Postural Sway Dynamics and Complexity Matching during the Disclosure of a Concealable Stigmatized Identity

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Abstract: This positional paper is the first of its kind to provide a framework to bridge the gap between disclosure research and embodied cognition via postural sway behavior. Despite the potential for experiencing discrimination or stigmatization, research suggests that revealing a concealable stigmatized identity (CSI), or any identity that can be hidden but when revealed has the potential for social devaluation, often leads to positive psychological and interpersonal outcomes. However, this typically only happens when a disclosure confidant provides support in response to disclosure. Therefore, this work aims to uncover how someone's antecedent goals (either approach or avoidance oriented) can impact the disclosure event using an embodied perspective whereby goal orientation has the propensity to affect unconscious behaviors such as postural sway. Healthy adults typically exhibit complex, fractal sway behaviors; therefore, any loss of complexity could be associated with maladaptive disclosure motivations. Finally, we suggest a future plan of research aimed at capturing the disclosure confidant's perception of the disclosure event and if they are more likely to exhibit complexity matching in their postural sway behaviors as a function of disclosure motivation.

1 INTRODUCTION

This paper presents an embodied cognition perspective to the process of disclosing a concealable stigmatized identity (CSI) A CSI is any identity that can be hidden and that socially devalues individuals in possession of such an identity (e.g., substance abuse disorder, sexual identity, mental illness, etc.). Stigmatized identities may differ in the degree of social stigmatization, interpersonal and life outcomes, and those living with a CSI continually face opportunities to disclose their identity across multiple domains (e.g., family life/work life). While there is the potential for negative outcomes such as rejection by friends and family (Corrigan and Matthews, 2003), discrimination (Kaufman and Johnson, 2004), and less upward mobility in the workplace (Clair et al., 2005), disclosure is also associated with positive outcomes including increased social support (Chaudoir and Quinn, 2010), better adherence to medication regimens (Mellins et al., 2002), and overall higher quality of life (Chaudoir and Fisher, 2010). However, these beneficial effects typically only arise when a confidant responds positively to the discloser and provides emotional support and understanding. In addition to intra- and interpersonal benefits, research suggests sharing information about typically hidden identities also facilitates greater understanding and acceptance of traditionally marginalized identities, and the characteristics associated with them. As such, research must continue to determine important factors that can lead to positive disclosure outcomes.

Given that decisions to disclose a CSI can be complicated, it is widely understood that disclosure events are almost always goal oriented (Omarzu, 2000). Thus, people share stigmatizing identities with a specific goal or expected outcomes in mind (e.g., strengthening a relationship, seeking treatment, simply relief in 'getting it off one's chest'). As such, this paper provides results of research suggesting antecedent goals influence embodied experiences of disclosure events whereby antecedent goals demonstrate differential effects on the fractal scaling of postural sway during those disclosure events. We argue that this complex social phenomenon is an embodied process, embedded in a social environment such that disclosure goals have the ability to affect this process at multiple levels, including unconscious communication through physical or social behavior. We also present research

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aimed at uncovering how unconscious behaviors (i.e. postural sway—minute movement variability during quiet stance) may impact a confidant's reaction to a disclosure event. We propose that a confidant may attune to subtle changes in postural sway and that this nonverbal information may in turn influence the interaction itself, such that a loss of complexity in postural sway may decrease the degree to which movements of the confidant become globally entrained (complexity matched) to those of the discloser. Consequently, it is likely that the participants in the disclosure event will therefore be less likely to consider the disclosure event a positive one. Finally, we will examine complexity matching of postural sway behavior between the discloser and confidant. Not only does this offer a novel data analysis tool to further the CSI literature, but to date, no research has examined complexity matching between two individuals specific to postural sway during such higher order social interaction.

1.1 Approach-Avoidance Motivation

Chaudoir and Fisher (2010) proposed that goals for disclosure events are motivated by approach or avoidance oriented systems, whereby approach goals are associated with achieving positive outcomes and avoidance goals are associated with avoiding negative outcomes. Initial research on approach and avoidance motivational systems suggests they are characterized by their valence (positive/negative) toward potential outcomes or environmental stimuli (Elliot, 1999). Furthermore, research suggests those with strong approach goals exhibit more attention toward incentive cues, while those with strong avoidance goals exhibit bias toward negative cues (Derryberry and Reed, 1994). For instance, Gable and Impett (2012) found individuals typically motivated by approach goals, such as the desire to increase intimacy, experience greater long-term relationship satisfaction and relationship outcomes. Conversely, if just one partner is avoidance oriented, both partners experience less relationship satisfaction and poorer relationship outcomes. Thus, when extended to the disclosure process, it follows that individuals who disclose with approach goals in mind are more likely to experience more positive intra- and inter-personal outcomes when compared with individuals with avoidant orientations (Chaudoir and Fisher, 2010). Related research suggests that motivational goals also result in differential exploration of the environment. Those with approach orientations are interested in "reducing the discrepancy between themselves and their goal" (e.g., closing the gap between discloser and confidant; Chaudoir and Fisher, 2010) and thus may be more likely to attend to positive stimuli in the environment. Conversely, avoidant individuals are interested in increasing the distance between themselves and potential negative outcomes (e.g., increasing distance between discloser and confidant; Carver and Scheier, 1998) and, as such may produce negative nonverbal behaviors. In line with this, research (e.g., Riccio and Stoffregen, 2008; Balasubramaniam, et al., 2000) on movement dynamics demonstrates that postural sway can elucidate how we explore the environment using multiple sensory systems (visual, auditory, haptic processes, etc.). Contrary to traditional beliefs that postural sway results from a brain body lag, Carpenter et al., (2010) argue that stochastic patterns of postural movement is useful in exploring the environment. Thus, we postulate that motivational systems will lead to differential exploration of the environment, as well as awareness of bodily states (e.g., heart rate). This investigation aims to provide evidence that will afford a better understanding of how antecedent goals may affect change across multiple levels of a system, whereby approach or avoidance motivation influences not only disclosure goals, but also manifests in unconscious behaviors, and interpersonal and psychological outcomes.

1.2 Postural Sway Dynamics

Although theoretically linked, these studies are the first to examine how motivational systems affect postural sway behavior beyond traditional nonverbal communication. In the current study we employ nonlinear data analytic tools to capture such postural movement variability. One way to quantify postural sway variability is to determine the fractal scaling of a postural sway time series using detrended fluctuation analysis (DFA). DFA is a robust technique to determine the scaling exponent of behavioral time series. Essentially, DFA breaks the time series into different window sizes to examine long-range correlations (for review, see Coey, 2015). Previous research has shown that healthy adults exhibit mono-fractal scaling (pink noise) in postural sway variability during anterior/posterior movement (e.g., Kuznetsov et al., 2013). Individuals with a movement disorder such as Parkinson's disease exhibit a loss of complexity such that their postural sway is more deterministic, or exhibits Brownian noise (Schmit et al., 2005). Further, this movement complexity not only serves a role in maintaining stable balance, but also reveals how the dynamics of

human perceptual, motor and cognitive processes are interaction-dominant, as opposed to the more traditional position of component-dominant dynamics where changes are linear input-output relations.(van Orden et al., 2012; Eiler, et al., 2014). Because our perceptual, cognitive, and movement processes are necessarily linked, changes at one level may affect changes at other levels of the system. Therefore, we expected that either approach or avoidance goal motivation at the cognitive level will lead to differences in postural sway complexity at the movement level (Riley, et al., 2012)—avoidance priming would lead to a loss in complexity of postural sway behavior compared to avoidance goal priming during the disclosure of a CSI.

Where researchers have thoroughly examined the complex behavior of a dynamical system using monofractal statistical analysis, little research has examined the multifractality of postural sway in humans. While theoretically linked to monofractals, multifractal scaling suggests a more reciprocal interaction between the actions of an intentional agent and the micro and macro events (time-scales) of the environmental context in which those actions take place, (Kelty-Stephen et al.,, 2013). Rather than assuming one scaling exponent, multifractal detrended fluctuation analysis (e.g., MFDFA) allows one to determine if there are different scaling exponents at short and long time scales. This could reveal how antecedent goals can affect movement behaviors at different time scales. The present study would be the first to examine the relationship between approach and avoidance motivation during a disclosure event via postural sway complexity.

1.3 Complexity Matching

Finally, the present study will allow us to assess the valence of the disclosure event via subjective ratings by an outside confidant, as well as to examine the complexity matching of the movement dynamics between discloser and confidant. Complexity matching is the phenomenon whereby two systems not only coordinate gross body movements over time, but they also have a tendency to exhibit similar complexity in their behavior (e.g., Abney et al., 2014; Marmelat and Delignières, 2012; Washburn et al., 2015). While ideally we would be able to examine this interaction in real time (two people in the experimental room, one sharing a CSI to another), that is limited both practically and ethically. Therefore, participants with a CSI were instructed to disclose their identity while no one is in the room. This was audio and video recorded which allows a second group of participants to listen and view the disclosure at a later time. To ensure anonymity, the video recording produced was a depth array, grey scaled image providing information about depth only, therefore the videos were devoid of facial features and other potentially identifying information (e.g., clothing patterns, etc). Because of these limitations, we are investigating complexity matching of the disclosure confidant only, not an interaction. With this limitation in mind, the current study will still provide powerful insight into the disclosure event. We expected that participants would exhibit more complexity matching when listening to an approach goal directed disclosure compared to an avoidance goal directed disclosure.

Finally, while a large body of research demonstrates that people tend to coordinate their gross body movements during an interaction, more recently, it has been suggested that humans have the capacity to coordinate fractal scaling in the minute patterns of movement behaviors (Abney, et al., 2014; Coey, 2015). This could provide crucial implications for this type of interaction. Because postural sway is an uncontrolled behavior, complexity matching of postural sway goes above and beyond that of coordinating gross body movements. This is an important route to explore, as it will be the first to determine how complexity matching of unconscious behavior can impact rapport between two individuals.

1.4 Study Overview

In sum, the current research provides novel exploration across many areas of social psychology and complexity science. First, by manipulating approach and avoidance goal motivation, we may examine the disclosure utilizing a traditional approach of exploring the linguistic and psychological content that may be observed during disclosure events. Additionally we also incorporate a dynamical systems approach to how such content affects the overall experience for both the discloser and the perceiver. Further, differences in postural sway complexity will provide a deeper understanding into the underlying dynamics of the disclosure process by elucidating nonverbal behaviors exhibited during a disclosure event. A loss in complexity, or more deterministic sway during an avoidance primed disclosure would suggest that when the avoidance motivational system is activated, people are exploring the environment

differently (e.g., attuned to more negative stimuli) which could negatively impact the disclosure interaction. Finally, recent research by Coey (2015) has addressed the potential utility in examining complexity matching between two complex systems embodying the others' dynamics. Differences in complexity matching during an approach oriented and avoidance oriented disclosures would therefore not only provide powerful evidence for interaction dominant dynamics, but it can also better our understanding of the disclosure process as a whole.

2 PRELIMINARY RESEARCH

2.1 Method

This study employed a 2 (goal motivation: approach, avoidance) x 2 (target: close other, professional other) mixed design with postural sway pattern complexity (via mono-fractal scaling), and self-report responses on the behavioral approach system and behavioral avoidance system scales (BIS/BAS; Carver and White, 1994) and the positive affect negative affect schedule (PANAS; Watson et al., 1988) as the dependent measures.

2.2 Participants and Procedure

Participants (N = 19) were recruited through the UC Psychology participant pool. 14 participants were female and 18 were white. Their ages ranged from 18-23 years. Participants were informed that the study is about how people share secrets. Participants were recruited if they selected any of the following from a list of CSI's in the prescreening survey: mental illness, sexual minority, alcohol or substance abuse disorder, history of sexual abuse or victimization, serious illness, abortion, teen pregnancy, or conviction or incarceration.

Qualifying participants were then invited to participate in the experimental portion of the study. Following informed consent, participants sat at a computer equipped with Media Lab software (Jarvis, 2014). They were first asked to write down a secret that they often keep hidden and answer some questions about their secret (e.g., *"How often do you think about your secret")*. Each participant then wrote 2 disclosure letters, one to a close friend/family member and the other to someone with whom they have a professional relationship (written in a randomized order between participants). Prior to writing both letters, participants were randomly assigned to either approach or avoidance goal priming in which they were prompted to think about "achieving positive outcomes" or "avoiding negative outcomes" respectively and were instructed to write 3-5 goals for their disclosure letter.

After writing both letters, the experimenter entered the room and instructed participants to act out their disclosure as if the person they wrote to is standing in the room with them. During the disclosure event 2 motion tracking sensors (FASTRAK, Polhemus, VT, USA), one attached to a headband on the back of the head, the other attached to a belt just bellow the belly button recorded postural sway data at 60 Hz. An Xbox Kinect also recorded postural sway and gross body movements at approximately 24 Hz, as well as produced a depth array video. Audacity was used to record verbal disclosures. First, we recorded participant's baseline postural sway while standing still for 20 seconds. Next, the letter was projected on a screen and participants were instructed to should act as though they were disclosing to the confidant, using their letter as a guide. During the verbal disclosures, the experimenter was not in the room. After completing the verbal disclosure for both letters, participants completed self-report dependent measures.

2.3 Preliminary Results and Discussion

We utilized DFA to examine the fractal scaling of individuals' postural sway during the disclosure of a CSI. As expected, our participants exhibited pink noise with alpha values around 1. However, pilot data suggest that avoidance primed disclosures may lead to a loss of complexity in postural sway behavior towards Brownian noise. Where approach primed disclosures exhibited more fractal scaling (M = .94, SD = .25), avoidance primed disclosures displayed a loss of complexity towards Brownian noise (M = 1.09, SD = .17). Results of an independent samples t-test did not reveal a significant difference between the two groups ($t(18) = 1.55$, $p > .05$, $d = .7$), however the strong effect size suggests more participants should be analysed to examine this trend further.

Results suggest that goal motivation does lead to meaningful differences in postural sway when revealing a CSI. It has been well documented that most human systems are stochastic in nature and, when examined further, live within areas of pink noise (Van Orden, et al.,, 2011). Further a loss of complexity either towards white noise or brown noise is associated with a disruption or degradation of the system including aging, disease, or a few servings of alcohol. Because we are seeing these

patterns in the pilot data whereby avoidance motivation is associated with a subtle loss in complexity, it may be that avoidance motivation systems are maladaptive to the disclosure process. However, disclosures can exist across all life domains, therefore, it is crucial that we achieve a greater understanding of how approach or avoidance goals will lead to more positive outcomes.

3 FUTURE RESEARCH

3.1 Method

Similar to study 1, this experiment will employ a 2 (goal motivation: approach, avoidance) x 2 (target: professional other, close other) within subjects design with the primary dependent variables the same as Study 1, as well as the inclusion of the complexity matching coefficient via MDFA (as well as other nonlinear time-series measures such as detrended cross-correlation analysis and cross recurrence quantification analysis; (see Coey, 2015). Additionally, participants will be asked about their perception of the disclosure (e.g., *"Overall, how much do you like this person?")*.

3.2 Participants and Procedure

40 Participants will be recruited through the UC SONA system's Psychology participant pool and will receive course credit. There is no inclusion criteria, however, participation in study 1 will disqualify them for participation in study 2.

Following informed consent, participants will be asked to listen to 8 disclosures while viewing the depth array video. During each video, 2 polhemus sensors will be attached to the back of their head and just below their belly button similar to study 1. After each disclosure, participants will be asked to rate it on a number of dimensions (e.g., overall tone, depth, quality, etc.). This process will be repeated until each participant has listened to and rated 4 disclosures (2 approach primed, 2 avoidance primed). They will be presented in a random order. Finally, participants will complete the BIS/BAS, PANAS, and mood scales and thoroughly debriefed.

3.3 Discussion

Results of the pilot study have led to a deeper investigation into the role that our motivational systems play in the disclosure process. The next step is to capture how others perceive these disclosures. We are currently in the process of recruiting and running more participants to reveal their CSI while Polhemus sensors record movement in the anterior-posterior direction. To further probe this trend, we will not only examine the mono-fractal scaling using DFA, we will also look at the multi-fractal scaling using MFDFA. As noted above, MFDFA allows us to look at the complexity of movement at multiple levels and can provide a greater understanding of how goals can affect change across different levels.

We will also recruit participants to listen to and watch a depth array video of these disclosures while we record their postural sway. With this, we will be able to investigate how this unidirectional coupling by the confidant to the discloser in the video affects someone's postural behavior. We anticipate that those disclosures that are approach primed will not only exhibit fractal scaling in the postural sway, but they will be more highly rated by an observer, and there will be more complexity matching between the discloser and the confidant. Thus, these results would provide important insight into the disclosure experience itself. Although we know the interpersonal interaction and outcomes during a disclosure experience are important, we do not yet know exactly what the confidant picks up on when someone reveals stigmatizing information. It is potentially the case that when participants do not match postural sway complexity, they will view the individual less favorably. Results from this study would thus support the idea that disclosure experiences are embedded in a social environment whereby revealing information about oneself is an on-going complex, dynamical multiagent process.

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