) condition, there was an indirect effect through personal value showing a full mediation, indirect effect = 0.13, $SE = 0.06$, $p = .038$, 95%CI [0.01;0.26].[7]

2.3. Discussion

As predicted, both the organic and the mechanical condition, compared to the control condition, fostered identification and belonging to the group. Moreover, it did not matter whether one acted or merely observed: both actors and observers expressed higher levels of identification and belonging to the group as whole. This provides evidence for our main hypothesis that not only coordinating together, but also observing others coordinate can have a positive impact on the experience of groupiness. Furthermore, we found that actors in the organic and mechanical condition experience more personal value to the group than the control condition. This did not hold for the observers. This is not surprising, as the observers take no active part in the coordination, and thus felt less indispensable to the group. However, personal value was essential in determining feelings of identification and belonging in the organic condition. Personal value partially (for identification) and fully (for belonging) mediated the relationship between organic solidarity (vs. control) and the solidarity experienced. This confirms the different pathways to solidarity also found in previous research (Koudenburg et al., 2015; Van Mourik Broekman, Koudenburg, Gordijn, Krans, & Postmes, 2017).

Finally, the measures of (perceived) entitativity showed that the actors in the experimental conditions *experienced* unity and *were perceived as* a unit equally in the organic and mechanical condition. This confirmed our expectation that the organic and mechanical airband

[6] When outliers were deleted from the model (standardized residuals below the 2.5th and above the 97.5th percentile), this effect became marginally significant, $p = .085$.

[7] When we do these mediation analyses for the actors only, we find the same; in the mechanical (vs. control) condition there was no indirect effect of personal value on belonging and identification, indirect effect belonging = 0.10, SE = 0.07, $p = .157$, 95%CI [−0.04;0.23] and indirect effect identification = 0.18, SE = 0.11, $p = .098$, 95%CI [−0.03;0.39]. However, in the organic (vs. control) condition there was an indirect effect of personal value on belonging and identification, indirect effect belonging = 0.19, SE = 0.08, $p = .014$, 95%CI [0.04;0.35] and indirect effect identification = 0.36, SE = 0.12, $p = .002$, 95%CI [0.14;0.59]. For the observers only, all the indirect effects were not significant, $ps > 0.503$, which is in line with our predictions, as we did not expect a difference between the conditions for personal value of the observers.

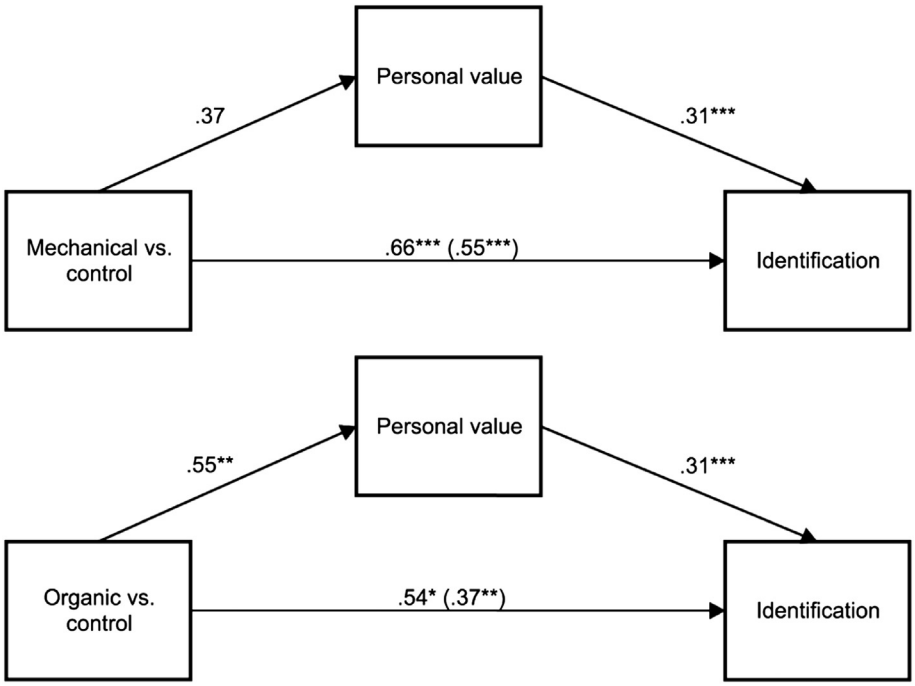

Fig. 2. Mediation model showing the relationship between mechanical vs. control and identification (top) and organic vs. control and identification (bottom), mediated by personal value. Path coefficients are shown; the coefficients between the parentheses are the path coefficients controlling for the mediators. The correlation between personal value and identification was $r = 0.50$, $p < .001$. Note: * $p < .05$, ** $p < .01$, *** $p < .001$.

coordination tasks manipulated unity to the same extent.

3. Study 2

In Study 1 the experimental and control conditions were designed to compare two forms of co-action with a situation in which there is no co-action. As a result, the control condition had no role distinctions. Because we were also interested in testing a situation in which there is action in the control condition, but no option for coordination among the actors, we designed a second study in which we altered the control condition. Here, actors in the control condition performed individually while observers watched. This allowed us to test whether it is acting in itself that causes the experienced solidarity or whether it is acting *together* that makes the difference. Furthermore, we wanted to use this second study to explore whether the *behaviour* of the actors and passive observers was also affected. We therefore designed a follow-up task for which an entirely different kind of behaviour (unrelated to the airband performance) was required of the whole group (actors and observers). Specifically, we asked groups to warm-up for a subsequent (ostensible) competitive task against other groups. Through observation measured levels of activity, structure, and sociality to explore whether differences between conditions would emerge.

3.1. Method

3.1.1. Participants

Two hundred seventy-six participants (193 female, 83 male, $M_{age} = 20.31$, $SD_{age} = 2.26$) participated for either course credits or a small monetary reward (€7).[8] The majority of the participants were students (194 from the international psychology program, 49 from the Dutch psychology program, 28 from other study programs, and 5 indicated that they did not study). Participants participated in a group of four to eight participants and were randomly allocated to one of the three conditions: control, mechanical solidarity, or organic solidarity, and one of two roles, observer or actor (control: observers: $n = 42$ and actors: $n = 44$, mechanical solidarity: observers $n = 47$ and actors $n = 51$, and organic solidarity: observers $n = 44$ and actors $n = 48$). Again, the experiment was advertised and conducted in English.

3.1.2. Procedure

Groups of four to eight participants were welcomed into a large room and were randomly given a badge with a number from one to eight. Participants who received a badge with the numbers one to four were observers and participants who received a badge with the number five to eight were actors. After this, participants were led into a separate room with eight laptops to complete the pre-questionnaire.[9] First participants were asked to give demographic information such as age, gender, nationality, study, and English proficiency.

For the next part of the experiment, participants were guided into the large room again. Similar to Study 1, the experimenter asked participants to stand on the number corresponding to their badge. Then, participants received written instructions for the 'musical task'. The set-up of the musical task was the same as in Study 1. However, different from Study 1, in the control condition, actors now also received the instructions to play "air instruments" while listening to a song. They were allowed to choose any instrument they like, even if it was not used in the song. However, actors were separated by dividers so that none of the actors could see one another, but the observers could still see all actors.

After the task, participants were asked to go to the laptop room again for the second part of the questionnaire. First, participants were asked to indicate on a 10-point scale how comfortable they felt, how much effort they exerted, how difficult they found the task, how much fun the task was, and how much they enjoyed the task.

To measure experienced solidarity, participants completed scales of identification, belonging, and entitativity (this time also in the control condition). Furthermore, personal value of participants was measured to test whether different identity formation processes take place in the mechanical and organic solidarity conditions. Identification with the group was measured with five items from the identification scale; 'I

[8] The sample size was not increased after analysis. Power for detecting a medium effect size was calculated post hoc as in Study 1 and was 0.82 (based on an average ICC of 0.11 and average cluster size of 7, Snijders, 2005).

[9] Only the measures central to this paper are presented. Pre-measures such as need to belong, need to conform, and need for distinction, are omitted in this paper as they are not relevant to test our hypotheses. Data from these measures are available via the first author.

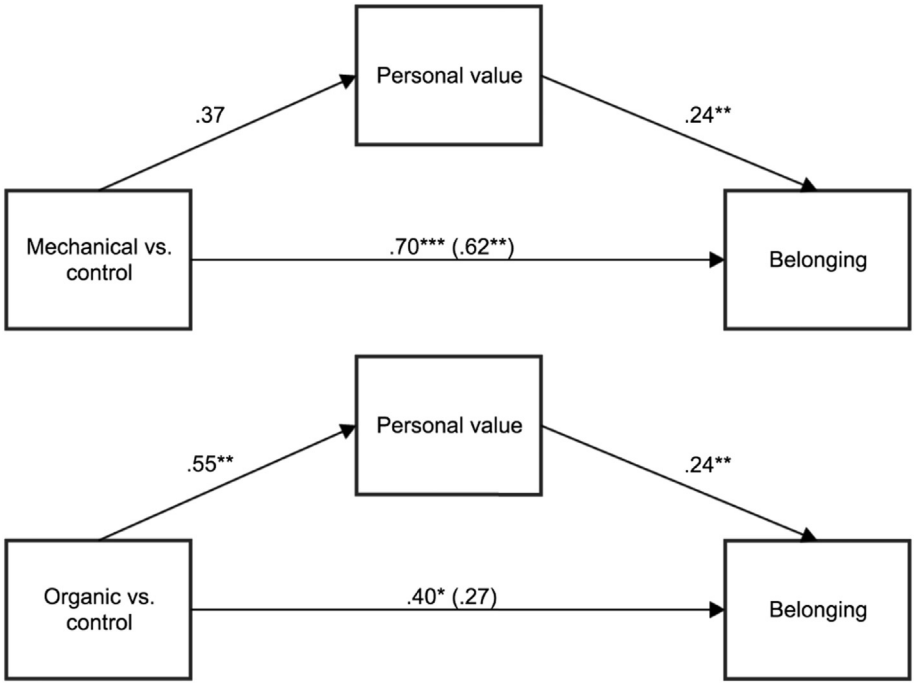

Fig. 3. Mediation model showing the relationship between mechanical vs. control and belonging (top) and organic vs. control and belonging (bottom), mediated by personal value. Path coefficients are shown; the coefficients between the parentheses are the path coefficients controlling for the mediators. The correlation between personal value and belonging was $r = 0.31$, $p < .001$. Note: * $p < .05$, ** $p < .01$, *** $p < .001$.

identify with the other participants in the group', 'I feel solidarity with the other participants in the group', 'I am glad to be a member of this group', 'I am similar to the average group member', and 'The other participants and I have a lot in common with each other' (Leach et al., 2008; Postmes, Haslam, & Jans, 2013; Cronbach's $\alpha = 0.79$). Belonging (Cronbach's $\alpha = 0.73$) and personal value (Cronbach's $\alpha = 0.76$), entitativity (actors: Cronbach's $\alpha = 0.90$, observers: Cronbach's $\alpha = 0.89$) were measured similarly as in Study 1.

Some additional concepts were measured; engagement of the actors with the performance was measured with two items; 'My attention was fully captured by the performance' and 'I got carried away by the performance' (Cronbach's $\alpha = 0.76$, $r = 0.62$). Engagement of the observers was measured with three items; 'I sometimes found myself to become so involved with the performance that I wanted to join', 'I felt the urge to join the performance while I was watching', and 'It was as if I was participating in my mind while I was watching' (Cronbach's $\alpha = 0.92$). Finally, the level of arousal of all participants was measured with three items, 'The performance was exciting', 'The performance was boring' (reversed), and 'The performance was arousing' (Cronbach's $\alpha = 0.76$). All items were measured on a 7-point Likert scale.

Next, participants were asked to write down which instrument they chose to play in the 'musical task' to check whether participants had not chosen the same instrument in the organic condition and chose a guitar in the mechanical condition. Lastly, acquaintance was measured as in Study 1.

When participants had completed the second part of the questionnaire, they were led into the large room again for the final task. In the large room participants received written instructions that the groups were to compete in a dance game using dance mats. Before they would be led into the room with these devises, they were asked to warm-up for 4 min to prepare. In reality there was no dance game and we were interested in the group behaviour (i.e., the level of activity, structure, and sociality) during the warming-up session. The experimenter put on some music (the same for all groups) and left the room for 4 min. The warming-up was filmed to make later analyses possible.

Two coders rated the videos with the warm-up task on levels of activity, structure, and sociality in the group.[10] We measured activity because the task demanded activity, and levels of activity would be a proxy for the effort, and thus the commitment to the group (as the participants believed that they were about to compete as a group against other groups). Structure was measured because in previous research we have conducted on audiences that had been exposed to displays of mechanical and organic solidarity, we found behavioural effects on structure (Van Mourik Broekman et al., 2017). Finally, sociality was measured because it resembles our dependent variable solidarity (belonging and identification) as measured in the questionnaire. We wanted to be able to capture this social effect in behaviour as well. The coders were asked to first rate only the first minute of the video on several semantic differential items that intended to capture the levels of activity, structure, and sociality in the group. Subsequently, they were asked to do the same for the last 3 min. We wanted to separate the first minute from the rest of the video because we expected to find most effect in the first minute (because it was closer in time to the manipulation). Activity was measured with five semantic differentials, calm – energetic, passive – active, static – dynamic, aimless – motivated, and bored – stimulated. The data from these items were aggregated for both the first minute (Cronbach's α coder 1 = 0.95 and Cronbach's α coder 2 = 0.89) and the last minutes (Cronbach's α coder 1 = 0.72 and Cronbach's α coder 2 = 0.97). The interrater reliability between both coders was high for both the first minute (ICC(2,2) = 0.73) and for the last minutes (ICC(2,2) = 0.73) and was therefore aggregated for each time point.

Structure was measure with seven items; disorganized – organized, spontaneous – mindful, uncooperative – cooperative, directed – impulsive (reversed), chaotic – structured, separated – united, and 'everybody seemed to be doing their own thing' – 'they seem to act according to a shared plan'. Again, data were aggregated for the first minute (Cronbach's α coder 1 = 0.93 and Cronbach's α coder 2 = 0.64) and the last minutes (Cronbach's α coder 1 = 0.96 and Cronbach's α coder 2 = 0.72). For each time point, data form the coders was

[10] Several other semantic differential items were included for exploratory purposes; (*footnote continued*) there is no leader – there is a leader, unoriginal – original, non-conforming – conforming, quiet – loud, and relaxed – tense. Theoretically we were mostly interested in structure, sociality, and activity. Therefore, we only report the aggregated scales of structure, sociality, and activity. Data from the remaining measures are available via the first author.

Table 2
Correlations between solidarity (aggregated items of belonging and identification) and personal value per condition (Study 1).

Condition	Role		1.
Control	Observer	1. Solidarity	_
		2. Personal value	0.165
	Actor	1. Solidarity	_
		2. Personal value	0.500**
Mechanical	Observer	1. Solidarity	_
		2. Personal value	0.192
	Actor	1. Solidarity	_
		2. Personal value	0.289
Organic	Observer	1. Solidarity	_
		2. Personal value	0.529**
	Actor	1. Solidarity	_
		2. Personal value	0.654***

Note: $^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$.

aggregated, the interrater reliability between both coders was moderate for the first minute (ICC(2,2) = 0.51) and substantial for the last minutes (ICC(2,2) = 0.73).

Finally, sociality was measured with six items; unpleasant – pleasant, disconnected – connected, uncomfortable – comfortable, unfriendly – friendly, closed – open, and unsocial – social. For each coder, the data was again aggregated (first minute, Cronbach's α coder 1 = 0.56 and Cronbach's α coder 2 = 0.90, and last minutes, Cronbach's α coder 1 = 0.96 and Cronbach's α coder 2 = 0.95). The interrater reliability for each time point was moderate for the first minute (ICC(2,2) = 0.48), and good for the last minutes (ICC(2,2) = 0.81) and was aggregated for each time point.

3.2. Results

The descriptive statistics from all the dependent variables per condition can be found in Table 3. As in Study 1, data was analysed via multilevel modelling using two contrasts to compare the control condition with the experimental conditions (ψ1: control = − 2/3, mechanical = 1/3, organic = 1/3) and to compare the two experimental conditions (ψ2: control = 0, mechanical = − 1/2, organic = 1/2). The main effects of the contrasts and role (actor vs. observer) and the interaction terms were tested. All outcomes were controlled for main effects of how comfortable participants were, how much effort they exerted, how much fun they had, how much they enjoyed the task and how well they knew the other participants in the group. Because these are not the variables of interest, these effects are not presented here. There were no main or interaction effects between contrasts and role for how difficult participants found the task and how shy they were; therefore, these variables were not included in the model.[11]

3.2.1. Experienced solidarity

First, we analysed the data for the whole group. For identification and belonging (the measures of experienced solidarity) we wanted to establish whether the experimental conditions evoked more solidarity than the control condition and whether this effect was present among both the actors and the observers. Because we did not hypothesize interaction effects for role and contrast on solidarity, we first analysed the model fit with and without the interaction terms. When the interaction terms did not improve the model fit (cut-off value $p = .10$), the model without the interaction terms was analysed. Regardless of whether the interaction term was significant, simple main effects were analysed to compare the effects for actors and observers separately.

For identification, the model fit did not improve significantly when adding the interaction terms to the model, $\Delta AIC = 0.56$, *logLikelihood ratio* χ^2 (2) = 4.56, $p = .102$. Therefore, the model without the interaction terms was tested. In line with our expectations (H1a) this showed that participants in the mechanical and organic condition identified more with the group than participants in the control condition, $b = 0.29$, $SE = 0.14$, $t(36) = 2.12$, $p = .041$, 95% CI [0.02, 0.56]. We found no effects of role or the organic vs. mechanical contrast on identification both $|ts| < 0.94$, *ns* (H1b). To compare whether the effects were present for both actors and observers, simple main effects were tested (H2). For actors we find the same pattern of effects, actors in the mechanical and organic condition identify more with the group than participants in the control condition, $b = 0.51$, $SE = 0.19$, $t(36) = 2.65$, $p = .012$, 95% CI [0.13, 0.89]. Levels of identification did not differ between actors in the mechanical and actors in the organic condition, $t = 0.32$, *ns*. For the observers, however, we found no evidence for a difference between observers in the mechanical and organic condition and the observers in the control condition, nor between the observers in the mechanical and observers in the organic condition, $|ts| < 1.41$, *ns*.

The model fit for belonging improved significantly after including the interaction terms, $\Delta AIC = 27.76$, *logLikelihood ratio* χ^2 (2) = 31.76, $p < .001$. We therefore analysed the model with the interaction terms and the simple main effect for actors and observers separately. We found a main effect for role; in contrast to Study 1, actors experienced less belonging than observers, $b = -0.39$, $SE = 0.12$, $t(226) = -3.32$, $p = .001$, 95% CI [− 0.63, − 0.16]. Both main effects of the contrasts and the interaction effect of the organic vs. mechanical contrast and role were non-significant, all $|t's| < 1.58$, *ns*. However, we found an interaction effect between the experimental vs. control contrast and role, suggesting that the difference between the control condition and the mechanical and organic conditions was different for actors and observers, $b = 1.23$, $SE = 0.22$, $t(226) = 5.54$, $p < .001$, 95% CI [0.80, 1.67]. When examining the effect of the experimental vs. control contrast separately for actors and observers, we found that in line with the hypothesis (H1a), actors in the mechanical and organic condition felt more belonging with the whole group than actors in the control condition, $b = 1.36$, $SE = 0.24$, $t(36) = 5.60$, $p < .001$, 95% CI [0.88, 1.84]. However, unlike Study 1, for the observers this effect disappeared, $t(36) = 0.52$, *ns*. Interestingly, for the observers we find a marginally significant effect on the organic vs. mechanical contrast showing that observers in the organic condition felt slightly less belonging to the whole group than observers in the mechanical condition, $b = -0.33$, $SE = 0.18$, $t(36) = -1.88$, $p = .069$, 95% CI [− 0.68, 0.02].

For personal value, we analysed the model without the interaction terms because the interaction terms did not contribute significantly to the model fit, $\Delta AIC = -0.01$, *logLikelihood ratio* χ^2 (2) = 3.99, $p = .136$. In line with our hypothesis (H3b), participants in the organic condition experienced more personal value to the group than participant in the mechanical condition, $b = 0.47$, $SE = 0.16$, $t(36) = 3.01$,

[11] Output from all analyses (with and without covariates) can be found in the supplementary material.

Table 3
Means and standard deviations per condition for all dependent variables (Study 2).

	Condition											
	Control				Mechanical				Organic			
	Observer (n = 42)		Actor (n = 44)		Observer (n = 47)		Actor (n = 51)		Observer (n = 44)		Actor (n = 48)	
	M	(*SD*)	*M*	(*SD*)	*M*	(*SD*)	*M*	(*SD*)	*M*	(*SD*)	*M*	(*SD*)
Belonging	4.95	(0.96)	3.67	(1.15)	5.38	(0.83)	4.96	(1.12)	5.04	(0.94)	5.23	(1.07)
Identification	4.04	(1.00)	3.80	(0.96)	4.35	(0.87)	4.15	(1.02)	4.04	(0.95)	4.40	(1.11)
Personal value	2.21	(0.85)	3.20	(1.03)	2.11	(1.03)	2.46	(1.08)	2.27	(0.96)	3.35	(1.48)
Solidarity (aggr.)	4.50	(0.80)	3.73	(0.91)	4.87	(0.74)	4.55	(0.93)	4.54	(0.82)	4.82	(0.93)
Arousal	3.93	(1.17)	4.39	(1.15)	4.11	(1.23)	4.33	(1.13)	4.63	(1.22)	4.55	(1.40)
Entitativity			3.42	(1.32)			4.11	(1.25)			4.27	(1.32)
Engagement actors			3.03	(1.30)			3.48	(1.34)			3.77	(1.55)
Perceived entitativity	3.16	(1.52)			3.97	(1.08)			4.27	(1.16)		
Engagement observer	3.54	(1.76)			4.45	(1.71)			4.44	(1.47)		

p = .005, 95% CI [0.16, 0.77]. Furthermore, participants in the control condition experienced slightly more personal value to the group than participants in the experimental conditions, although this effect did not reach statistical significance, $b = -0.26$, $SE = 0.14$, $t(36) = -1.86$, p = .071, 95% CI [−0.53, 0.01]. Finally, actors experienced more personal value than observers, $b = 0.75$, $SE = 0.14$, $t(228) = 5.40$, $p < .001$, 95% CI [0.48, 1.03] (H3a). To compare actors and observers, we analysed these separately. For actors we found the results in the expected direction, actors in the organic condition felt more personally valuable to the group than actors in the mechanical condition, $b = 0.67$, $SE = 0.23$, $t(36) = 2.88$, p = .007, 95% CI [0.22, 1.13]. Also, we found that actors in the control condition felt slightly more personally valuable to the group than the experimental conditions combined, although this was only marginally significant, $b = -0.39$, $SE = 0.21$, $t(36) = -1.86$, p = .071, 95% CI [−0.79, 0.02].[12] For the observers, both effects disappeared, $|ts| < 1.10$, *ns*.

Because of the high levels of personal value of the actors in the control condition (see Table 3), a mediation analysis as in Study 1 cannot yield the same results. However, the correlations between solidarity (aggregated items from identification and belonging, Cronbach's α = 0.85) and personal value (Table 4) could give some insights in the processes that lead to the emergence of solidarity in the different conditions. These correlations display a similar pattern as in Study 1 (cf. Table 2 for correlations of Study 1). For actors, the correlations between solidarity and personal value in the control condition ($r = 0.07$, *ns*) and in the mechanical condition were non-significant ($r = 0.30$, p = .036) whereas in the organic condition this was significant ($r = 0.58$, $p < .001$). The correlation from the organic condition was significantly stronger than the mechanical condition, $z = 1.70$, p = .044, as well as the control condition, $z = 2.73$, p = .003 (Preacher, 2002). This suggests that, for the actors, solidarity is related to personal value only in the organic condition, which is in line with the findings from Study 1. For the observers, there was no significant correlation between solidarity and personal value in the control condition ($r = 0.18$, *ns*) or in the mechanical condition ($r = 0.24$, *ns*), but there was for the organic condition ($r = 0.33$, p = .027). Comparison of the correlations between the organic condition and the mechanical condition revealed that they did not significantly differ from one another, $z = 0.46$, p = .324, nor did the correlations between the organic and the control condition, $z = 0.74$, p = .229.

3.2.2. Measures for actors only

Confirming H1a, we found that actors in both the mechanical and the organic condition experienced more entitativity with fellow actors than actors in the control condition, $b = 0.76$, $SE = 0.26$, $t(36) = 2.96$, p = .006, 95% CI [0.26, 1.27]. No difference was found between actors in the mechanical condition and actors in the organic condition, $t(36) = -0.17$, *ns* (H1b). Furthermore, there was no difference between the experimental condition and the control condition, nor between the two experimental conditions, for engagement with the performance, $|ts| < 1.64$, *ns*. We also measured identification of the actors with the actors and with the observers. Even though we found effects of overall identification with the whole group, we did not find effects of actors' identification.

Table 4
Correlations between solidarity (aggregated items of belonging and identification), personal value, and arousal per condition (Study 2).

Condition	Role		1.	2.
Control	Observer	1. Solidarity	_	
		2. Personal value	0.178	_
		3. Arousal	0.420**	0.259
	Actor	1. Solidarity	_	
		2. Personal value	0.072	_
		3. Arousal	0.161	0.225
Mechanical	Observer	1. Solidarity	_	
		2. Personal value	0.242	_
		3. Arousal	0.193	0.017
	Actor	1. Solidarity	_	
		2. Personal value	0.297*	_
		3. Arousal	0.290*	0.309*
Organic	Observer	1. Solidarity	_	
		2. Personal value	0.333*	_
		3. Arousal	0.671***	0.229
	Actor	1. Solidarity	_	
		2. Personal value	0.579***	_
		3. Arousal	0.584***	0.410**

* $p < .05$.
** $p < .01$.
*** $p < .001$.

3.2.3. Measures for observers only

In line with our hypothesis about experiencing solidarity (H1a), observers in the mechanical and organic condition also *perceived* more entitativity among the actors than the observers in the control condition, $b = 0.83$, $SE = 0.24$, $t(36) = 3.42$, p = .002, 95% CI [0.36, 1.31]. Moreover, observers in the mechanical and organic condition were more engaged in the performance than observers in the control condition, $b = 0.61$, $SE = 0.30$, $t(36) = 2.05$, p = .048, 95% CI [0.03, 1.19]. As expected, there were no differences in perception of entitativity among the actors between the observers in the mechanical and the organic condition, $t(36) = 1.10$, *ns*, nor in the level of engagement between the observers in the mechanical and organic condition, $t(36)$

[12] This unexpected effect became non-significant when outliers (standardized residuals below the 2.5th and above the 97.5th percentile) were removed.

Table 5
Means and standard deviations per time point and condition for dependent variables from the warm-up (Study 2).

	Condition											
	Control				Mechanical				Organic			
	First minute		Last minutes		First minute		Last minutes		First minute		Last minutes	
	M	(*SD*)	*M*	(*SD*)	*M*	(*SD*)	*M*	(*SD*)	*M*	(*SD*)	*M*	(*SD*)
Activity	3.87	(1.20)	2.82	(1.68)	3.97	(1.21)	3.05	(1.34)	4.24	(1.49)	4.48	(1.76)
Structure	4.68	(1.09)	4.16	(1.09)	4.41	(0.97)	4.35	(0.87)	4.60	(0.98)	4.55	(1.48)
Sociality	4.87	(0.91)	4.37	(1.63)	4.90	(0.90)	4.69	(1.14)	5.01	(1.03)	5.22	(1.17)

$= -0.16$, *ns*. As with the actors, we also measured identification of the observers with the observers and with the actors. Here also, we did not find effects of observers' identification.

3.2.4. Arousal

For arousal, the model fit improved marginally significantly when adding the interaction terms to the model, $\Delta AIC = 0.71$, *logLikelihood ratio* χ^2 (2) = 4.71, $p = .095$. We therefore analysed the model with the interactions. We found a main effect showing that participants in the organic condition were more aroused by the musical task than participants in the mechanical condition, $b = 0.49$, $SE = 0.23$, $t(36) = 2.09$, $p = .044$, 95% CI [0.03, 0.94]. We found no differences in arousal between the participants in the control condition and participants in the experimental conditions, nor did this interact with role, both $|ts| < 1.35$, *ns*. Overall actors were more aroused than observers, $b = 0.29$, $SE = 0.13$, $t(226) = 2.20$, $p = .029$, 95% CI [0.03, 0.54]. Furthermore, the difference between the mechanical and organic condition was different for actors and observers, $b = -0.54$, $SE = 0.27$, $t(226) = -1.97$, $p = .050$, 95% CI [−1.07, −0.004]. When we looked at the actors only, we found no difference between the actors in the mechanical and the actors in the organic condition, $t(36) = -0.32$, *ns*. The observers in the organic condition, however, were slightly more aroused than the observers in the mechanical condition, although this was only marginally significant, $b = 0.49$, $SE = 0.26$, $t(36) = 1.87$, $p = .070$, 95% CI [−0.02, 1.00].[13]

When we look at the correlations between solidarity and arousal per role and condition (see Table 4), we see that arousal is positively correlated with solidarity for observers in the organic condition ($r = 0.67$, $p < .001$). This correlation is significantly stronger than the correlation between arousal and solidarity in the mechanical condition ($r = 0.19$, *ns*), $z = 2.84$, $p = .002$, and marginally stronger than the correlation between arousal and solidarity in the control condition ($r = 0.42$, $p = .006$), $z = 1.63$, $p = .051$.

3.2.5. Post-performance interactions

The video data of the post-performance task were analysed at the group level using regression analysis with the experimental vs. control contrast and the organic vs. mechanical contrast. The descriptive statistics from the coded behaviour can be found in Table 5. We found no effects in the first minutes for levels of activity, structure, or sociality, all $|t|s < 0.53$, *ns*. However, for the last minutes we found an effect for activity: groups in the organic condition were more active in the last minutes of the warm-up task than groups in the mechanical condition, $b = 1.44$, $SE = 0.64$, $t(34) = 2.25$, $p = .031$, 95% CI [0.14, 2.74].

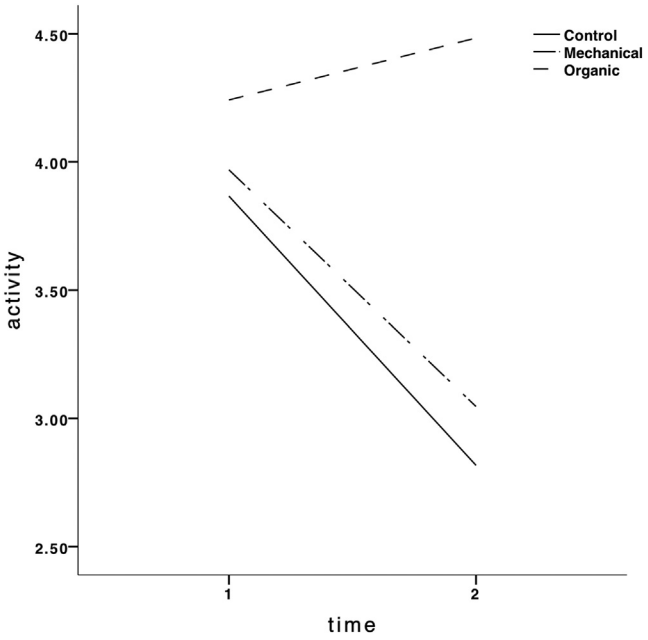

Fig. 4. Study 2: Levels of activity in the group per condition for the first minute (time point 1) and the last minutes (time point 2).

There was no difference in levels of activity between the control condition and the two experimental conditions, $t(34) = 1.69$, *ns*. Furthermore, we found no effect on level of structure and sociality in the last minutes of the warm-up task, all $|ts| < 1.27$, *ns*.

A repeated measures analysis of activity over time (the first minute vs. the last minutes), reveals that both time, $F(1,34) = 12.96$, $p = .001$, and the interaction between time and condition are significant, $F(2,34) = 6.47$, $p = .004$. Fig. 4 shows that both in the mechanical and the control condition activity seems to decline over time, however, in the organic condition, groups seem to stay active throughout the task.[14]

3.3. Discussion

Study 2 replicated the solidarity effects found in Study 1 for the actors; actors in the mechanical and organic condition identified more and felt more belonging to the group than actors in the control condition. However, contrary to our hypotheses these effects were not found for observers. We think this is a result of the altered control condition.

[13] We also measured empathy with the performance, positive evaluation of the performance, and how well the participants thought they would collaborate with the group in the future. For neither variables, we found any main or interaction effects. For negative evaluation we found that participants in the organic and mechanical condition found the performance slightly less negative than participants in the control condition, although this effect was only marginally significant, $b = -0.51$, $SE = 0.26$, $t(36) = -2.01$, $p = .052$, 95% CI [−1.02, −0.01].

[14] To test whether the activity on the organic condition at time 2 could be explained by the increased arousal in this condition, an exploratory mediation analysis was performed, see supplementary material. Indeed, for activity at time 2, we found a marginally significant indirect effect of the organic condition compared to the control condition on activity at time 2 via arousal at group level, indirect effect = 0.40, SE = 0.24, $p = .089$, 95%CI [−0.06;0.86]. We found no such indirect effect for arousal on activity on time 1.

While in study 1 'actors' in the control condition were not active, in the current study, observers in the control condition were able to observe all actors perform. This may have elevated their sense of identification and belonging to the group (see Table 3) whereas actors in the control condition were unable to see or coordinate with fellow actors, and thus could not share this sense of solidarity. We speculate that the actors in the control condition were put into a, perhaps embarrassing, position in which they had to perform without receiving visual feedback from their co-performers. As the observers were aware of this, and perhaps perceived some discomfort, they may have sympathized with the actors to the same extent as the observers in the experimental condition (but for a different reason). Furthermore, as the actors in this condition were performing to that same song, and thus the same rhythm, they may have, inadvertently, looked coordinated. And although the observers perceived less unity among the actors, as they knew the actors were not actually coordinating, visually it may not have looked uncoordinated, making solidarity with the individual actors possible.

We also see that the new control condition affects the sense of personal value of the actors. Like Study 1, for observers, there were no differences in personal value between the different conditions. This is not an unexpected finding as observers in all three conditions contribute equally to the group (they do not participate in either condition). Actors in the organic condition, as in Study 1, felt more personally valuable to the group than actors in the mechanical condition. However, because the actors in the control condition actually individually contribute to the total performance, we found that they experience personal value to the group to a larger extent than the actors in the experimental conditions combined (although they do not feel more personally valuable than actors in the organic condition, see Table 3 for descriptive statistics). This is in line with our previous research that shows that actors who have to perform solo (i.e., as individuals) can experience heightened levels of personal value to the same extent as actors who are performing in a complementary fashion (Koudenburg et al., 2015, Study 3). Because of the changed outcomes as a result of the control condition, performing a mediation analysis as in Study 1 could not reveal the same effects. Importantly however, correlations between personal value and solidarity (identification and belonging combined) suggest a similar pattern; in the organic condition, for the actors, feeling personally valuable in the group is strongly correlated with the sense of solidarity in the group, but not in the control or mechanical conditions.

Actors in the mechanical and organic solidarity condition also experience the group of performers as more united than the actors in the control condition. The same was true for observers: in the mechanical and organic condition observers perceived the actors to be more united than in the control condition. We also found that observers in the mechanical and organic solidarity conditions were more engaged in the performance than observers in the control condition. This suggests that despite the fact that the control condition evoked solidarity in the observers, they were less engaged in a performance of soloists. Furthermore, when we look at evoked arousal, we found that participants in the organic condition felt more aroused than participants in the mechanical condition and that this effect is driven by the observers in the organic condition. This suggests that the heightened engagement from observers in both the mechanical and organic condition led to increased arousal only for the observers in the organic condition. The organic performance was thus able to rouse the observers more than the mechanical performance was, and this was positively associated with the solidarity they experienced with the group as a whole. This may in turn explain the behavioural effects we found in the warm-up task; groups in the organic condition remained active throughout the task whereas groups in the mechanical and control condition decreased their activity over time.

4. General discussion

From the interactive model of identity formation, specific predictions can be derived about the way in which coordinated interactions between people can foster group formation (e.g., Koudenburg et al., 2015). The current research demonstrates that this group formation is not restricted to those who coordinate their action, but can extend to observers who do not participate actively. We show that two distinct forms of coordination, mechanical or organic displays, can both foster the emergence of an overarching group that includes both performers *and* observers. Interestingly, this even happens when actors and observers are not previously acquainted. This research provides an insight into why performing arts bring performers and spectators together. More broadly, this research illustrates that small numbers of individuals that act as a group, can influence and shape a broader social environment by psychologically blurring the boundary between the active group and its observers: well-coordinated actions on stage can foster an emergent sense of "us" that includes the audience as well.

This research shows that acting together mechanically or organically can evoke a sense of solidarity with the whole group (identification and belonging, both studies; H1a) and with the actors (entitativity, Study 2). Study 1 showed that observers who watch mechanical and organic displays of co-action experience solidarity with the whole group of actors and observers (although to a lesser extent than the actors) compared to a no performance control condition. Study 2 did not replicate this effect, likely because we changed the control condition to a condition in which there was a performance, but not coordination (actors performed solo). As a result, observers in the control condition experienced equal levels of solidarity with the group as observers who saw displays of mechanical and organic solidarity. We believe this is because observers in the control condition in Study 2 were able to see all performers act and were perhaps sympathizing with their situation (actors were randomly assigned to act in solo, which could, thus, also have happened to the observers). However, in support of our original hypothesis (H1a), we found that observers in this control condition perceived less entitativity among the actors and were slightly less engaged in the performance than observers who watched displays of co-action (mechanical or organic).

When we look at the distinction between the two forms of co-action, in both studies we confirmed our hypothesis that organically coordinated action instilled among actors a greater sense of personal value to the group than mechanical co-action (H3a). Even though individual actors were not actually contributing musically to the performance (after all, they were just playing imaginary instruments), they were experiencing a sense of personal value to the group. Overall, observers felt less personally valuable to the group than actors (H3b), and this did not differ across conditions. More importantly, in Study 1, feelings of solidarity were mediated by feeling personally valuable to the group in the organic (vs. control) condition but not the mechanical (vs. control) condition (H4). Like previous research (Koudenburg et al., 2015) this suggests that mechanical and organic solidarity are two distinct forms of solidarity that are formed through different pathways. Correlations between personal value and solidarity (identification and belonging) in Study 2 show a similar pattern; in the organic condition, but less so in the mechanical condition, personal value is strongly correlated with solidarity.

Study 2 uncovered another distinction between displays of mechanical and organic co-action; despite being equally engaged in the performance, observers who watched organic co-action felt slightly more aroused after the performance than observers who watched mechanical co-action. Interestingly, this seems to translate into behaviour; groups in the organic condition remained active throughout the warm-up task whereas the groups in the mechanical and control conditions had a declining activity throughout the task. Although these results have to be interpreted with caution, as only 37 groups were analysed, this does seem to suggest that there was a sustained commitment to the

organic group. As the task was to warm-up for a subsequent task in which they had to compete with other groups, the heightened activity suggests that the groups in the organic condition were more willing to exert continued effort to maintain a high level of group performance.

Overall, these results show convincingly that observers can experience solidarity in line with a group of actors. Furthermore, this research reveals that there are different pathways to experiencing solidarity. When enacting organic forms of solidarity, a sense of personal value is an essential predictor in determining solidarity. Moreover, the second study shows that organic forms of solidarity (compared to mechanical forms of solidarity) can lead to heightened arousal. This in turn may predict behaviour; groups in the organic condition remained more active during the post-experiment warm-up task.[15] This suggest that acting, but also observing, solidarity can not only shape relationships but also behaviour.

4.1. Implications

This research shows that displays of solidarity in co-action, like a musical performance such as a concert, can evoke a sense of solidarity. In fact, this effect is not limited to those who "perform" and put their solidarity on display, but extends to those who observe. When actors and observers come together in such a way, actors can come to include observers in their psychological in-group, creating an overarching feeling of "we-ness". Previous research focused on the effects of co-action on those who act (e.g., Fischer, Callander, Reddish, & Bulbulia, 2013b; Koudenburg et al., 2015; Reddish, Bulbulia, & Fischer, 2014; Reddish, Fischer, & Bulbulia, 2013; Reddish, Tong, Jong, Lanman, & Whitehouse, 2016b; Valdesolo & Desteno, 2011; Wiltermuth & Heath, 2009), but the current research explains why observers can become an integral part of the social structure that emerges during a performance. Because observers recognize the social structure among the actors and feel solidarity with them, they can psychologically transcend the physical boundary between actors and observers. But not all performances engender solidarity, and not all performances do so in the same way. The interactive model of social identity formation (Postmes, Haslam, et al., 2005) can help explain, in part, the process by which displays of solidarity can foster the emergence of solidarity. Specifically, results confirmed that solidarity can arise through different pathways, as predicted by this model. Feeling personally valuable plays a key role in emergent solidarity in an organic display: this points to the role of inductive (bottom-up) processes. In mechanical displays of solidarity, by contrast, similarity and perceived unity play a central role in emergent solidarity: this points to the role of deductive (top-down) processes.

Interestingly, our research shows that watching organic solidarity is more arousing to observers than watching mechanical solidarity. From the literature, one may expect that displays of mechanical solidarity (e.g., marching, chanting, applauding in unison, or performances, rituals, or sports in which people do the same thing) would be more arousing for both participants and audience. However, our research suggests that observing more complex and dynamic forms of interactions in which actions are complementary, can elicit arousal among observers more than mechanical performances. Strikingly, this seems to affect group behaviour.

The findings in this research can help us better understand the social-psychological impact of collective gatherings such as festivals, demonstrations, sports events, or other performances. The actions of a core group of people can shape and change the feelings and behaviour of a lager body of people. Interestingly, this research shows that not only professional performers who have performed together many times can elicit such social change, but that any aggregate of people that engages in coordinated action can. One can imagine that professional performers, who are trained in having an impact on the audience, could be even more influential in transforming an audience of strangers into a psychological group.

The current research has focussed on the impact of on-stage performances, in which the actors are aware that they are performing for an audience. One may wonder whether similar processes of group formation take place when an audience unwittingly observes the actions of a group that is not explicitly performing for them (e.g., a group of schoolchildren playing a game on the street, or a particular social interaction in a shop). It is likely that the mechanisms which play a role in the current research are not unique to performance settings: people should be able to feel a connection with the actions of any group they encounter. This research shows that the effects of within group processes are not limited to the individuals within the group, but can extend to the individuals around them.

These insights bridge the gap between the literature on solidarity emerging through organic and interactive processes within small groups on the one hand (e.g., Koudenburg, Postmes, et al., 2017; Postmes, Haslam, et al., 2005; Postmes, Spears, et al., 2005) and the more mechanical processes of identification within large crowds on the other hand (e.g., Neville & Reicher, 2013; Novelli, Drury, Reicher, Stott, & Reicher, 2013; Páez et al., 2015). Our findings demonstrate that the influence of organic forms of solidarity can reach beyond the boundaries of a small group of actors, if they are observed by a large audience. If we apply our findings more generally to other types of groups that are not necessarily performing, this can explain how people choose to support or join groups in their environment, or feel connected to groups they watch on television. As such, this research sheds light on a broad range of group growth phenomena.

4.2. Limitations and future research

In Study 1, all participants in the control condition received the same instructions; they had to imagine playing an instrument while listening to the song. As a result, there was no clear role distinction between these participants (apart from participants' position in the room). Although this design is somewhat inelegant, this allowed us to compare the experimental conditions to a true *baseline* condition in which there was a complete absence of action. To improve the experimental design, in the second study we created a control condition in which there was a distinction between roles. Here we had actors *act* but *not co-act* by letting them perform at the same time but independently of one another (using room dividers). This allowed for a comparison of the experimental condition with a control condition in which there was an absence of coordination, but no absence of action. However, this resulted in a design in which the comparison between conditions for actors was optimal, but for observers the comparison was not optimal as all observers watched some form of coordinated performance. Observers were thereby able to feel a sense of solidarity with individual performers in the two solidarity conditions, but also in the control condition. Because of the altered control condition, some of the effects from the first study could not be replicated, i.e., the solidarity effects or observers, and the mediation effect of personal value on solidarity. Despite this, all other effects were replicated.

To establish the difference between mechanical and organic forms of coaction, we measured personal value. However, personal value is something that is experienced by those who act organically, and not those who remain passive and merely observe. Therefore, personal value cannot explain the solidarity experienced by observers of organic coaction. In previous research, in which we investigated audience responses to dance performances we found that, *perceptions* of personal value and unity among member of the dance group determined the solidarity experienced by audiences that watched organic solidarity (compared to individually performing dancers), whereas for the audiences that watched mechanical solidarity (compared to individually

[15] Exploratory mediation analysis revealed a marginally significant indirect effect from organic (vs. mechanical) solidarity to activity time 2 via arousal, see the supplementary material for the full analysis.

performing dancers) the solidarity experienced was only explained by perceptions of unity among the dance group (Van Mourik Broekman et al., 2017). In the current research, we were not able to explain the process of feeling solidarity for the observers. Future research should focus on determining what, besides perception of personal value among performers, can explain solidarity experienced by observers of organic solidarity. Perhaps the feeling that there is room for the individual in such groups, makes one feel like they belong to such a group.

Finally, performances, or any other coaction, cannot always be straightforwardly categorized into the two forms of solidarity discussed in this paper. It is important to note that mechanical and organic solidarity are not mutually exclusive and often both forms can be displayed in interactions. In our research, both experimental conditions had mechanical and organic elements. For instance, mechanical and organic solidarity were both manipulated by instructing the actors to execute a task. These top-down instructions required participants to conform to the experimenter's request. However, when comparing the two conditions to each other, the mechanical condition was clearly more mechanical due to the fact that actors all played “air-guitar” and were therefore more similar. We managed to activate a sense of organic solidarity by letting the participants in this condition choose their *own* instruments for the performance freely. This was experienced, both by actors and observer, qualitatively differently than mechanical solidarity, as evidenced by the increased sense of personal value among actors, the increased experience of arousal among observers, and the heightened activity of the group as a whole in the organic solidarity condition (compared to the mechanical condition).

4.3. Conclusion

Performances can be entertaining and beautiful; we go to performances to experience great music, great performers, or a great show. But performances also have a social component. In fact, this research shows the social component of a performance can transcend the boundary between performers and audience and can shape the sense of togetherness they experience. This illustrates that the separation between performances and audience is physical, but not necessarily psychological. A performance can transform performers and a room full of separated individuals into a meaningful social entity. Acting together on stage can thus alter who we are and how we behave, even when only watching this. In this way, performances (even by non-professionals) have the power to spread solidarity among a previously unconnected group of individuals. In the end, such processes may bring about social change and even reshape society.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jesp.2017.12.002.

References

Beeman, W. O. (1993). The anthropology of theater and spectacle. *Annual Review of Anthropology, 22*, 369–393.

Cester, N., & Muncay, C. (2003). *Are you gonna be my girl [Recorded by Jet]. On Get Born [MP3 file]*. New York, United States: Elektra.

Durkheim, E. (1984). *The division of labour in society*. London, England: Macmillan (Original work published 1893).

Evans-Pritchard, E. E. (1928). The dance. *Africa: Journal of the International African Institute, 1*(4), 446–462.

Fischer, R., Callander, R., Reddish, P., & Bulbulia, J. (2013a). How do rituals affect cooperation? *Human Nature, 24*(2), 115–125. http://dx.doi.org/10.1007/s12110-013-9167-y.

Fischer, R., Callander, R., Reddish, P., & Bulbulia, J. (2013b). How do rituals affect cooperation? An experimental field study comparing nine ritual types. *Human Nature, 24*(2), 115–125. http://dx.doi.org/10.1007/s12110-013-9167-y.

Good, A., & Russo, F. A. (2016). Singing promotes cooperation in a diverse group of children. *Social Psychology, 47*(6), 340–344. http://dx.doi.org/10.e1027/1864-9335/a000282.

Ip, G. W., Chiu, C., & Wan, C. (2006). Birds of a feather and birds flocking together: Physical versus behavioral cues may lead to trait- versus goal-based group perception. *Journal of Personality and Social Psychology, 90*(3), 368–381. http://dx.doi.org/10.1037/0022-3514.90.3.368.

Jans, L., Postmes, T., & Van der Zee, K. I. (2011). The induction of shared identity: The positive role of individual distinctiveness for groups. *Personality and Social Psychology Bulletin, 37*(8), 1130–1141. http://dx.doi.org/10.1177/0146167211407342.

Jans, L., Postmes, T., & Van der Zee, K. I. (2012). Sharing differences: The inductive route to social identity formation. *Journal of Experimental Social Psychology, 48*(5), 1145–1149. http://dx.doi.org/10.1016/j.jesp.2012.04.013.

Khan, S. S., Hopkins, N., Reicher, S., Tewari, S., Srinivasan, N., & Stevenson, C. (2016). How collective participation impacts social identity: A longitudinal study from India. *Political Psychology, 37*(3), 309–325. http://dx.doi.org/10.1111/pops.12260.

Konvalinka, I., Xygalatas, D., Bulbulia, J., Schjødt, U., Jegindø, E.-M., Wallot, S., ... Roepstorff, A. (2011). Synchronized arousal between performers and related spectators in a fire-walking ritual. *Proceedings of the National Academy of Sciences of the United States of America, 108*(20), 8514–8519.

Koudenburg, N., Jetten, J., & Dingle, G. A. (2017). Personal autonomy in group-based interventions. *European Journal of Social Psychology, 47*(5), 653–660. http://dx.doi.org/10.1002/ejsp.2230.

Koudenburg, N., Postmes, T., & Gordijn, E. H. (2013). *PLoS ONEConversational flow promotes solidarity, 8*(11), e78363. http://dx.doi.org/10.1371/journal.pone.0078363.

Koudenburg, N., Postmes, T., & Gordijn, E. H. (2017). Beyond content of conversation: The role of conversational form in the emergence and regulation of social structure. *Personality and Social Psychology Review, 21*(1), 50–71. http://dx.doi.org/10.1177/1088868315626022.

Koudenburg, N., Postmes, T., Gordijn, E. H., & Van Mourik Broekman, A. (2015). Uniform and complementary social interaction: Distinct pathways to solidarity. *PLoS One, 10*(6), 1–29. http://dx.doi.org/10.1371/journal.pone.0129061.

Lakens, D. (2010). Movement synchrony and perceived entitativity. *Journal of Experimental Social Psychology, 46*, 701–708. http://dx.doi.org/10.1016/j.jesp.2010.03.015.

Lakens, D., & Stel, M. (2011). If they move in sync, they must feel in sync: Movement synchrony leads to attributions of rapport and entitativity. *Social Cognition, 29*(1), 1–14. http://dx.doi.org/10.1521/soco.2011.29.1.1.

Leach, C. W., van Zomeren, M., Zebel, S., Vliek, M. L. W., Pennekamp, S. F., Doosje, B., ... Spears, R. (2008). Group-level self-definition and self-investment: A hierarchical (multicomponent) model of in-group identification. *Journal of Personality and Social Psychology, 95*(1), 144–165. http://dx.doi.org/10.1037/0022-3514.95.1.144.

McNeill, W. H. (1995). *Keeping together in time: Dance and drill in human history*. Cambridge: Harvard University Press.

Miles, L. K., Nind, L. K., & Macrae, C. N. (2009). The rhythm of rapport: Interpersonal synchrony and social perception. *Journal of Experimental Social Psychology, 45*(3), 585–589. http://dx.doi.org/10.1016/j.jesp.2009.02.002.

Neville, F. G., & Reicher, S. D. (2013). The experience of collective participation: Shared identity, relatedness and emotionality. *Crowds in the 21st century: Perspectives from contemporary social science* (pp. 113–132). Contemporary Issues in Social Science: Routledge.

Novelli, D., Drury, J., Reicher, S., Stott, C., & Reicher, S. (2013). Crowdedness mediates the effect of social identification on positive emotion in a crowd: A survey of two crowd events. *PLoS One, 8*(11), e78983. http://dx.doi.org/10.1371/journal.pone.0078983.

Páez, D., Rimé, B., Basabe, N., Wlodarczyk, A., & Zumeta, L. (2015). Psychosocial effects of perceived emotional synchrony in collective gatherings. *Journal of Personality and Social Psychology, 108*(5), 711–729. http://dx.doi.org/10.1037/pspi0000014.

Pinheiro, J., Bates, D., DebRoy, S., Sarkar, D., & R Core Team (2017). nlme: Linear and nonlinear mixed effects models (Retrieved from) https://cran.r-project.org/package=nlme.

Postmes, T., Haslam, S. A., & Jans, L. (2013). A single-item measure of social identification: Reliability, validity, and utility. *British Journal of Social Psychology, 52*(4), 597–617. http://dx.doi.org/10.1111/bjso.12006.

Postmes, T., Haslam, S. A., & Swaab, R. I. (2005). Social influence in small groups: An interactive model of social identity formation. *European Review of Social Psychology, 16*(1), 1–42. http://dx.doi.org/10.1080/10463280440000062.

Postmes, T., Spears, R., Lee, A. T., & Novak, R. J. (2005). Individuality and social influence in groups: Inductive and deductive routes to group identity. *Journal of Personality and Social Psychology, 89*(5), 747–763. http://dx.doi.org/10.1037/0022-3514.89.5.747.

Preacher, K. J. (2002). Calculation for the test of the difference between two independent correlation coefficients [computer software] (Retrieved October 19, 2017, from) http://quantpsy.org.

Preacher, K. J., Zyphur, M. J., & Zhang, Z. (2010). A general multilevel SEM framework for assessing multilevel mediation. *Psychological Methods, 15*(3), 209–233. http://dx.doi.org/10.1037/a0020141.

Reddish, P., Bulbulia, J., & Fischer, R. (2014). Does synchrony promote generalized prosociality? *Religion, Brain and Behavior, 4*(1), 3–19. http://dx.doi.org/10.1080/2153599X.2013.764545.

Reddish, P., Fischer, R., & Bulbulia, J. (2013). Let's dance together: Synchrony, shared intentionality and cooperation. *PLoS One, 8*(8), http://dx.doi.org/10.1371/journal.pone.0071182.

Reddish, P., Tong, E. M. W., Jong, J., Lanman, J. A., & Whitehouse, H. (2016a). Collective synchrony increases prosociality towards non-performers and outgroup members. *British Journal of Social Psychology*. http://dx.doi.org/10.1111/bjso.12165.

Reddish, P., Tong, E. M. W., Jong, J., Lanman, J. A., & Whitehouse, H. (2016b). Collective synchrony increases prosociality towards non-performers and outgroup members. *British Journal of Social Psychology, 55*(4), 722–738. http://dx.doi.org/10.1111/bjso.12165.

Seeger, A. (1994). Music and dance. *Companion encyclopedia of anthropology* (pp. 686–705). London: Routledge.

Snijders, T. A. B. (2005). Power and sample size in multilevel linear models. *Encyclopedia of statistics in behavioral science*John Wiley & Sons, Ltdhttp://dx.doi.org/10.1002/0470013192.bsa492.

Spencer, P. (1985). *Society and the dance: The social anthropology of process and performance.* Cambridge [Cambridgeshire]: Cambridge University Press.

Stupacher, J., Maes, P.-J., Witte, M., & Wood, G. (2017). *Music strengthens prosocial effects of interpersonal synchronization – If you move in time with the beat.* http://dx.doi.org/10.1016/j.jesp.2017.04.007.

Valdesolo, P., & Desteno, D. (2011). Synchrony and the social tuning of compassion. *Emotion, 11*(2), 262–266. http://dx.doi.org/10.1037/a0021302.

Van Beest, I., & Williams, K. D. (2006). When inclusion costs and ostracism pays, ostracism still hurts. *Journal of Personality and Social Psychology, 91*(5), 918–928. http://dx.doi.org/10.1037/0022-3514.91.5.918.

Van Mourik Broekman, A., Koudenburg, N., Gordijn, E. H., Krans, K. L. S., & Postmes, T. (2017). *The impact of art: Exploring the social-psychological pathways that connect audiences to live performances* (Unpublished manuscript)Groningen, The Netherlands: Department of Social Psychology, University of Groningen.

Wiltermuth, S. S., & Heath, C. (2009). Synchrony and cooperation. *Psychological Science, 20*(1), 1–5. http://dx.doi.org/10.1111/j.1467-9280.2008.02253.x.

Xygalatas, D., Mitkidis, P., Fischer, R., Reddish, P., Skewes, J., Geertz, A. W., ... Bulbulia, J. (2013). Extreme rituals promote prosociality. *Psychological Science, 24*(8), 1602–1605. http://dx.doi.org/10.1177/0956797612472910.