Stress and Sleep: A Daily Diary Study Using FitBits

Sleep difficulties have detrimental effects on both employees and organizations, as they are related to reduced levels of productivity, increased use of health services, increased health related absences, increased workplace accidents and reduced safety behaviors (e.g., Daley, Morin, LeBlanc, Grégoire, & Savard, 2009; Philip & Åkerstedt, 2006; Stoller, 1994). Moreover, the financial costs of employees' sleep difficulties are staggering as a recent study suggests that sleep difficulties cost U.S. organizations $63 billion per year in lost productivity (Kessler et al., 2011). As a result, researchers have long been interested in understanding triggers of sleep difficulties and have found that psychosocial work stressors are common antecedents (Barber et al., 2017; Jacquinet-Salord, Lang, Fouriaud, Nicoulet, & Bingham, 1993; Jansson & Linton, 2006; Nixon, Mazzola, Bauer, Krueger, & Spector, 2011). However, the mechanism underlying this relationship and even the work stress – sleep directionality (i.e., sleep difficulties might also affect perceived work stress, in line with sleep aiding in recovery from the previous day's stress; Belenky et al., 2003) are understudied. Therefore, we examine the role of rumination as a potential mechanism linking sleep and work stress. In doing so, we examine sleep as both an antecedent of workplace stress as well as a consequence of it.

Focusing on a pervasive workplace stressor, that of organizational constraints (work conditions that interfere with an individual's task performance; Pindek & Spector, 2016), we propose that employees who suffer sleep difficulties the previous night are more likely to perceive organization constraints during the following work day. As a result of this stressor, employees will likely ruminate (i.e., dwell on negative emotions and replay the stressful event in one's head; Martin & Tesser, 1989) about the negative workplace experience. In turn, it is likely that rumination will negatively affect the employees' sleep that night given that sleep is influenced by stressful experiences of the preceding day (e.g., Barber et al.,

2017). Examining this entire sleep-stressor-strain-sleep chain allows us to ascertain if strain has any incremental validity in predicting sleep over the direct effects of sleep during the prior night.

METHOD: The sample included 139 full-time staff employees from a large university in the US who received $50 gift-cards as compensation for their participation. Participants were fitted with a fitbit device (Montgomery-Downs, Insana, & Bond, 2012) and trained on the data collection procedures. Daily surveys were emailed during the next 10 work days.

We measured *Constraints* using Pindek, Howard, Krajcevska, and Spector (2017) four items, at approximately 5pm daily [alpha = .70; ICC(1) = .59]. We measured *Rumination* (Genet & Siemer, 2012; Nolen-Hoeksema & Morrow, 1991) at approximately 9 pm [alpha = .93; ICC(1) = .35]. *Objective Sleep Length* was assessed with the Fitbit tracker. Fitbit is considered a good measuring tool for sleep in normative populations (Montgomery-Downs et al., 2012). Furthermore, our pretest indicated strong reliability between simultaneously used Fitbit devices (r = .98) and between simultaneously used Fitbit and Actigraph (Pilcher et al., 2012; Sadeh, 2011) devices (r = .96). We extracted sleep data for both the preceding night [ICC(1) = .15] and following night [ICC(1) = .29] for every work day, into two separate variables.

RESULTS: Descriptive statistics and correlations between the study variables at both the within person and between person levels are presented in Table 1. Mplus (Muthén & Muthén, 1998-2012) was used to analyze the proposed multilevel study, with days nested within individuals. Model fit analyses indicated good fit for the proposed model ($\chi^2_{(1)} = 2.87$, p = .09; RMSEA = .037, CFI = .995, TLI = .941, SRMR within = .018, SRMR between = .002), although not all estimated paths were significant (see figure 1). That is, the rumination - subsequent sleep path (b = -.04), and the corresponding within level correlation (r = -.06)

were not significant, whereas all variables were significantly correlated with the preceding night's sleep.

DISCUSSION: Our pattern of results supports the sleep as recovery framework (Belenky et al., 2003), whereby, similar to previous findings (e.g., Barber & Bundick, 2015; Barnes, Lucianetti, Bhave, & Christian, 2015), the lack of sleep preceding the work day results in higher levels of work stressors. On the other hand, our results provide very little evidence that poor sleep is an outcome of work stressors. There have been mixed findings regarding sleep disturbances as a consequence of work stressors, particularly when using objective measures of sleep (Barber et al., 2017). However, since our results demonstrate significant relationships between sleep that precedes the work day and stressors related phenomena during the day, we believe that the sleep and stressor measures were appropriate. Using the current design, we demonstrated that when accounting for sleep that precedes the work day, daily stressors do not incrementally predict sleep the following night. One possible explanation is that inadequate sleep is a depletion of resources, but not a strain. Another possible explanation is that rumination is too distal from sleep, and we need to explore a more proximal strain variable. For example, it is possible that a stressful day at work yields increased rumination, which yields poorer sleep hygiene behaviors (Barber & Munz, 2011) that in turn, predicts poor sleep the following night.

Future research can examine the moderating role of physical activity (Barber et al., 2017; Toker & Biron, 2012), disengagement activities, additional stressors and strains, and examine quality rather than quantity of sleep. In conclusion, this research provides important insight into the greater role of sleep as an antecedent rather than an outcome in the daily experience of work stress.

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Have We Forgotten about the Leader in Organization Stress Research?

Work stress negatively affects employees' psychological and physical health as well as work attitudes and performance (Ganster & Schaubroeck, 1991; LePine, Podsakoff, & LePine, 2005; Nixon, Mazzola, Bauer, Krueger, & Spector, 2011; Spector, Chen, & O'Connell, 2000). Such impacts have significant financial costs for employers and society at large. For example, work-related depression costs European employers 617 billion euros annually (Matrix, 2013). These findings indicate that work stress is a significant problem in European countries despite commissions, policies, and treaties aimed at promoting employee wellness (EU-OSHA, 2014).

In the current study, we focus on a forgotten segment of the workforce, that of organizational leaders. With few exceptions (e.g., Westman & Etzion, 1999; Wirtz et al., 2017), research on work stress tends to focus on how leaders affects subordinates' stress and well-being (e.g., Skakon et al., 2010). However, the effect that subordinates have on leaders' stress may be substantial according to a report from the Center for Creative Leadership (Campbell et al., 2007). That is, 75% of the leaders surveyed reported that having a leadership role increased their stress level and that subordinates contribute to the leaders' stress just as much as their own leader, peers, and customers (Campbell et al., 2007).

Using the job demands-resources theory (JDR-M; Bakker & Demerouti, 2007) and based upon work by Wirtz et al. (2017), we examine job demands through the perspective of the leader as opposed to through the more typical lens of the subordinate's experience. To do this, we argue that the resource role (Bakker & Demerouti, 2007) a leader plays for subordinates constitutes a job demand for the leader. In other words, in acting as a resource for the subordinates, the leader needs to exert mental energy and effort to support his/her subordinates. This is especially true when subordinates have high job demands. Therefore, we propose a multilevel indirect effects

model whereby the subordinates' stressor/strain process, via the job stressor model (Spector & Fox, 2002), acts as a job demand for the leader which in turn, creates a stressor/strain process for the leader. We illustrate this phenomenon using workload (stressor) and physical symptoms (strain). That is, subordinates with high workloads are more likely to experience physical health symptoms. Both subordinates' stressors and strains act as a job demand for the leader, which takes the form of an increased workload. This increased workload for the leader is in turn related to an increase in physical health symptoms for the leader.

Method: The sample consisted of 586 employees working in 164 groups within 55 manufacturing organizations in Italy. The mean age of participants was 38.4 (*SD* = 9.9) and the sample was mostly male (68.2%). The group leaders were slightly older (*M* = 40.5, *SD* = 9.1) and also mostly male (81.4%). The number of employees per group ranged between 3 and 20 members (excluding the leader) with an average group size of 3.57 employees.

All survey items were translated from English into Italian by one translator and then back-translated into English by a second translator. The few resulting discrepancies were discussed and adjustments were made. The subordinates' surveys included demographic items, workload (Spector & Jex, 1988; 5 items, alpha = .89) and physical symptoms, (Spector & Jex, 1988; 13 items, alpha = .80). The leaders' surveys included demographic items, workload (alpha = .89), and physical symptoms (alpha = .74). Using Mplus 7.1 (Muthén & Muthén, 1998-2012), we ran a multilevel confirmatory factor analysis (MCFA) with two factors at the within level (subordinates' workload and physical symptoms) and two factors at the between level (leaders' workload and physical symptoms). Results indicated adequate fit [$\chi^2_{(268)} = 636.385$, p = .000, RMSEA = .068; CFI = .833; TLI = .809; SRMR Within = 0.083; SRMR Between = .123].

Results/Discussion Descriptive statistics and correlations are available in Table 1. The proposed multilevel indirect effects model was tested with Mplus 7.1 (Muthén & Muthén, 1998-2012) using a fixed effects approach. Fit indices indicated strong model support [$\chi^2_{(2)} = 2.184$, $p = .335$, RMSEA = .013; CFI = .999; TLI = .995; SRMR Within = 0.000; SRMR Between = .056]. Unstandardized coefficients are available in Figure 1. Positive relationships were found between workload and physical symptoms for both the subordinates [within level ($b = .411$, $p < .01$); between level ($b = .250$, $p < .01$)] and the leaders ($b = .140$, $p < .01$). Additionally, both subordinates' workload ($b = .785$, $p < .01$) and subordinates' physical symptoms ($b = .925$, $p < .05$) were positively related to the leaders' workload. Finally, we examined the indirect effect linking subordinates' workload to supervisor's workload via subordinates' symptoms. This indirect effect was significant ($b = .231$, $p < .05$).

The results of the current study suggest the need to examine a forgotten segment of the workforce when studying workplace stress, that of the leader. Typically, researchers examine the leader as either a source of stress (Che et al., in press) or as a resource (Bakker & Demerouti, 2007) for employees. However, as employees progress through the organizational ranks, they encounter more stressors than entry level employees. One of these stressors is their subordinates. That is, leaders act as a resource for their subordinates, but in doing so, the subordinates become a demand for the leader, triggering the stressor/strain process.

These findings have both theoretical and practical utility. From the theoretical perspective, we unified two popular workplace stress models—the JDR-M (Bakker & Demerouti, 2007) and the job stressor model (Spector & Fox, 2002), showing how they can be used together to understand an organizational phenomena. From a practical standpoint, we highlight leaders' work stress given the added stressors associated with leadership positions.

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Table 1

Descriptive Statistics and Correlations between Study Variables

	1	2	3	4
1. Leaders' Workload	-			
2. Leaders' Symptoms	0.184**	-		
3. Subordinates' Symptoms	0.580**	0.283**	-	0.331**
4. Subordinates' Workload	0.695**	0.118**	0.509**	-
Mean	15.429	17.623	18.583	14.794
SD[1]	5.55	4.22	5.07	5.26

Notes.

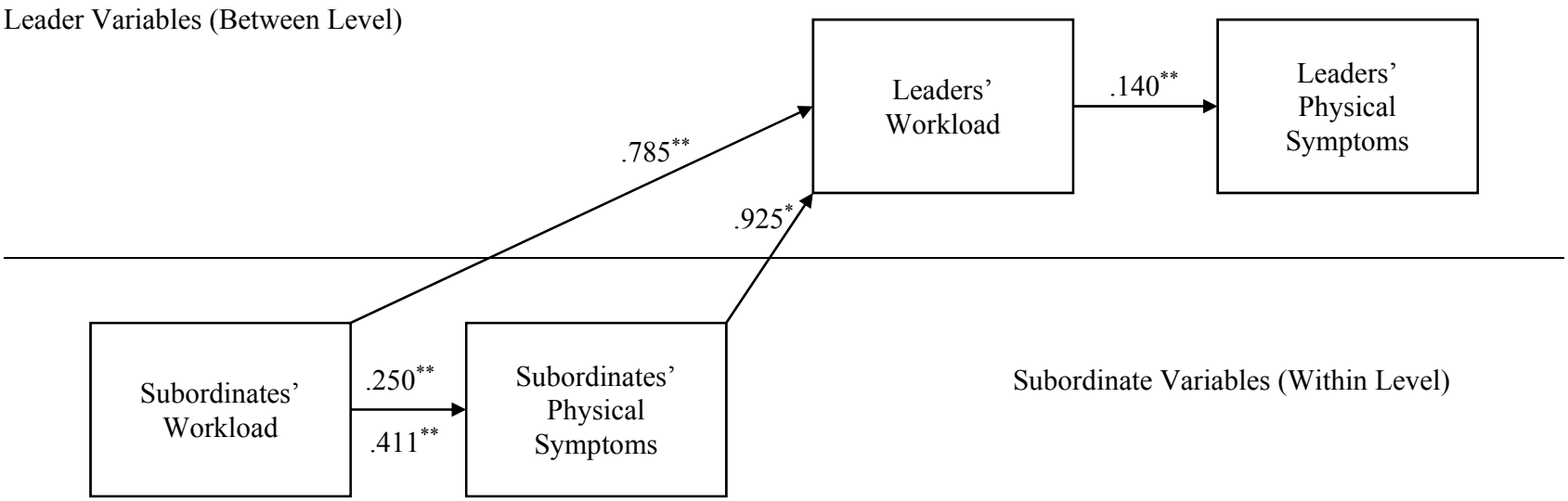
Within correlations (N = 586 employees) are above the diagonal while between level correlations (N = 164) are below the diagonal.

*p < .05, **p < .01.

[1] Note that Mplus provides the estimated variance statistic as opposed to the standard deviation. Therefore, we calculated the square root of that index to report the standard deviation.

Figure 1

Study Model Results



Notes.
** $p < .01$
* $p < .05$

For subordinate level data, the path coefficient for the within level relationship is presented below the arrow and the path coefficient for the between level relationship is presented above the arrow.

Table 1

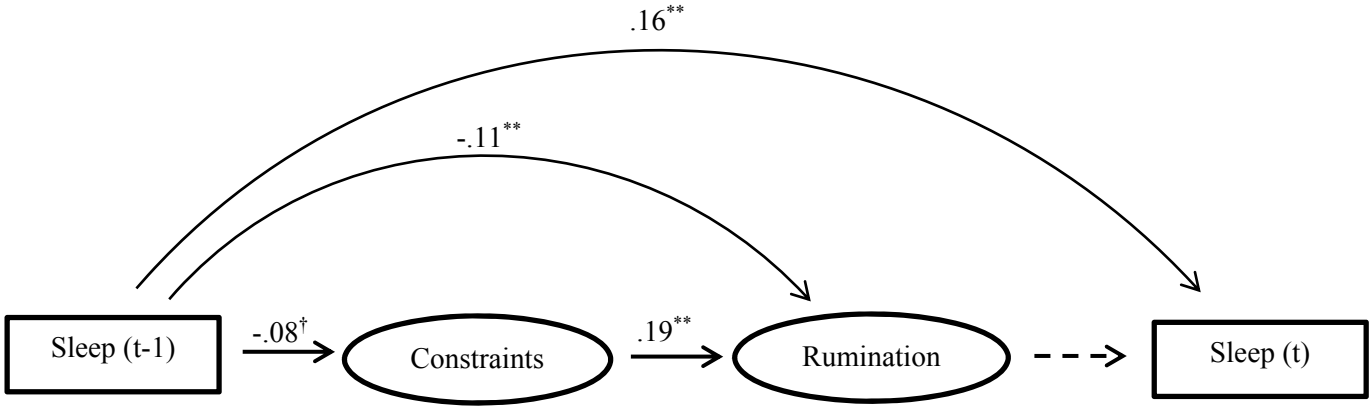
Descriptive Statistics and Correlations between Study Variables

			Correlations			
	Mean	SD	1	2	3	4
1. Sleep $_{(t-1)}$	350.53	179.11		.01	-.01	.99**
2. Constraints	1.39	0.58	-.08*		.68**	.01
3. Rumination	1.39	0.77	-.13**	.20**		.00
4. Sleep $_{(t)}$	391.72	151.92	.16**	-.08*	-.06	

Note. Correlations below the diagonal are between-person correlations (N = 139), and those above the diagonal are within-person correlations (N ranges between 805 and 1380).

*p < .05, **p < .01.

Figure 1



Note. † p < .1, * p < .05, ** p < .01. The dotted line represents path estimates that were not significantly different from zero.

Is stress in action teams good? The role of climate in the stress-shared mental models relationship.

Research on teams, has emphasized the need for the team to possess shared mental models (SMM) (i.e., overlapping task and teamwork knowledge) as these provide adequate coordination for effective functioning (Mohammed & Dumville, 2001). Yet, little is known about the antecedents of SMM, leading many authors to suggest this as an important area for future research (e.g., DeChurch & Mesmer-Magnus, 2010; Lim & Klein, 2006; Marks, Zaccaro, & Mathieu, 2000; Mohammed et al., 2010; Pearsall, Ellis, & Bell, 2010). This gap in the literature leaves organizations and human resource managers with little knowledge regarding how to foster SMMs in order to improve the performance of their teams. In addition, research has also shown that such SMM take time to develop within teams (McComb, 2007) making it difficult for action teams to have the opportunity to benefit from their positive affect on team performance. Action teams are defined as "short-term mission teams that are formed around a certain task … and are dissolved upon its completion" (Vashdi, Bamberger, Erez, and Weiss-Meilik, 2007). Military, rescue teams, healthcare teams (OR teams), and aviation crew, are only some examples (Hirschfeld and Bernerth, 2008; Kozlowski & Bell, 2003; Vashdi et al., 2007). In an attempt to address these gaps in the team literature we build hypotheses and examine a number of factors that may combine to facilitate the occurrence of SMM in action teams.

Based on theories of stress within teams we suggest that the extent to which a situation is potentially stressful for the action team will be positively related to both task and team mental models. More specifically, as action teams such as cockpit teams, have very strong interdependence, each team member deeply understands and internalizes that he/she relies on the other teammates to accurately solve problems and complete the mission successfully. Based on Torrance (1967) who claimed that team members are more likely to seek the judgments of others, even of a lower status, in stressing conditions and on Lanzetta (1955) who found that, in small

teams, stress resulted in a more democratic approach to problem-solving, Driskell and Salas (1991) concluded that there is "increased receptivity under stress" (p.476). Such receptivity in highly interdependent teams is likely to help team members recognize the other team member's mental models, be attuned to how they see the processes and procedures that will help task attainment and adjust their mental models so as to be able to deal with the new, stressing conditions. Thus, we assume that action team-members will exhibit a more common understanding about interaction patterns and responsibilities (Team Mental Models; TEMM) as stress increases. Similarly, Entin & Serfaty (1999), claim that when a mission's demands increase and stress occurs, team members' focus turns heavily to the task, and they allocate more cognitive resources to deal with the urgent issues regarding the mission at hand. Given the common professional background and the meticulous training among action team members (e.g. Espevik et al., 2006), which are consistently trained for coping with emergency, we argue that stressing conditions will enhance Task Mental Models (TAMM), as team members may return to task basics and to assigned protocols, which are shared knowledge and commonly trained.

Further we adhere to Bamberger's (2008) call for context theories of management and suggest short term emergent climates within the team may moderate the relationship between stress and SMM. As a strong teamwork climate fosters an environment that enables open and direct discussion even when dealing with complicated and interpersonal issues (Miles & Kivlighan, 2008), we propose that action teams undergoing stressing conditions are even more likely to enhance reciprocity and the tuning of mental models to those of the other team members when there is a strong teamwork climate (i.e. behaviors that represent values of cooperation, coordination and communication) than when teamwork climate is low.

As for safety clime, in response to real and practical development and needs, research has extended the interest in such climate from long-term and relatively stable teams, to short-term and more dynamic teams, namely, action teams (Uitdewilligen, Waller & Pitariu ,2013). In such teams, under a strong safety climate, team members are more likely to follow the safety protocols when a

risky and stressing condition occurs, generating high shared TAMM, more than when safety climate is low.

We tested our hypotheses using a questionnaire distributed to 158 pilots in 65 cockpit-crew teams from an Israeli airline. The extent to which the team's mental models are shared, was calculated similar to what Webber et al. (2000), using the Rwg scores to assess the extent to which the team members answers to the given scenarios are similar. The Severity of stressing conditions was measured by aggregating responses of three chief officers in the airline who were asked to assess the severity of the adverse events reported by the team who actually flew the plane on a scale from 1 (not stressful) to 5 (extremely stressful).

Our analysis did not find support for a main effect of stressing conditions and team mental models, but we find a marginally significant positive relationship between stressing conditions and task mental models ($b=0.17$, $p<0.1$). More importantly, we found that teamwork climate moderated the relationship between stressing conditions and team mental models. When teamwork climate is high the higher the stressing conditions the more the team mental models are shared (i.e. the stronger the team mental models). But, when teamwork climate is low or moderate there is no significant relationship between stressing conditions and team mental models. As for the moderating role of safety climate we found a marginally significant result.

Our results point to the fact that when positive team climates are high in action teams, stressing conditions result in more shared mental models. While climate has been found in the past to buffer the relationship between stress and outcomes (Bakker & Demerouti, 2007), we claim that the mechanism at play in action teams are different and that climate will not simply eliminate a negative effect between stress and SMM but that it will promote a positive effect of stress.

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An Organizational House of Cards:

How Witnessing Rudeness Undermines Intergroup Cooperation

In the modern organization, cooperation is one of the most important processes by which individuals facilitate organizational success. By pooling resources, individual employees enable their organization to transcend departmental and professional boundaries and generate increasingly innovative and cost efficient solutions that can greatly benefit the organization (Halevy, Bornstein, & Sagiv, 2008). However, cooperation does not always naturally occur when individuals combine to form groups. In fact, individuals are constantly faced with conflicting agendas and situations in which their immediate self-interest is at odds with what is best for their group or organization (Balliet, Parks, & Joireman, 2009). Thus, cooperation between individuals working together in a group can often fracture when individuals are faced with the dilemma that what is best for their group is not always aligned with their personal goals (Rand, Dreber, Ellingsen, Fudenberg, & Nowak, 2009). Similarly, individuals often encounter conflicting motivations that suggest that what is best for the entire organization is not necessarily what is best for their in-group. Hence, while cooperation between different groups in the organization may benefit the organization as a whole, it may also go against the agenda of one's own group.

Indeed, past research has shown that the nature of cooperation between individuals and different groups within an organization is rather fragile and that cooperation can often fracture when individuals or groups have different agendas. For example, the extant literature has indicated that some of the antecedents to low intergroup cooperation include various social value orientations (Bogaert, Boone, & Declerck, 2008) motivational ambiguities (Dawes, 1980), and environmental uncertainty that may result in different priorities for different groups (Bendor,

1993; McCarthy, Hagan, & Cohen, 1998). Combined, these theoretical perspectives suggest that different motivations and agendas could fracture cooperation between individuals and between groups. However, these investigations share a common assumption -- that the antecedents to low intergroup cooperation as a result of different intragroup or intergroup motivations and agendas are fairly stable and pervasive (Walker, Bauer, Cole, Bernerth, Feild, & Short, 2013; Barrick, Thurgood, Smith, & Courtright, 2015). In contrast, in this paper we argue that inherent conflicting motivations and stable characteristics are not essential to the fracturing of cooperation. Instead, we suggest that cooperation is more like "a house of cards" that can easily collapse by exposure to even small, low intensity hostile acts in the workplace. Thus, this paper will detail in a series of experimental studies how fleeting but common subtle negative stimuli that regularly occur in a workplace can have disastrous consequences for group cooperation.

We tested our hypotheses in two experimental studies. In the first study, 300 participants were exposed to a video depicting either a control or rude interaction between an employee and a customer. Similar manipulations has been successful in past research to manipulate rudeness (Foulk, Woolum, & Erez, 2016). Participants then took part in one of two games: The intergroup prisoner's dilemma-maximizing difference (IPD-MD; Halevy et al., 2008) or the Nested Social Dilemma (NSD; Wit & Kerr, 2002) games. In the IPD-MD game, each member is given a monetary endowment and can decide how much of it keep for him/herself or to contribute to either of two pools, one that benefits the in-group and another that, in addition, harms the out-group. The NSD game is similar to the IPD-MD game with one major difference; participants do not actively harm the out-group by contributing to the outgroup pool but instead they may choose to equally help both in-group and out-group by contributing to a collective pool. Thus, a more passive hostile option towards the out-group would be to contribute solely to the in-group

and not the collective pool. Past research using these social dilemma games, has shown that the majority of individuals choose to cooperate with their in-group and thus engage in in-group love and that they do not necessarily engage in out-group hate by harming the out-group (Halevy et al., 2008). In contrast, our results show that it does not take much to break this delicate balance and that participants who experienced rudeness and then took part in the IPD-MD game showed increased out-group hate. Similarly, the results for those who participated in the NSD game showed that experienced rudeness was related to decreased out-group pro-social behavior.

In Study 2, we aimed at examining the underlying processes through which intergroup cooperation is impacted by exposure to rudeness. Eighty working participants took part in a two-stage online experiment conducted in the same day; one in the morning and the other at the evening. In the morning, participants specified two groups in their organization: one that they identify with, and another group that they are not affiliated with. They were then exposed to the same rudeness manipulation used in Study 1. In the evening, participants reported the extent to which they felt cognitively depleted, as well as their level of identification with the other-group they specified earlier. Finally, similar to the NSD game in which the dependent variable was help to out-group members, they were asked the degree to which they would be willing to provide aid to members of the other group, should the need arise. The results supported our theorized moderated mediation model, and showed that exposure to rudeness in the morning interacted with cognitive depletion to affect identification with the out-group. That is, exposure to rudeness lowered participants' identification with the out-group, which in turn, lowered their willingness to help the out-group. However, this was only true for those who were cognitively depleted and individuals who were not depleted successfully avoided classifying the group they were not affiliated with as out-group and were willing to help them similarly to those they affiliated with.

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My Sensitivity is Your Business: Is the Detrimental Effect of Sensory-Processing Sensitivity on Other's Social Anxiety Attenuated by State Mindfulness?

Abstract

People with high levels of sensory-processing sensitivity (SPS) are prone to social anxiety, especially when coupled with low levels of mindfulness. We hypothesized that not only does SPS correlates with social anxiety of the focal person; it also correlates with the social anxiety experienced by interlocutors. Moreover, the effect of SPS on the social anxiety of both the focal person and the interlocutor are (a) *attenuated* by state mindfulness, and (b) *augmented* by a distracting environment. We tested these hypotheses in three laboratory experiments, *N's* = 96, 154, 104, in which participants reported SPS, conversed in dyads and rated social anxiety, where the focal person was randomly distracted or not, and then reported social anxiety and mindfulness. Meta-analyses of these data suggested that SPS is positively correlated with social anxiety of both the focal persons, $\overline{r}$ = .34, and the interlocutor, $\overline{r}$ = .28, that mindfulness attenuated this effect on the interlocutor, $\overline{\beta}$ = -.21 (based on two studies), and that distraction slightly augments this effect both for the focal person, $\overline{\beta}$ = -.10, and the interlocutor, $\overline{\beta}$ = -.12. Thus, SPS is associated with a negative outcome for the focal person's interlocutor, and yet that this association is malleable.

Keywords: Sensory-Processing Sensitivity, Social Anxiety, State Mindfulness.