

# Concealable Stigmatized Identity Disclosure as a Possible Perturbation to Complex Social Systems

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## Abstract

Interpersonal coordination is essential for successful cooperative action. Beyond synchronized joint action to achieve a goal such as moving furniture, humans tend to spontaneously coordinate movement in everyday action (i.e., coordinated limb movement during walking). Furthermore, these actions are said to arise from the interaction dominant dynamics between agents and foment cooperative behavior. As such, existing research demonstrates that closer affiliation is associated with entrainment of physiological signals including heart beat and rhythmic limb movement. Considering the role social stigmatization plays in disrupting social interaction, the present research investigated the impact of concealable stigma disclosure (depression diagnosis or bisexual identity)—as a perturbation to a nonlinear dynamical system—on interpersonal coordination and affiliation. Study 1 results demonstrate that depression disclosure may lead to more social distancing in a collision avoidance walking task compared to bisexual and neutral disclosures. In study 2, interaction improved affiliation regardless of disclosure type.

**Keywords:** Concealable stigma disclosure; spontaneous synchronization; interpersonal coordination; nonlinear dynamics

## Introduction

Human behavior and coordination is said to arise from social complex dynamical systems with interacting components at and between multiple timescales—for example, exchanges between two academics at a research conference and between higher order structures such as the academy (Richardson, Dale, & Marsh, 2014). As spontaneous synchronization is characteristic of complex dynamical systems, interpersonal coordination is thought to aid in enhancing rapport and solidarity (Lumsden, Miles, & Macrae, 2014; Fischer et al., 2013). In fact, research has demonstrated that many physiological signals between two coacting individuals tend to spontaneously synchronize including heart rate (Mitkidis et al., 2015), rhythmic limb movement (Cross, Wilson, & Golonka, 2016), and even neural activity (Pérez, Carreiras, & Duñabeitia, 2017). Importantly, in complex systems, this increased synchronization is typically exhibited following transitional states between disorder and order (Haken, 1977). Another crucial aspect of a complex system is reorganization following perturbation (Thelen, 1993). In the present studies, we investigated the role of stigma disclosure (i.e., depression diagnosis or bisexual identity) as a perturbation disrupting interpersonal behavioral dynamics during unidirectional coupled rhythmic arm movement and a cooperative collision

avoidance walking activity. We further considered how spontaneous synchronization impacted liking.

## Concealable Stigma Disclosure as a Perturbation

In his early sociological work on the process of stigma, Erving Goffman (1963) stated that the stigmatization of certain attributes arises when deviations from expected societal norms are made salient. Importantly, this results in social devaluation and marginalization (Jones et al, 1982). While some stigmatizing attributes are readily apparent, such as race or physical disability, many stigmatized identities are not visible. Individuals with a concealable stigmatized identity (CSI)—including a mental health disorder or sexual minority identity—often make decisions regarding how and when to share this information. Though revealing a CSI could result in rejection by friends and family (Hoggart, 2017), reduced job mobility (Baur et al., 2018), or even job loss (Ragins, Singh, & Cornwell, 2007), extant research demonstrates numerous benefits of revealing a concealable stigma within personal and professional relationships (Quinn & Earnshaw, 2013).

General self-disclosure is an expected aspect of relationship formation and growth (Greene, Derlega, & Matthews, 2006), and disclosing a CSI can serve to strengthen trust and increase affiliation within a relationship (Beals, Peplau, & Gable, 2009). Furthermore, the burden associated with keeping a CSI concealed is said to increase cognitive load as actively hiding an important part of one's identity distracts from other tasks (Smart & Wegner, 1999). Researchers have also demonstrated that concealing a hidden stigma can lead to less group cohesion in the workplace (Clair, Beatty, & Maclean, 2005) and is associated with increased depressive symptomology (Frost, Parsons, & Nanin, 2007) and less adherence to identity related medicine (Lyimo et al., 2014). Therefore, while the risk of a negative disclosure response is significant, sharing a CSI to a supportive confidant is desirable, and sometimes necessary.

Though stigma disclosure is an important aspect of identity management and relationship development, making a CSI known may disrupt or perturb the social relationship. As stigma exists when an individual holds an identity that can be labelled as deviant or different from the cultural norm, when someone discloses a CSI, a degree of uncertainty about the relationship is inserted into the interaction. Naturally, a complex dynamical system tends to fall into stable states, in an interpersonal interaction, that is often exhibited through

synchronization of behavioral and physiological signals (Richardson, Dale, & Marsh, 2014). When a perturbation is introduced into the system, there is generally a period of fluctuation and destabilization, known as a critical fluctuation (Gorman et al., 2012). During this time, the system explores new patterns of behavior until, inevitably, it falls into a new stable state. Though stigma disclosure has not been explicitly described as a perturbation to a dynamical system, the phenomenon of relationship fluctuations and changes following a disclosure has long been noted. In a recent qualitative study of sexual violence disclosure within close relationships, researchers found that 91% of dyads described a shift in the relationship, either positive or negative, following the disclosure (O'Callaghan, Lorenz, Ullman, & Kirkner, 2018). As such, CSI disclosure may result in a critical fluctuation which transitions interpersonal relationships into new stable states, either positively or negatively.

### The Present Study

In the present studies, we investigated the impact of CSI disclosure on spontaneous synchronization and behavioral dynamics during cooperative action. In particular, we were interested in exploring interpersonal behavioral dynamics following a CSI disclosure, and how this influenced liking and attitude change. To examine CSI disclosure as a perturbation, participants viewed a pre-recorded 'ice-breaker' video presented as a live Skype video feed. In study 1, which served as a proof of concept, the confederate disclosed that she either: 1) identifies as bisexual, 2) has depression, or 3) never learned how to ride a bike (neutral disclosure). In study 2, the depression condition was dropped as participants' attitudes towards individuals with depression were relatively positive prior to participation. In both studies, after the confederate disclosure, participants performed rhythmic arm movements while unidirectionally coupled to the confederate with a prerecorded video. Cross-spectral coherence was employed as a meter of coordination. Participants also completed a walking collision avoidance task in which the participant was forced to walk in an elliptical pattern around the confederate, relative deviation from a straight line, circular deviation, was used as a meter of avoidant behavior. As such, in these two studies we tested the following hypotheses:

*Hypothesis 1: Participants will exhibit less spontaneous synchrony with the confederate in the stigma disclosure conditions compared to control during a rhythmic arm movement task.*

*Hypothesis 2: Participants will exhibit larger circular deviation (ie., more avoidance) when interacting with the confederate in the stigma disclosure condition compared to neutral disclosure during a walking collision avoidance task.*

*Hypothesis 3: Both liking and attitudes towards the stigma group will increase following the interaction with the study confederate.*

## General Experimental Method

### Participants

Participants in study one ( $N = 31$ ) were recruited from a large Australian university's psychology participant pool and received partial course credit for their time. Four participants were excluded from analysis: One due to experimenter error, one participant was visually impaired and required a cane to aid in walking, and two participants did not consent to their data being used following the debrief. Therefore,  $N = 27$  participants were included in the reported analyses. Participants were between 18 to 29 years old ( $M = 20.33$ ,  $SD = 3.16$ ) and the majority (81.5%) identified as female. The majority of participants self-identified races were White (40.7%), Asian (37%), Middle Eastern (7.4%) or multi-racial/undefined (14.8%). In study two, participants ( $N = 30$ ) were recruited using posted flyers and word of mouth and received AUD\$30.00 for their time ( $n = 3$  were recruited for course credit). Data from five participants were excluded from analysis: four participants saw the video timer during the ice-breaker task, therefore realizing the videos were pre-recorded, and one participant had met the study confederate previously. Participants included in analysis ( $N = 25$ ) were between 18 and 48 years old ( $M = 31.84$ ,  $SD = 9.09$ ) and the majority (68%) identified as female. Participants self-identified races were White (48%), Asian (44%), or multi-racial/undefined (8%).

### Procedure

**Prescreen and Attitudes** Approximately 2-7 days prior to the lab experiment, participants completed a 15-minute online Qualtrics survey to measure attitudes towards bisexual women and people with depression (these measures are described below).

**Disclosure Manipulation** In the laboratory session, following informed written consent, participants were instructed to watch another participant answer 5 'ice-breaker' questions on what they were told was a live Skype video feed. The video they viewed, however, was a recording of the study confederate in which the confederate disclosed either a bisexual identity (study 1 [ $n = 11$ ]; study 2 [ $n = 11$ ]), a depression diagnosis (study 1 [ $n = 9$ ]), or that they do now know how to ride a bike (study 1 [ $n = 7$ ]; study 2 [ $n = 14$ ]). Participants also answered the same questions on a pretend Skype video call, the order was counterbalanced such that half of the participants answered the questions first, and the other half viewed the confederate video first. Next, participants completed a revised version of the Reysen Likability Scale (Reysen, 2005) and the one item Inclusion of the Other in the Self (IOS) measure (Aron, Aron, & Smollan, 1992).

**Behavioural Synchrony** Participants then completed a unidirectional arm curl behavioural synchrony task to quantify spontaneous interpersonal synchrony. In a baseline

trial, participants performed arm curl movements to the beat of a metronome (in study 1, the metronome was 61 BPM, and reduced to 50 BPM in study 2). The metronome played for 15 seconds, and participants were instructed to continue at the same rate for an additional 75 seconds (90 seconds in total). In the next trial, participants performed the same 90 second arm curl task while viewing the confederate doing the same action over what appeared to be a live Skype video feed, and without the aid of a metronome. In reality, the confederate movement was prerecorded, and her arm movement maintained a consistent 61 or 50 BPM in studies 1 and 2 respectively. Movement was recorded from two handheld HTC Vive controllers at a 90 Hz recording rate. We captured the degree to which participants spontaneously synchronised their movement to the confederate by measuring cross-spectral coherence. Cross-spectral coherence identifies how correlated two time series are across a range of frequencies with degree of coordination measured from 0 to 1—where 0 suggests no coherence and 1 being perfect coherence (Richardson, Marsh, & Schmidt, 2005). In study one, participant time series were compared against the confederate time series by matching the final peaks and analysis was performed on the last 60 seconds of the trial. As that provided an imperfect estimate of coherence, in study 2, a tone in the confederate video signalled confederate movement and was matched to the participant time series. In study 2, the first 5 seconds of the trial was removed to account for potential transient movement at the beginning of the trial. Cross-spectral coherence was performed for both participant right/confederate left and participant left/confederate right arm time series. As the pattern of results were the same, coherence was averaged for ease of interpretation.

**Collision Avoidance** Following the remote behavioural synchrony activity, the research confederate entered the room to complete an in-person collision avoidance task using methods adapted from those employed by Richardson and colleagues (2015) and served as an indicator of complementary joint action and avoidant behavior. Participants completed two 60 second trials of continuous walking between targets concurrently with the confederate. In the task space, four posts (1m tall) were placed in the corners of a 3m x 3m square and the participant and confederate started at adjacent posts. The participants and confederate were instructed to walk diagonally between the target posts at a comfortable and consistent pace, and to touch the top of their target posts at the same time as their study partner. To successfully complete these task demands, one person would maintain a straight-line trajectory, while the other would move in an elliptical pattern to avoid collision (see Figure 1; Richardson et al., 2015). Unbeknownst to participants, the confederate was instructed to maintain the straight-line trajectory, essentially imposing the elliptical pattern on the participant. As such, we use circular deviation as a measure of avoidance, potentially signalling social distancing away from the research confederate. Essentially, circular deviation characterizes the proportional deviation

(relative to the confederate) that the participant takes from a straight line trajectory. Finally, participants again responded to questionnaires measuring their attitudes towards people with depression and women who are bisexual, their general liking of the confederate, and the IOS.

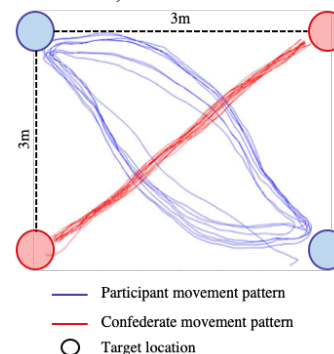


Figure 1: Experimental space and example participant and confederate movement patterns for the walking collision avoidance task.

## Measures

**Feeling Thermometer** To quantify overall attitudes towards bisexual women and people with depression, participants completed a modified version of a *feeling thermometer* in which participants rated a number of attributes on a 101-point scale where lower ratings (min = 0) indicates negative feelings and higher ratings (max = 100) indicates positive feelings (Herek & Capitanio, 1999). Participants were asked to provide feelings on 13 different characteristics (e.g., 'People with Autism' and 'People who inject illegal drugs') to distract from the true purpose of the study; though we were specifically interested in responses towards 'Bisexual women' and 'People with depression.' Participants responded to this measure during the online prescreen and at the end of their lab participation.

**Liking** To measure participant's affiliative feelings toward the confederate, participants completed a modified version of the Reysen Likability Scale (Reysen, 2005). This assessed how much the participant 'likes' the confederate with questions such as "*How close do you feel to the other participant?*" on a likert-scale from 1 (*Not at all*) to 9 (*Very close*). A composite score was created by averaging the responses. Participants responded to this measure following the 'ice breaker' questions and again at the end of the study.

**Inclusion of the Other in the Self** This is a one-item measure in which participants describe their relationship with the research confederate on a 7-point scale where each point contains two circles labelled 'you' and 'x' (x being the research confederate). The circles vary in their degree of overlap such that the circles do not overlap at 1 and almost completely overlap at 7 (Aron, Aron, & Smollan, 1992). As with the likability measure above, participants responded to this measure following the 'ice breaker' questions and at the

end of the study. All measures were completed on a lab computer using Qualtrics.

**Debrief** Given the deception in this study, all participants were thoroughly debriefed and explained the purpose of the manipulation. As part of this process, participants rated the degree to which they believed the research confederate was a participant on an 11-point scale (0 = *Completely believed she was a participant*; 10 = *Completely believed she was not a real participant*). Lastly, participants were given the opportunity to re-consent to their data being used once they were aware of the true purpose. In study 1,  $n = 2$  participants did not consent, therefore, their data were immediately deleted and not used for any analyses. All participants in study 2 provided consent for their data to be used in publication.

## Study 1: Proof of Concept

### Study-Specific Method

Study 1 included three disclosure conditions (depression, bisexual, and neutral) to compare the impact of different types of stigma disclosure on interpersonal movement dynamics, attitudes, and liking. During the behavioral synchrony task, a 61-bpm metronome was used for both the baseline and the confederate recording. Data collection occurred between August and October 2019.

### Results and Interpretation

**Behavioral Synchrony** Due to an equipment malfunction during the coupled condition, data was not recorded for two participants during the synchrony trial. However, as data were recorded for these participants in the baseline trial, they were maintained and their coherence values were replaced with mean values of the corresponding condition. A 2 (coupling condition: baseline and unidirectional coupling) X 3 (disclosure: depression, bisexual, neutral) mixed methods analysis of variance was performed on the coherence parameter. Recall that coherence provides a value from 0 to 1 with 0 reflecting no coherence and 1 being perfect coherence. As expected, there was a significant main effect of coupling condition ( $F(1,22) = 9.73, p = .01, \eta_p^2 = .31$ ) such that there was greater synchronization with the confederate in the coupled condition compared to baseline (Table 1). This simply suggests that participants did spontaneously synchronize their rhythmic arm movements to the confederate when viewing the video. Surprisingly, there was

no effect of disclosure type on the degree of synchronization ( $F(2, 22) = .04, p = .96, \eta_p^2 = .004$ ).

**Collision Avoidance** For three participants in the bisexual disclosure condition, movement data were corrupted and therefore, not included in the analysis. To test the hypothesis that stigma disclosure would result in greater avoidance away from the confederate, we conducted a oneway analysis of variance on the circular deviation across the three disclosure conditions. Results revealed a significant effect of disclosure type ( $F(2,19) = 4.39, p = .03, \eta_p^2 = .32$ ). Post hoc analyses using a Bonferroni adjustment revealed that circular deviation was greater in the depression disclosure condition ( $M = 6.57, SD = 2.81$ ) compared to the bisexual disclosure condition only ( $M = 2.57, SD = 1.43$ ). Surprisingly, neither experimental condition was significantly different from the neutral disclosure ( $M = 4.33, SD = 3.35$ ). These results partially support hypothesis 2 as participants demonstrated more avoidance away from the research confederate following a depression disclosure (Figure 2).

**Attitudes and Liking** To test hypothesis 3, we performed four separate 2 (time: pretest/posttest) by 3 (disclosure condition: depression, bisexual, or neutral) analyses of variance on four dependent variables of interest: attitudes towards people with depression (taken from the one-item measure from 0-100), attitudes towards bisexual women (taken from the one-item measure from 0-100), affiliation as measured by the adapted Reysen Likability Scale, and closeness as measured by the one-item IOS.

There was no significant main effect of time, disclosure type, or the expected interaction on attitudes towards bisexual women and people with depression (all  $F$ 's  $< 1.33, p > .26$ ). Though nonsignificant, there was a trend towards more positive attitudes towards people with depression following a depression disclosure (pretest:  $M = 76.57, SD = 20.83$ , posttest:  $M = 86, SD = 11.12$ ) as well as warmer feelings towards bisexual women following a bisexual disclosure (pretest:  $M = 66.18, SD = 30.95$ , posttest:  $M = 76.55, SD = 19.94$ ).

More surprisingly still is the result of the analysis of variance on liking. Results revealed a significant main effect of time ( $F(1,22) = 16.36, p = .001, \eta_p^2 = .43$ ) such that liking decreased following the participant's interaction with the research confederate (time 1 [ $M = 6.13, SD = 0.93$ ] and time 2 [ $M = 5.38, SD = 0.98$ ]). Contrary to our hypothesis and previous research, participants tended to like the research confederate less after the behavioral synchrony and collision avoidance tasks regardless of the disclosure condition.

**Table 1.**

*Mean and standard deviation of coherence parameter at baseline (uncoupled) and during the coupled condition*

	Baseline $M$ ( $SD$ )				Coupled $M$ ( $SD$ )				$p$
	<u>Depression</u>	<u>Bisexual</u>	<u>Neutral</u>	<u>Total</u>	<u>Depression</u>	<u>Bisexual</u>	<u>Neutral</u>	<u>Total</u>	
Study 1	.10 (.27)	.03 (.09)	.002 (.002)	.04 (.15)	.28 (.34)	.31 (.39)	.32 (.35)	.31 (.35)	< .01
Study 2	-	.03 (.02)	.06 (.11)	.05 (.09)	-	.64 (.31)	.52 (.38)	0.57 (.35)	< .01

*Note.*  $p$  values refer to the significant main effect of coupling condition.

However, there was no significant difference in closeness as measured by the IOS at times one and two or between the disclosure conditions (all  $F$ 's  $< 2.32$ ,  $p > .12$ ).

Though these results were unexpected, it should be noted that the participants in this study were relatively suspicious in regards to the research confederate with most participants indicating some degree of suspicion ( $M = 3.5$ ,  $SD = 2.53$ ). As participants were recruited from the psychology department participant pool, many stated that they were uncertain if their study partner was a real participant as they had experienced deception in previous research, or they had learned about confederate research in their coursework.

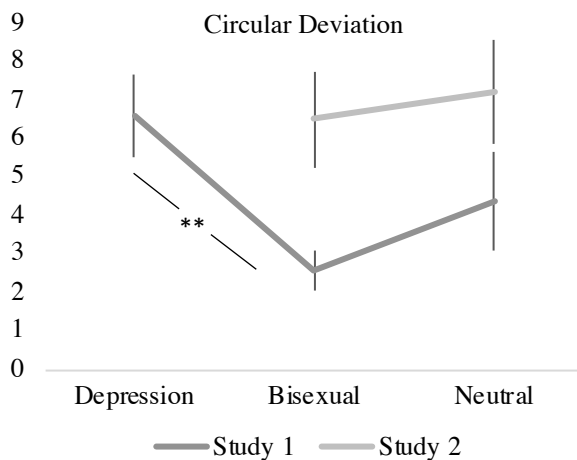


Figure 2. Mean circular deviation away from the research confederate for participants in the depression, bisexual, and neutral conditions (note, the depression condition was dropped in study 2). Error bars represent standard error. \*\*  $p < .01$

## Study 2

### Study-Specific Method

Given the already warm feelings towards people with depression during the prescreen in study 1, this condition was dropped in study 2. Therefore, participants either heard a bisexual disclosure or that the research confederate cannot ride a bike during the disclosure manipulation. During the behavioral synchrony task, a 50-bpm metronome was used for both the baseline and the confederate recording. Crucially, in study 2 participants were recruited primarily from the community rather than from the psychology participant pool. Participants in study 2 were less suspicious compared to study 1 ( $M = 1.5$ ,  $SD = 1.12$ ). Data collection occurred between November and January 2019-2020.

### Results and Interpretation

**Behavioral Synchrony** As with study 1, we conducted A 2 (coupling condition: baseline and unidirectional coupling) X 2 (disclosure: bisexual, neutral) mixed methods analysis of variance on the coherence parameter. As expected, there was a significant main effect of coupling condition ( $F(1,22) =$

58.68,  $p < .01$ ,  $\eta_p^2 = .72$ ) such that there was greater synchronization in the coupled condition compared to baseline (Table 1). As with study 1, there was no effect of disclosure type on the degree of synchronization ( $F(2, 22) = .34$ ,  $p = .57$ ,  $\eta_p^2 = .05$ ).

**Collision Avoidance** To test the hypothesis that stigma disclosure would result in greater avoidance away from the confederate, we conducted an independent samples T-test to compare the circular deviation between the bisexual and neutral disclosure condition. Unlike in study 1, results revealed no significant difference in circular deviation ( $T(23) = 0.37$ ,  $p = .71$ ) suggesting no change in avoidance behavior following a bisexual disclosure (Figure 2).

**Attitudes and Liking** To test hypothesis 3, we performed three separate 2 (time: pretest/posttest) by 2 (disclosure condition: bisexual or neutral) analyses of variance on three dependent variables of interest: Attitudes towards bisexual women, liking, and closeness.

As with study 1, there was no significant main effect of time, disclosure type, or the expected interaction on attitudes towards bisexual women (all  $F$ 's  $< 0.68$ ,  $p > .42$ ).

For liking, results revealed a significant main effect of time ( $F(1,23) = 12.09$ ,  $p = .002$ ,  $\eta_p^2 = .35$ ) such that liking increased following the participant's interaction with the research confederate (time 1 [ $M = 5.72$ ,  $SD = 1.10$ ] and time 2 [ $M = 6.69$ ,  $SD = 1.02$ ]). Whereas liking of the confederate significantly *decreased* in the previous study in which participants were already suspicious regarding the research confederate, affiliation towards the confederate significantly *increased* following the interaction in study 2. This pattern of results was maintained for the IOS measure ( $F(1,23) = 19.85$ ,  $p < .01$ ,  $\eta_p^2 = .46$ ) such that participants felt closer to the confederate at time 2 ( $M = 3.44$ ,  $SD = 1.42$ ) compared to time 1 ( $M = 2.72$ ,  $SD = 1.31$ )

## Discussion

These two studies investigated the impact of stigma disclosure on spontaneous synchronization, behavioral avoidance, attitudes, and liking. Results did not support our first hypothesis that CSI disclosure would reduce coherence during unidirectionally coupled rhythmic arm movement task. Study one did demonstrate greater avoidance during the collision avoidance walking task, however, this was not supported by study two. Finally, affiliation following coordinated action was contradictory between studies one and two with significantly less liking at time 2 in study one and significantly greater at time 2 in study two; this may be due to the overall suspicion participants experienced towards the confederate in study 1. Taken together, these results provide tenuous support that stigma disclosure perturbs social interaction leading to a reorganization of human behavior and less coordinated movement.

As expected, participants did synchronize their rhythmic arm movement to the confederate video as interpersonal coordination is an emergent phenomenon of human

interaction (Lumsden et al., 2014). Previous research has demonstrated that synchronous movement may not simply be a stable state, but a functional aspect of increased affiliation. Miles and colleagues (2011) found that participants exhibited more inphase synchrony with an incongruent (compared to a congruent) confederate in a minimal groups paradigm perhaps suggesting that participants unintentionally increased coherence to reduce differences between the two. While spontaneous synchrony has been examined within minimal groups, little is known regarding interpersonal coordination following a stigma disclosure. Though these results suggest no difference in coordination, this may support the idea that synchronization influences cooperation, as synchrony was not reduced. Future research should further disentangle the function of coordinated action on attitude change and affiliation following a CSI disclosure.

Results partially supported hypothesis 2 as participants in the depression disclosure condition deviated more from a straight-line trajectory compared to both the bisexual disclosure and neutral disclosure conditions. This is in line with the social distancing individuals exhibit towards people depression (Link et al., 1999). This behavioral pattern was not demonstrated in the bisexual disclosure condition which had the smallest circular deviance. While initially surprising, the research confederate described discomfort when participants did not take on the elliptical role. Future research should examine how stigma impacts the leader-follower relationship during joint action.

Finally, whereas affiliation decreased following coordinated action in study one, it significantly increased in study two. As trust is an important factor in relationship formation (Lewicki & Bunker, 1995), participant suspicion in study one may have influenced their liking of the research confederate. In study two, where suspicion was low, participants expressed more liking and closeness towards the research confederate following the interpersonal interaction regardless of CSI disclosure. Though not reported above, we also performed Pearson correlations to determine the relationship between synchronous and avoidant behavior on attitudes and liking and found no significant relationships.

## Limitations and Conclusion

Given the nature of the deception in this research, there are limitations that should be addressed. First and foremost, the confederate did not spontaneously provide a genuine in person CSI disclosure, rather, she followed a script and participants viewed this on a prerecorded video. While this was important to maintain consistency between participants, future research should aim to capture the interpersonal interaction following an in-person, genuine disclosure. Though the results presented here are inconsistent, they provide the framework for conceptualizing CSI disclosure as a perturbation to complex dynamic systems.

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