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Reports

Who syncs? Social motives and interpersonal coordination

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ABSTRACT

Interpersonal synchrony provides an important foundation for social interaction, as periods of temporal coordination lead to enhanced sociality. Moreover, synchronous actions are governed by lawful physical principles of coordination dynamics, suggesting some degree of inevitability. However, both anecdotal and laboratory evidence indicates that not all individuals synchronize. Here we explored whether differences in social motives (i.e., social value orientation) influence the propensity to coordinate with others. The results revealed that individuals with a pro-social orientation spontaneously coordinated with a confederate to a greater extent than those with a pro-self orientation, regardless of whether such orientations were assessed as dispositional characteristics (Study 1) or were the result of a priming manipulation (Study 2). These findings have important implications for both coordination dynamics and prominent accounts of social exchange.

Introduction

Synchrony is pervasive. We marvel at fireflies flashing in unison (Buck & Buck, 1968), rely on the coordinated firing of cardiac pacemaker cells (de Bruin, Ypey, & Van Meerwijk, 1983), and effortlessly fall into rhythm with others when singing, dancing or simply taking a stroll (McNeill, 1995). Importantly, however, although governed by the lawful physical principles of coordination dynamics, synchrony is by no means inevitable — not all rhythms conform. It is unusual, for example, to observe large numbers of pedestrians locked in step as if they were performing a military drill.[1] Why then is this so? Although previous work has identified physical variables (e.g., biomechanics; coupling strength) that modulate the emergence of interpersonal synchrony (e.g., Nessler & Gilliland, 2009; Richardson, Marsh, & Schmidt, 2005), less consideration has been given to the psychological factors that impact this form of joint action. In particular, little is known about whether there is variation between individuals in terms of their propensity to coordinate with others. Here we examine this question by exploring the relationship between people's general disposition towards social situations (i.e., social value orientation) and the spontaneous emergence of interpersonal synchrony.

Synchrony and social interaction

Synchrony between interaction partners has received considerable attention. On the theoretical side, modeling of coordination dynamics (e.g., Haken, Kelso, & Bunz, 1985) indicates that just like more general forms of synchronized activity, interpersonal synchrony is an inherently lawful, self-organized activity. Via an informational coupling (e.g., vision), over time the movements of interacting individuals become mutually entrained leading to the emergence of specific, stable patterns of coordination (i.e., in-phase and anti-phase synchrony[2]). Importantly, an expansive literature has confirmed this account (for overviews see Oullier & Kelso, 2009; Schmidt & Richardson, 2008). People spontaneously and unintentionally align their actions with others in precisely the manner predicted by these models (Schmidt & O'Brien, 1997). Furthermore, research exploring the consequences of synchrony reveals that this form of coordination results in increased liking and rapport (Hove & Risen, 2009), blurs self-other boundaries (Miles, Nind, Henderson, & Macrae, 2010; Paladino, Mazzurega, Pavani, & Schubert, 2010), facilitates person perception (Macrae, Duffy, Miles, & Lawrence, 2008), and enhances altruistic behavior and cooperation (Valdesolo & DeSteno, 2011; Wiltermuth & Heath, 2009). In short, synchronous activity promotes sociality (Marsh, Richardson, & Schmidt, 2009).

Where researchers have considered the converse relationship (i.e., the impact of social factors on the emergence of synchrony) comparable effects have emerged. For instance, Néda, Ravasz, Brechet, Vicsek, and

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[1] However, see Strogatz, Abrams, McRobie, Eckhardt, and Ott (2005) for one (potentially calamitous) example of pedestrian synchrony.

[2] In-phase synchrony (i.e., a 0° relative phase relationship) occurs when the actions of each individual are simultaneously at equivalent points of the movement cycle, while anti-phase synchrony (i.e., a 180° relative phase relationship) occurs when such actions are simultaneously at opposite points of the cycle.

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Brarbási (2000) reported that audiences spontaneously synchronized their applause in appreciation of fine performances. Moreover, in a laboratory context the introduction of an arbitrary participant-confederate difference led to enhanced levels of synchrony as a means to reduce perceived social distance (Miles, Lumsden, Richardson, & Macrae, 2011). In contrast, participants who experienced antipathy after being made to wait for a tardy confederate synchronized less on a subsequent movement task than those who endured no such delay (Miles, Griffiths, Richardson, & Macrae, 2010). These examples highlight that the dynamics underlying the emergence of synchrony are not impenetrable to (social) psychological influences. Indeed, Néda et al. (2000) speculated that cultural factors (e.g., group homogeneity) may shape synchronization, while close inspection of our own data (e.g., Miles, Griffiths, Richardson, & Macrae, 2010; Miles et al., 2011; Richardson et al., 2005) reveals considerable variation in the degree to which individuals synchronize.[3] So what may give rise to such individual-level variability?

Social value orientation

In an impressive body of work, social value orientation (SVO; McClintock, 1972) has been identified as a fundamental determinant of people's goals in interpersonal contexts (see Balliet, Parks, & Joireman, 2009; Bogaert, Boone, & Declerk, 2008; Van Lange, 1999, 2000). Developed to extend models of behavior based solely on notions of rational self-interest, the construct of SVO describes stable individual differences in preferences for patterns of interdependent outcomes during social exchange. Three primary orientations exist: (i) *pro-social*, whereby individuals are motivated to cooperate in order to achieve maximum outcome equality for themselves and interaction partners; (ii) *individualist*, whereby maximum outcomes for self are sought with little or no consideration of outcomes for others; and (iii) *competitive*, whereby outcomes for self are maximized relative to outcomes for others. In practice, individualists and competitors are frequently combined into a single *pro-self* category, as both orientations look to maximize their own outcomes in either absolute (individualists) or relative (competitors) terms. We adopted this convention in the current work.

Social value orientation has proven to be a powerful predictor of social behavior — pro-social individuals cooperate in mixed-motive economic games (Balliet et al., 2009), donate to charity (Van Lange, Bekkers, Schuyt, & Van Vugt, 2007), volunteer (McClintock & Allison, 1989), and use public transport (Van Vugt, Meertens, & Van Lange, 1995) more frequently than their pro-self counterparts. This propensity towards cooperation and sociality provides an important link to interpersonal synchrony. Following periods of temporal coordination, people act more cooperatively (Kirschner & Tomasello, 2010; Wiltermuth & Heath, 2009), are more able to cooperate (Valdesolo, Ouyang, & DeSteno, 2010), become more agreeable (Wiltermuth, 2011) and engage in more altruistic deeds (Valdesolo & DeSteno, 2011). Could it therefore be the case that cooperation is not only a beneficial consequence of synchrony, but also a predictor of its emergence?

Study 1

Coordination dynamics present synchrony per se as a cooperative phenomenon (i.e., involving the interaction of multiple elements of a system). Perhaps the tendency towards cooperation on the part of pro-social individuals can be appreciated not only with respect to psychological-level outcomes (e.g., pro-social behavior) but also in terms of a more general understanding of lawful, self-organizing systems. We explored this possibility by examining the spontaneous emergence of interpersonal synchrony as a function of SVO. Drawing from the extant literature, we anticipate pro-social oriented participants to synchronize their movements with those of a confederate to greater extent than those with a pro-self orientation.

Method

Participants and design

Seventy female undergraduates (mean age 20.3 years) took part in the study in exchange for course credit. The study had a single factor (SVO: pro-social vs. pro-self) between-participant design and was approved by the School of Psychology, University of Aberdeen ethics committee.

Procedure and materials

Participants arrived at the laboratory individually and were initially asked to complete the 9-item triple-dominance measure of SVO (see Van Lange, 1999). This scale has robust psychometric properties, is a valid predictor of SVO-linked behavior (Bogaert et al., 2008) and importantly is not influenced by social desirability (Platow, 1994). The task itself consists of a series of decomposed games in which participants must allocate 'points' to themselves and a hypothetical other. For instance, participants might be asked to choose between alternatives corresponding to a pro-social orientation (e.g., 480 points for self and 480 points for other), an individualist orientation (e.g., 540 points for self and 280 for other) or a competitive orientation (e.g., 480 points for self and 80 points for other). Participants are classified according to their SVO if they make at least 6 of the 9 choices consistent with one orientation. In line with previous work (see Au & Kwong, 2004), 17 participants could not be classified on the basis of 6 consistent choices and were therefore excluded.

Next, allegedly as preparation for a subsequent part of the study, the remaining 53 participants were asked to perform some light activity in the form of repetitive arm curls (i.e., arm extension/flexion) while holding a wooden rod (5 cm diameter, 60 cm long). Arm movements were recorded at 120 Hz using a magnetic motion tracking system (Polhemus Liberty, Polhemus Corporation, Colchester, VT) with a sensor attached to the end of the rod. The experimenter demonstrated the activity before asking the participant to perform the movement in time with an electronic metronome (1.4 Hz) for 60 s. At this point, the participant was corrected if she did not perform the arm curls correctly (i.e., limited range of movement, not keeping time with the metronome). Participants were then required to perform arm curls without the accompanying metronome for an additional 60 s. This served as the 'baseline' stage of the task and was included to measure any differences in chance coordination (see Data reduction for further details).

In the next phase, participants were informed that they would repeat the arm curl exercise for a further 3 min while simultaneously viewing another participant, via a live video-link, who was taking part in the same study in an adjacent laboratory. In reality, the video-link was a pre-recorded video of a 24-year-old female confederate performing arm curls (1.4 Hz), displayed at approximately life-size using a data projector. The participant was instructed to begin performing arm curls once the other person was visible via the video-link. This period served as the 'interaction' stage of the procedure. Importantly, no instructions were given with regard to coordinating with the other individual, but participants were asked to refrain from directly communicating (e.g., waving, talking) via the video-link.

Finally, participants were asked if they had noticed anything suspicious during the study. No participants suspected that they had been viewing a video recording or that the study was investigating interpersonal synchrony.

[3] For instance, in Miles, Griffiths, Richardson, and Macrae (2010), on average participants in the control (i.e., on-time) condition spent 51% ($SD = 14\%$) of the interaction period synchronized with the confederate, however individual levels of participant-confederate synchrony in this condition ranged from 4% to 97%. Similarly, in the late condition, on average participants spent 24% ($SD = 12\%$) of the interaction synchronized, but this value ranged from 1% to 74% when considered individually.

Data reduction

Unfortunately, after completing data collection we noticed that the trigger used to initiate the recording of participants' movement data was not precise, meaning that we were unable to calculate accurate estimates of the relative phase relationship between participant and confederate actions. We were, however, able to calculate cross-spectral coherence (hereafter referred to as *coherence*). Coherence indexes coordination on a scale ranging from 0 (i.e., no coordination) to 1 (i.e., absolute coordination) by correlating two time-series over the range of possible component frequencies.

Prior to analysis, the first 5 s of each time series of movement data was removed to eliminate transients that may occur during the initiation of arm movements. Baseline (i.e., chance) coordination was calculated by comparing participant movements during the 60 s period when they performed the arm curls alone, with the first 60 s of the confederate's movements. Thus, for each participant, their raw movement data were reduced to separate estimates of coordination (i.e., coherence) relative to the confederate's movements for the baseline and interaction stages of the procedure.

Results and discussion

Corroborating previous research, we observed considerable variation in the extent to which participants spontaneously synchronized with the confederate. Across the sample the mean coherence value during the test stage of the procedure was .41 ($SD = .35$), but across individual participants this ranged from virtually no coordination to very high levels (range = .01 to .96).

Of the 53 participants who responded with 6 consistent choices on the SVO measure, 30 were categorized as pro-social while 23 were categorized as pro-self (individualist: $N = 18$; competitive: $N = 5$). This distribution is very much in line with previous research (see Au & Kwong, 2004). In order to assess the impact of SVO on coordination, we compared average coherence levels using a 2 (SVO: pro-social vs. pro-self) × 2 (Stage: baseline vs. interaction) mixed model ANOVA with repeated measures on the second factor. This revealed main effects of both SVO, $F(1, 51) = 5.23$, $p = .03$, $\eta_p^2 = .09$, and Stage, $F(1, 51) = 36.30$, $p < .001$, $\eta_p^2 = .42$, which were qualified by a SVO × Stage interaction, $F(1, 51) = 4.19$, $p = .04$, $\eta_p^2 = .08$, as displayed in Fig. 1.

Post-hoc testing (Tukey *a*, $p < .05$) revealed that while both groups of participants coordinated their movements with those of the confederate at greater than chance levels (i.e., interaction > baseline), participants with a pro-social orientation ($M = .50$, $SD = .33$) coordinated to a significantly greater extent than those with a pro-self orientation ($M = .28$, $SD = .34$). There was no such difference during the baseline stage (pro-social: $M = .11$, $SD = .16$; pro-self: $M = .09$, $SD = .16$). What this reveals is that participants with an inclination towards cooperative behavior spontaneously coordinated with a confederate to a greater extent than those who tend to focus more on ensuring adequate outcomes for themselves in interdependent contexts. In this way, SVO was seen to have a bearing on the propensity with which individuals synchronized their actions with others. In Study 2 we sought to confirm and extend this effect by manipulating participants' social motives (i.e., pro-social or pro-self) prior to a period of interaction with a confederate.

Study 2

To further investigate the relationship between SVO and synchrony revealed in Study 1 we conducted a follow-up experiment. The procedure was modeled closely on that employed in Study 1 with the primary exception that participants were instructed (i.e., primed) to adopt either a pro-social or pro-self motivation, ostensibly in preparation for a separate task (see Procedure and materials). We also sought to extend the generality of any potential effects by including male participants in the sample. To permit same sex participant-confederate dyads we created two new target videos, one with a male confederate, and one with a female confederate. Finally, we employed an alternative method to record participant and confederate movements which enabled the calculation of relative phase. This measure offers greater insight into the coordination dynamics inherent to interpersonal synchrony by providing estimates of not only the amount of coordination, but also the mode (i.e., in-phase vs. anti-phase). In line with the results of Study 1, we expected participants who had been instructed to adopt a pro-social motivation to coordinate with the confederate to a greater degree compared with those primed to seek pro-self outcomes.

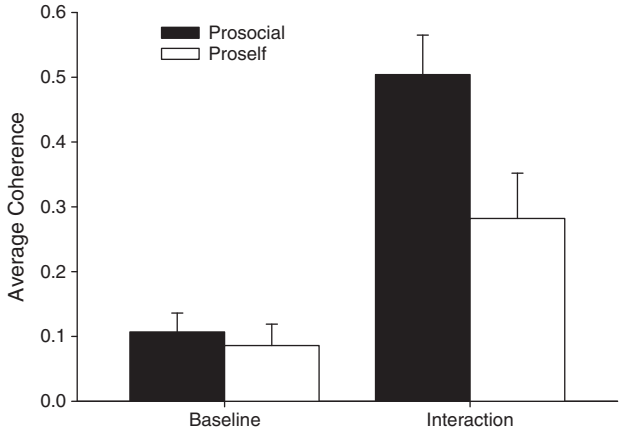

Fig. 1. Amount of coordination (i.e., average coherence) between participant and confederate arm movements during baseline and interaction stages as a function SVO (pro-social vs. pro-self). Error bars represent 1 SEM.

Method

Participants and design

Thirty undergraduates (mean age 21.1 years, 22 female) took part in the study in exchange for course credit. Participants were quasi-randomly assigned to receive instructions that were intended to prime either pro-social ($n = 15$) or pro-self motives ($n = 15$), with the stipulation that sex was evenly distributed as a function of instruction condition (i.e., 4 males per condition). The experiment was approved by the School of Psychology, University of Aberdeen ethics committee.

Procedure and materials

As in Study 1, participants arrived at the laboratory individually and were initially asked to complete a 'points allocation game' (in reality the 9-item triple-dominance measure of SVO, see Van Lange, 1999). All participants were retained regardless of their SVO.[4] Next, again allegedly as preparation for a subsequent part of the study, participants performed arm curls while holding a wooden rod. Arm movements were recorded at 200 Hz using electrogoniometers (Biometrics SG-110, Biometrics Ltd, Gwent, UK) attached across the right elbow in combination with a Biopac M150 data acquisition unit, a Biopac DA100C amplifier and Acq*Knowldege* software version 3.8.2 (Biopac Systems, Goleta, CA). The baseline stage of the procedure was performed in the same manner as in Study 1, after which participants were informed that they would repeat the arm curl exercise while simultaneously viewing another participant via a live video-link. Again, the video-link was in fact a pre-recorded video of

[4] The distribution of SVOs did not differ as a function of participant sex, $\chi^2(2, N = 30) = 1.70$, $p = .43$, or assigned SVO Instruction condition, $\chi^2(2, N = 30) = 0.20$, $p = .90$.

either a 25 year-old female confederate (for female participants) or a 25 year-old male confederate (for male participants). The videos were filmed under identical conditions and both confederates performed arm curls in time with an electronic metronome (1.4 Hz).

Prior to beginning the video-link, participants were told that the final stage of the procedure would involve a face-to-face interaction with the other participant (i.e., the confederate) during which they would play the same 'points allocation game' (i.e., the triple-dominance measure of SVO) as they had completed at the beginning of the study. Crucially, the instructions regarding this stage of the procedure were designed to prime either pro-social or pro-self motives. Specifically, participants were told that their goal during the subsequent 'points allocation game' was to either: "*ensure equal outcomes for both yourself and the other participant*" (pro-social condition), or to: "*ensure the best possible outcome for yourself*" (pro-self condition). These instructions were based on Van Lange's (1999) definitions of pro-social and pro-self motivation. To maintain the cover-story, participants were told that the video-link provided an opportunity to form an initial impression of the other participant before their face-to-face interaction, and as such they were to refrain from any direct communication (e.g., waving, talking). No other mention was made as to how they should behave during this stage of the procedure. Participants then performed the arm-curls for 3 min while viewing the video-link.

Finally participants were informed that there was in fact no face-to-face interaction and were funnel debriefed as for Study 1. No participants reported any suspicions regarding the video-link or that the study was investigating interpersonal coordination.

Data reduction

Consistent with Study 1, prior to analysis the first 5 s of movement data for each interaction was removed. Next, in order to prepare the data for the calculation of relative phase, each time series was centered around 0 and low-pass filtered using a 10 Hz Butterworth filter. Coordination between participant and confederate arm movements was estimated for each participant individually. Relative phase was normalized to a range of 0°–180° and the distribution of relative phase angles across nine 20° phase regions (0°–20°, 21°–40°…161°–180°) was determined by calculating the frequency of coordination occurring within each of these regions (see Schmidt & O'Brien, 1997). Thus, for each participant, their raw movement data (relative to the target) were reduced to estimates of the time spent in each of nine relative phase regions for the baseline and interaction stages of the procedure separately. Coordination is indicated by a concentration of relative phase angles in the regions of the distribution near 0° (i.e., in-phase coordination) and/or 180° (i.e., anti-phase coordination).

Results and discussion

Again, substantial variation in the amount of coordination was observed. On average, participants spent 23.8% of the test stage of the procedure synchronized (i.e., in-phase coordination) with the confederate, however this value ranged from 1.7% to 63.3% when considered individually.

The relative phase relationship between participant and confederate arm movements was compared using a 2(SVO Instruction: pro-social or pro-self) × 2 (Stage: baseline or interaction) × 9 (Relative Phase Region: 0°–20°, 21°–40°…161°–180°) mixed model ANOVA with repeated measures on the final two factors.[5] A main effect of Relative Phase Region, $F(8, 224) = 11.42$, $p < .001$, $\eta_p^2 = .29$, was qualified by 2-way interactions between SVO instruction × Relative Phase Region, $F(8, 224) = 2.87$, $p = .01$, $\eta_p^2 = .09$, and Stage × Relative Phase Region, $F(8, 224) = 13.76$, $p < .001$, $\eta_p^2 = .33$, and importantly a 3-way SVO Instruction × Stage × Relative Phase Region interaction, $F(8, 224) = 2.53$, $p = .01$, $\eta_p^2 = .08$. Inspection of Fig. 2 suggests no systematic pattern of coordination (i.e., an even distribution of relative phase angles) during the baseline stage of the procedure, but an increased concentration of relative phase angles near the 0°–20° region (i.e., in-phase coordination) during the interaction stage.

To verify these apparent effects and simplify interpretation, a follow-up 2(SVO Instruction: pro-social or pro-self) × 2 (Stage: baseline or interaction) mixed model ANOVA that focused only on coordination in the 0°–20° phase region was conducted. This revealed main effects of both SVO Instruction, $F(1, 28) = 5.47$, $p = .03$, $\eta_p^2 = .16$, and Stage, $F(1, 28) = 20.65$, $p < .001$, $\eta_p^2 = .42$, which were qualified by a SVO Instruction × Stage interaction, $F(1, 28) = 5.01$, $p = .03$, $\eta_p^2 = .15$, (see Fig. 2 inset). Post-hoc tests (Tukey *a*, $p < .05$) indicated that while both groups of participants coordinated with the confederate at levels greater than chance (i.e., interaction > baseline), those who received the pro-social instructions showed a significantly greater degree of in-phase coordination than those who received the pro-self instructions (pro-social $M = 30.8\%$, $SD = 18.9\%$; pro-self: $M = 16.9\%$, $SD = 11.6\%$).[6] Consistent with the effects revealed in Study 1, participants primed with a pro-social orientation spontaneously synchronized their movements with those of an interaction partner to a greater extent than those instructed to adopt a pro-self motivation.

General discussion

Interpersonal synchrony presents a potential conundrum. On one hand this form of coordination is governed by lawful physical principles of coordination dynamics (Kelso, 1995; Schmidt & Richardson, 2008), suggesting some degree of inevitability. Alternatively, both anecdotal and laboratory evidence points to considerable variation in the extent to which interpersonal synchrony is observed (e.g., Miles, Griffiths, Richardson, & Macrae, 2010; Miles et al., 2011; Richardson et al., 2005). Here we explored whether differences in social value orientation contribute to the propensity to coordinate with others. The results were revealing. Across two studies we demonstrated that a pro-social mindset was associated with greater levels of interpersonal synchrony than a pro-self focus. This effect was seen regardless of whether such motivation was borne out of stable individual differences (Study 1), or resulted from explicit instructions designed to prime pro-social or pro-self strivings during an ostensibly separate task (Study 2). Moreover, the mode of synchrony observed in Study 2 (i.e., in-phase) is precisely that predicted by models of coordination dynamics (Haken et al., 1985). In this way, SVO was seen to shape the emergence of interpersonal synchrony.

These findings provide evidence to colligate low-level motor behavior with higher-order social cognitive processes. The potency of the physical 'pull' towards behavioral synchrony was tempered according to distinctly psychological qualities. The broad implications of this observation are twofold. First, coordination dynamics appear to be sufficiently flexible to accommodate individual nuances in social motivation. This extends previous work that has identified physical (e.g., Nessler & Gilliland, 2009; Richardson et al., 2005) and contextual (e.g., Miles, Griffiths, Richardson, & Macrae, 2010; Miles et al., 2011) factors that impact the emergence of interpersonal synchrony by demonstrating such influence at the level of the individual. Important questions remain however, regarding quite how dispositional properties alter the physics of coordination. One potential explanation lies in the strength of the

[5] A preliminary analysis revealed no significant effects of participant sex, nor any interactions with SVO instruction condition, therefore this factor was not considered in the main analyses. Although the relatively low number of male participants ($n = 8$) suggests a lack of statistical power, inspection of the data indicates that the males in the present sample behaved much like the females in that coordination in the 0°-20° relative phase region was higher for those who received the pro-social instructions ($M = 22\%$) than those who received the pro-self instructions ($M = 12\%$).

[6] Conducting the equivalent analyses but with coherence as the index of coordination (see Study 1) yielded the same pattern of results (i.e., pro-social > pro-self).

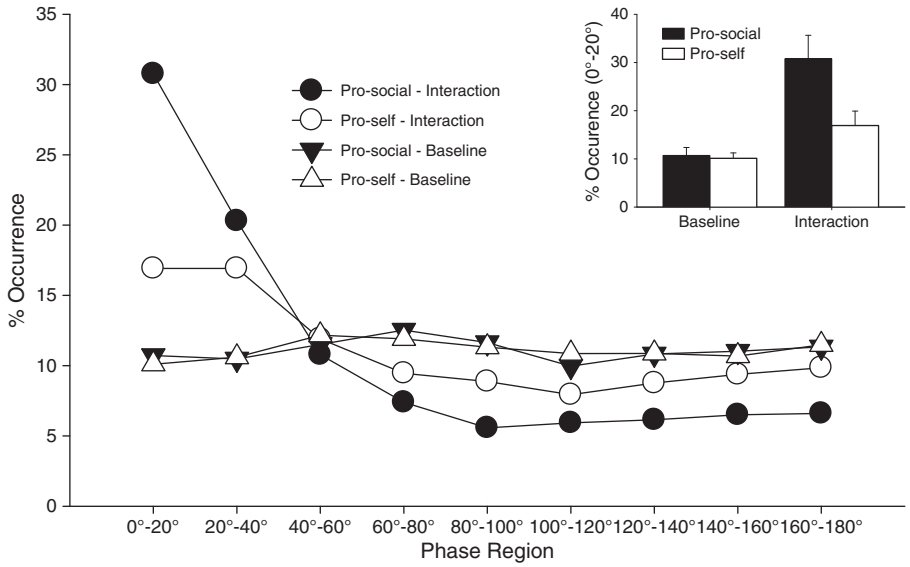

Fig. 2. Distribution of the relative phase relationship between participant and confederate arm movements during baseline and interactions stages as a function of SVO instruction condition (i.e., pro-social or pro-self). The inset displays coordination in the 0°–20° (i.e., in-phase) relative phase region. Error bars represent 1 SEM.

information coupling between interactants. In the present study actions were visually coupled, raising the prospect that differences in the way pro-social and pro-self participants allocated attention to the confederate contributed to the modulation of synchrony (cf. Stel, Rispens, Leliveld, & Lokhorst, 2011). This possibility awaits investigation.

Second, the explanatory utility of SVO appears to extend beyond conventional contexts for examining cooperative behavior (e.g., economic games, social dilemmas). Consistent with functional accounts of synchrony, the actions of socially-focused individuals were aligned with patterns of interpersonal behavior that promote sociality. We suggest this follows a generalized cooperative intent on behalf of pro-social individuals (Bogaert et al., 2008) whereby the *mutual* benefits of interpersonal synchrony satisfy the pro-social goal of outcome equality (Van Lange, 1999, 2000). A more stringent examination of this proposition would measure synchrony as a function of SVO within actual dyads (i.e., no confederate or video-link). Related work indicates, perhaps surprisingly, that dyadic heterogeneity may be effective in eliciting cooperation in negotiations (Schei, Rognes, & Shapiro, 2011) as well as when attempting to intentionally coordinate motor actions (Schmidt, Christianson, Carello, & Baron, 1994). A useful task for future research will be to explore this issue further.

It may be tempting to characterize the present findings simply as an extension of earlier work demonstrating enhanced pro-sociality following periods of synchronous activity (e.g., Valdesolo & DeSteno, 2011; Wiltermuth & Heath, 2009). While we acknowledge the possibility of a straightforward bi-directional relationship between synchrony and pro-social behavior, we believe some additional points merit consideration before endorsing this viewpoint. Importantly, recent research indicates that synchrony can also foster anti-social outcomes in that individuals are more compliant with requests to aggress towards others following a period of coordinated action (Wiltermuth, 2011). This suggests that rather than solely promoting pro-social behavior, synchrony may set the stage for a more generic form of social connection and all that this entails (e.g., cohesion, conformity, obedience). Indeed, McNeill (1995) argues that many human rituals, ranging from religious ceremonies to military drill, feature coordinated rhythmic movement that functions to enhance collectivity. While such a sense of connectedness may clearly lead to altruistic acts (e.g., selfless contributions to the group), on other occasions being part of the collective can in fact have decidedly unsociable outcomes (e.g., military action). In the context of the current inquiry this gives reason to pause before assuming a simple reciprocal relationship between synchrony and pro-social behavior. Regardless of one's SVO, the consequences of synchrony (e.g., enhanced rapport, agreeableness, self-other overlap, person perception, and feelings of connectedness) may not necessarily lead to pro-social outcomes (Wiltermuth, 2011).

At a more theoretical level, the status of the relationship between synchronous actions and social cognitive functioning also warrants some reflection. In question is the causal basis of coordinated action and, as a consequence, the specificity of the functional association between synchrony and social exchange. Although fashionable, the reduction to specialized neural mechanisms (e.g., a mirror neuron system) that characterizes contemporary social cognitive neuroscience appears, in this instance, to fall short of both the generality and parsimony offered by other explanations (e.g., self-organizing coordination dynamics). After all, precisely the same dynamics underlie myriad examples of synchrony (e.g., pendulum clocks, fireflies, pacemaker cells, interpersonal coordination), only a few of which have any potential recourse to neurocognitive activity as an explanatory basis for coordination. One implication here is that if interpersonal synchrony is indeed an emergent property of physical laws, the social cognitive qualities associated with this form of coordination may be epiphenomenal in nature. That is, rather than being grounded in neural structures, motor programs or mental schema (Richardson, Shockley, Fajen, Riley, & Turvey, 2008), patterns of synchronous actions may in fact be a more general foundation on which the specific characteristics of social exchange are built (Marsh et al., 2009; Miles, Nind, & Macrae, 2009; Richardson, Marsh, & Schmidt, 2010). To this end, casting synchrony solely as an attribute of pro-sociality appears a questionable theoretical proposition.

The present work identified social value orientation as one source of variation regarding the propensity for individuals to spontaneously synchronize their actions with others. Participants with a preference for cooperation coordinated with a confederate to a greater extent than more self-focused individuals. In this way, although manifest at somewhat different levels of analysis, cooperation and coordination may be seen to share a common theoretical grounding (cf. Baron, 2007).

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