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**The Role of Sensory Processing Sensitivity
and Analytic Mindset in Ethical Decision-making**

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Abstract

Sensory Processing Sensitivity (SPS) is an individual difference that affects people's thinking and behavior. People who are high in SPS, Highly Sensitive People (HSPs), are more sensitive to stimuli and prefer to take their time in thinking through problems. This study examined the effects of SPS and analytic mindset on ethical decision-making. Mindset was manipulated by instructing participants to either think thoroughly through the ethical problem (deliberation) or focus on finding a concrete, practical solution when solving the problems (implementation). HSPs performed better in the deliberative mindset, allowing them to solve the problem using their natural problem-solving approach. People low in SPS performed better in the implementation mindset. Results suggest that ethics interventions should not be "one size fits all", and should consider a person's natural problem-solving tendencies.

Keywords: ethical decision-making, mindset, sensory processing sensitivity, highly sensitive people

The Role of Sensory Processing Sensitivity and Analytic Mindset in Ethical Decision-making

Ethical decision-making is a complex process (e.g., Mumford et al., 2006) which is vital to work in all fields. Variables both internal and external to individuals impact the quality of the decisions that people make (Caughron et al., 2011; Klugyte, Connelly, Thiel, & Devenport, 2013; Martin et al., 2011; Thiel, Connelly, & Griffith, 2011). Due to its effect on cognition, one individual difference that is likely to affect the way a person approaches an ethical problem is Sensory Processing Sensitivity. Sensory Processing Sensitivity (SPS) is a temperament-based individual difference (Jagiellowicz, Xu, Aron, Aron, Cao, Feng & Weng, 2011) that concerns people's cognitive sensitivity to certain stimuli, including one's own internal processes as well as external stimuli (Acevedo, Aron, Aron, Sangster, Collins & Brown, 2014). Internal stimuli may include an increased sensitivity to one's own emotions or bodily sensations. External stimuli include environmental or social sources, such the emotional or social cues of others, loud noises, bright lights, and strong odors. In addition, Highly Sensitive People (HSP or HSPs) may find new or unpredictable stimuli to be unpleasant (Aron & Aron, 1997), and they typically engage in a series of cognitive processes to attempt to sufficiently deal with the problematic situation or dilemma. There are four dimensions of SPS, which reflect the thinking of HSPs in novel, intense and/or unpredictable situations. They include 1) increased awareness of sensory stimuli, 2) inhibition of behavior, 3) deep cognitive processing of sensory information, and 4) increased emotionality. All four dimensions must be present to meet the criteria for SPS. SPS has been demonstrated to be related to stress and burnout at work (Benham, 2006; Lindsay, 2017; Redfearn, van Ittersum, & Stenmark, 2020), as well as increased emotional reactions (Aron,

Aron, & Jagiellowicz, 2012). Due to a high priority given to emotionally salient stimuli and events, particularly ones that involve social conflict and resolution, the dimensions of SPS have been associated with better decision-making for current and future events (Aron, Aron & Jagiellowicz, 2012). Lastly, SPS has been linked with higher levels of empathy, especially when physical or social harm to others might exist (Acevedo et al., 2014).

Taken together, the findings on SPS suggest that this personality variable may affect the way an individual approaches an ethical problem. Ethical decision-making and behavior are vitally important for organizational effectiveness, and a better understanding of how SPS might be related to ethical decision-making can help inform interventions designed to improve ethical decision-making. Therefore, the purpose of the present study is to examine the role of SPS in ethical decision-making, within the context of two different analytic (problem-solving) mindsets: deliberative focus and implementation focus.

Ethical decision-making requires decisions which are morally consistent with society's acceptable standards (Beu, Buckley, & Harvey, 2003). Not only is successful ethical decision-making vital for success across all occupations (Zeni, Buckley, Mumford & Griffith, 2016; Stenmark & Kreitler, 2017), but poor ethical decision-making can also be very costly to organizations (Beu, Buckley, & Harvey, 2003). Organizations which promote ethical decision-making and behavior benefit from positive outcomes, such as reduced turnover and increased trust from consumers (Zeni, Buckley, Mumford & Griffith, 2016). Ethical decision-making often involves ambiguous, "gray" areas, which may seem minor, but even poor decisions regarding seemingly minor problems can have negative consequences for organizations and end up resulting in more serious ethical violations (Stenmark et al, 2011).

Indeed, ethical decisions often involve sorting through such “gray” areas, which contributes to its complexity; this requires engaging in multiple cognitive processes in order to make an effective decision (Beu, Buckley & Harvey, 2003; Stenmark & Kreitler, 2017). Mumford, et al. (2006) identified multiple cognitive processes involved in ethical decision-making, including information gathering, forecasting, and sensemaking. Forecasting involves the prediction of potential consequences of a decision, which can help people to evaluate potential decision options. Sensemaking involves an analysis of the situation in order to gain a better understanding of how multiple aspects of the situation fit together. By gathering information, engaging in sensemaking, and forecasting possible outcomes, decision-makers are able to consider important aspects of the problem, including causes, consequences, and potential solutions, in order to make the best decision (Stenmark & Kreitler, 2017; Stenmark et al., 2011; Zeni, Buckley, Mumford, & Griffith, 2016). Each of these cognitive processes, however, may be flawed, and errors can occur. For example, information gathering can be negatively impacted by cognitive biases and heuristics (Zeni, Buckley, Mumford & Griffith, 2016). Thus, it is important to examine the different cognitive processes involved in ethical decision-making in order to determine what is affected by situational variables.

Cognitive strategies involved in ethical decision-making

Mumford et al. (2006; 2008) have identified seven cognitive strategies involved in ethical decision-making, which facilitate the process of considering the ethical problem situation in depth, in order to make the best decision: recognizing circumstances, seeking help, considering others’ perspective, dealing with emotions, anticipating consequences, questioning one’s own judgment, and looking within to analyze personal motivations. These processes have been

shown, across a number of studies, to be related to effective ethical decision-making (Antes et al., 2012; Caughron, Antes, Stenmark, Thiel, Wang, & Mumford, 2011; Martin et al., 2011; Mumford et al., 2006). Engaging in these cognitive processes helps to facilitate the thorough analysis of the important elements of the problem situation, including the goals and motives of other people, one's own biases, and the role of the emotions involved in the situation. Situational variables have been shown to impact the extent to which individuals engage in these processes when solving ethical problems (Caughron et al., 2011; Martin et al., 2011). Emotions can also influence the use of these processes when solving ethical problems (Kligyte, Connelly, Thiel, & Devenport, 2013; Thiel, Connelly, & Griffith, 2011). Given these previous findings regarding the effects of emotions and situational variables on the use of ethical decision-making strategies, it seems possible that not only could SPS be related to how likely a person would be to engage in these processes, but also that a situational variable such as analytic mindset might influence their use. Therefore, participants' use of cognitive strategies as they worked through ethical decision-making problems was examined as a dependent variable in the present study.

Ethicality in HSPs

Various studies suggest that HSPs would be more absorbed in the cognitive processes of ethical decision-making, possibly leading to more ethical judgment and behavior. According to SPS theory, due to their heightened sense of emotionality, HSPs are said to be more engaged and in-line with the emotions they experience, as well as with the emotions of others (Bakker & Moulding, 2012). In one study, HSPs were found to be more responsive toward positive emotions of close persons, negative emotions of others in general, or situations that are perceived to have heightened emotional content or conflict (Acevedo, Aron, Aron, Sangster, Collins &

Brown, 2014). In addition, another study found that SPS-specific brain areas were strongly correlated with regions in the brain that involve self-awareness, self-other processing, complex decision-making, emotional sense-making, and empathy (Acevedo et al., 2014). Thus, these findings suggest that HSPs are more likely to engage in situations that are emotionally salient, particularly with respect to social scenarios. SPS has also been significantly correlated to regions in the brain that contain mirror neurons (Acevedo et al., 2014). Heightened mirror neuronal activity has been found to cause one to feel physical pain and empathy when watching someone go through a socially or physically painful experience of their own (Acevedo et al., 2014). This is thought to be caused by a phenomenon called neural resonance, the process by which sensorimotor and affective areas in the brain react as if they are experiencing real physical pain, even though none is personally experienced. Increased neural resonance has been found to predict increased ethicality in situations where a perceived deontological moral dilemma exists (Christov-Moore, Sugiyama, Grigaityte & Iacoboni, 2017). Thus, HSPs theoretically would be more likely to engage in and behaviorally respond to imminent or existing perceived dilemmas that involve the perception of harm to others, such as ethical problems. Therefore, the ethicality of participants' decisions was examined as a dependent variable in this study.

The present study examined both the cognitive processes involved in ethical decision-making (strategy use) and participants' perceptual aspects of ethical decision-making. Thus, the present study examined the following hypotheses:

H1a: People who are high in sensory processing sensitivity will engage in more of the cognitive processes involved in ethical decision-making?

H1b: People who are high in sensory processing sensitivity will differ from people who are low in sensory processing sensitivity in their perceptions involved in ethical decision-making?

Analytic mindset

The analytic mindset, or problem-solving approach, taken by participants may interact with SPS to impact the use of ethical decision-making strategies. The present study examined the impact of using an implementation mindset, as compared to a deliberative mindset as an independent variable. Analytic mindset has been shown to affect performance on complex problem-solving tasks; and ethical decision-making involved complex problem-solving (Mumford et al., 2006). People using a deliberative mindset analyze the problem in a thorough manner, considering various aspects of the situation in an abstract way, including causes of the problem situation, contingencies in planning, resources available, and restrictions to solution implementation (e.g. Gollwitzer, 1999; Gollwitzer & Brandstatter, 1997; Schaal & Gollwitzer, 1999). The abstract analysis associated with a deliberative mindset tapers off as people take a more implementation-oriented approach to problem-solving. An implementation-oriented approach focuses on practical issues regarding execution of a specific solution.

Studies examining analytic mindset suggest a number of advantages and disadvantages of each mindset, as they relate to ethical decision-making. For example, a deliberative mindset could improve ethical decision-making because of the causal analysis and solution generation involved in deliberative processes (Strange & Mumford, 2005). An implementation mindset, however, encourages a focus on practical issues surrounding solution implementation; therefore, an implementation mindset could improve ethical decision-making by encouraging people to

focus on vital features of solution implementation, such as goals, contingencies, and constraints (Dailey & Mumford, 2006). On the other hand, Stenmark, et al. (2010) did not find an effect of analytic mindset on the cognitive processes involved in ethical decision-making. Stenmark, et al. (2010), however, did not qualitatively examine open-ended responses, which may have allowed the researchers to uncover effects on cognitive processes, unlike the present study. Thus, the present study examined the following research questions:

RQ1a: How will analytic mindset impact the cognitive processes involved in ethical decision-making?

RQ1b: How will analytic mindset impact the perceptions involved in ethical decision-making?

Deliberative Nature of HSPs

Numerous functions of SPS appear to be geared towards increased deliberation. SPS theory suggests that one of the hallmarks of being highly sensitive is an initial need for reflection (Aron and Aron, 1997). This need to reflect inclines the HSP towards the input and processing of new stimuli or potential conflicts, as opposed to output in terms of more immediate behavioral reactions. These processes result in longer periods of behavioral inhibition and increased attention and awareness of internal and environmental stimuli (Acevedo et al., 2014). SPS theory posits that in order to facilitate the deep cognitive processing of potentially useful stimuli, HSPs may undergo a momentary period of behavioral inhibition prior to responding to the situation in front of them. As a result of this delay, a slower decision may be reached, although fewer decision-making errors may be made due to the increased time spent reflecting.

In HSPs, the brain increases metabolic demand and energy in to order to attend to more useful cues that might be used to make the best decisions. This means that subtle or non-relevant cues are also afforded equal attention until only the relevant cues remain. Due to this initial non-discriminant cognitive processing, HSPs are naturally predisposed to being more detail-oriented. During the moment of behavioral inhibition, HSPs will reflect upon past similar experiences and project future hypothetical scenarios that would be useful to make a better and more informed decision (Acevedo et al., 2014). In addition, SPS has been found to be associated with higher levels of brain activity in the area of action planning, which occurs prior to behavioral action (Aron & Aron, 1997). Thus, there are a number of cognitive processes that dispose HSPs to using a more contemplative and thorough or deliberative mindset. It is possible that SPS might be a moderator that influences how analytic mindset impacts ethical decision-making. Stenmark, et al. (2010) found no effect of analytic mindset, but it is possible the inclusion of SPS as a potential moderator might reveal an effect. Therefore, the present study examined the interaction of HSP and the independent variable of analytic mindset. Thus, the present study examined the following research question and hypothesis:

H2: Analytic mindset will interact with SPS such that HSPs will perform worse on the cognitive processes involved in ethical decision-making when they are compelled to engage in an implementation mindset in solving ethical problems, as compared to when they are instructed to engage in a deliberative mindset in solving ethical problems.

RQ2: How will analytic mindset interact with SPS with respect to its effect on the perceptions involved in ethical decision-making?

Method

Participants

Participants were one hundred and ninety-four undergraduate university students (128 females, 66 males; average age = 19.55, SD = 3.22) from a mid-sized public university in the southwest. They volunteered to participate in this study as an optional means of fulfilling a course requirement or to receive extra credit for a course.

Materials

Experimental Task. The experimental task consisted of a series of four vignettes in which the main character faces an ethical problem. Participants read through the vignettes and responded as if they were the main character. There was one problem from four primary categories of research misconduct, as identified by Mumford, et al. (2006): data management, study conduct, business practices, and professional practices. Each scenario featured the main character being asked a question about a problem with ethical implications from colleague. Before reading through the vignettes, participants read through background information describing the hypothetical organization (an electronics firm), the other characters involved, and their own role in the organization. The main character was a middle-level manager of the organizational department responsible for testing and designing new products. Each email described a different problem to be solved, and included relevant problem-specific information for participants to consider in thinking through the problem. After reading the scenario, participants were asked to respond to prompt questions about the potential courses of action. After identifying the potential courses of action, participants were prompted to forecast possible consequences of those courses of action. Last, participants were prompted to describe their final decision about the problem.

Mindset Manipulation

Mindset was manipulated by instructing participants to think about the problem in a specific way, consistent with previous research (Gollwitzer, 1999; Stenmark et al., 2010). Participants in the deliberative condition were told to consider all different aspects of the scenario as they solved the problem. Participants in the implementation condition were told to focus on providing a concrete, workable solution. The mindset instructions were repeated before each of the vignettes, in order to improve the salience of the manipulation throughout the completion of the problem-solving task.

Measurement

Manipulation Check. In order to determine if the mindset manipulation did, in fact, result in participants' approaching the problem-solving situation using the desired mindset, participants answered questions regarding the two different mindset dimensions (deliberation and implementation). Each dimension of the manipulation check questions consisted of 2 questions, which participants answered on a 1 (Not at all) to 5 (Very much so) scale. The implementation dimension questions were reverse-scored, such that higher scores in both dimensions indicated a higher degree of deliberation. The deliberation questions were, "To what extent did you try to think about the problem from all different perspectives?" and "To what extent did you think broadly about the problem in order to make sure you considered all relevant information?". The implementation questions were, "To what extent did you try to find a practical, workable solution to the problems?" and "To what extent did you focus your attention specifically on solving the problems?". The manipulation check questions were separated by other questions in the post-task questionnaire in order to help participants to consider them separately, rather than responding the same way to all questions automatically. Participants' ratings on the two

questions from each mindset dimension were averaged in order to serve as their manipulation check score for each dimension.

Highly Sensitive Person Scale. Sensory processing sensitivity was measured by the shortened version of the Highly Sensitive Person Scale (HSPS). This 18-item measure assesses three subscales of sensory processing sensitivity. Ease of Excitation (EOS) is measured by 8 items, Aesthetic Sensitivity (AES) is measured by 5 items, and Low Sensory Threshold (LST) is measured by 5 items. Individuals high in EOS become overwhelmed by external and internal demands. Individuals high in AES are highly aesthetically aware, and individuals high in LST experience unpleasant sensory arousal in response to external stimuli (Evers, Rasche, & Schabraq, 2008). The original scale was 27 questions. However, Smolewska, McCabe and Woody (2006) were able to shorten and sub-compartmentalize the scale into three subscales without sacrificing any validity or reliability from the original scale.

Moral Intensity. In order to assess participants' ethical perceptions, the Perceived Moral Intensity Scale (PMIS; Sweeney and Costello, 2009) was used. This 9-item measure evaluates the extent to which participants recognize different elements of moral intensity in a separate vignette which involves an ethical problem in a business setting. This vignette ends with the main character taking a potentially unethically action. After reading the vignette, participants are asked to rate their level of agreement with a series of statements (e.g., Most people would agree that Tom's action is wrong). The nine items on the PMIS represent nine dimensions of moral intensity. The scale includes Jones' (1991) dimensions: magnitude of consequences, social consensus, probability of effect, temporal immediacy, proximity, and concentration of effects. Additionally, this questionnaire includes three other dimensions: identification of an ethical dilemma, ethical judgment, and ethical intentions.

Content-Coding. Participants' qualitative responses to the stimulus emails were content-coded in order to examine the cognitive processes that participants engaged in as they generated a solution to the ethical problem. Four Masters students in I/O psychology served as the content-coders. These content-coders participated in a 10-hour frame-of-reference training program prior to evaluating the participants' responses.

Dimensions of Interest. Participants responded to questions asking them to describe the possible courses of action, the potential consequences of those actions, and the decision they would make and why. Questions asking about the possible courses of action and their consequences were content-analyzed to evaluate the quality of participants' forecasts. The decision field was content-analyzed for ethicality. Finally, the participants' responses were considered in their entirety to evaluate their use of five cognitive strategies important for ethical decision-making; recognizing circumstances, considering others, anticipating consequences, questioning judgement and looking within.

The raters assessed the quality of the forecast, ethicality of the final decision, and the use of cognitive strategies on a 5-point scale. For all rating scales, a rating of 1 was reflective of a low level of the construct, a rating of 3 was reflective of a moderate level of the construct, and a rating of 5 was reflective of a high level of the construct. More detail on the definitions and operationalizations for the content-coded dimensions can be found in the Appendix.

The forecast was scored by evaluating the detail, complexity, and criticality of the participants' responses to questions regarding the potential courses of action. The interrater reliability for overall forecast quality was .82. Decision ethicality was evaluated by considering three markers of ethicality: regard for the welfare of others, attendance to personal responsibilities, and adherence to/knowledge of social obligations. Interrater reliability for

ethicality was .84. Due to the nature of the stimulus problems, 5 of the 7 cognitive strategies identified by Mumford, et al. (2006) were examined. Dealing with emotions and seeking help were excluded because they were not relevant to the stimulus problems. The average interrater reliabilities calculated for recognizing circumstances, anticipating consequences, considering others, questioning judgment, and looking within were .74, .76, .65, .70, and .72, respectively.

Procedure

Each participant was randomly assigned to one of two different mindset groups: Implementation (N = 93) and Deliberative (N = 101). The study was conducted in a computer lab with up to 6 participants at individual computer stations at a time. Participants completed all tasks and questionnaires on the computer. After participants read and signed the informed consent form, they completed the experimental task, which consisted of reading a series of four vignettes and responding to questions about each one. The experimental vignettes, used in previous studies of ethical decision-making (e.g., Stenmark, et al., 2011) describe a hypothetical organization and a series of problems facing the main character. Each vignette was presented in the form of an email from a colleague in the organization. Participants were asked to respond to each email with a description of possible courses of action, potential consequences of those actions, and their final decision and why they would make that decision. The mindset manipulation was written into the instructions for the task, and the experiment proctor also read the instructions aloud, in order to enhance the salience of the instruction.

Participants completed their analysis of the email problems in their own time. Following the main experimental task, participants completed the HSPS, the PMIS, and then they completed a post-task questionnaire with manipulation checks and demographics. After completing all experiment materials, participants were debriefed and thanked for participating.

Results

Manipulation Check

In order to determine whether the mindset manipulation induced participants to approach the problem from the intended mindset, participants in the deliberative vs. implementation mindset conditions were compared based on their responses to the questions regarding the manipulation check. There were two questions for each mindset condition; the two questions were each scale were averaged, such that there was a manipulation check score for the deliberation questions and a score for the implementation questions. Before the questions for each manipulation check scale were aggregated, a correlation analysis and scale analysis was performed to ensure that it was appropriate to combine them. The two question items for each scale were significantly correlated to each other ($r = .49, p < .01$ for the two deliberative questions and $r = .51, p < .01$ for the implementation scale). Additionally, the questions from the two scales were significantly negatively correlated to each other (ranging from $r = -.43, p < .01$ to $r = -.58, p < .01$). Cronbach's alpha for the deliberative scale was .65, and Cronbach's alpha for the implementation scale was .68.

The deliberative group ($M = 4.26, SD = .64$) did not differ significantly from the implementation group ($M = 4.12, SD = .65$) on the implementation manipulation check questions ($t = 1.53, p > .05$). However, participants in the deliberative condition ($M = 4.18, SD = .64$) indicated that they were significantly more likely to work hard to think through the problem thoroughly to analyze it from all different perspectives ($t = 2.58, p < .05$), than participants in the implementation mindset condition ($M = 3.92, SD = .75$). This suggests that is it likely that the manipulation did result in participants in the deliberative mindset condition being more likely to

analyze the problem in a deliberative way, compared to those in the implementation mindset condition.

Analyses

Because the mindset independent variable was categorical, the SPS variable was also transformed into a categorical variable by assigning participants to either a high sensitivity group or low sensitivity group, based on their scores. This allowed the effects of the IVs to be examined using a MANOVA. Scores on the HSPS scale were used to divide participants into high sensitivity and low sensitivity groups, consistent with Aron, Aron, & Jagiellowicz (2012), who proposed that it is appropriate to dichotomize the scores of the HSP scale, and that SPS, as a construct, is likely relatively dichotomous in humans. The mean SPS score was 4.22; participants who scored below the mean were classified as low sensitivity ($N = 101$), and participants who scored above the mean were classified as high sensitivity ($N = 93$). Once the SPS variable was dichotomized into high and low groups, two separate MANOVAs were used to analyze the content-coded dimensions and the PMIS dimensions, respectively (see Table 1 for a correlation table among all DVs). Gender was retained as a significant covariate for the MANOVA analyses.

Content-Coded Dimensions

In order to examine H1a, RQ1a, and H2, a 2 (Deliberative vs. Implementation Mindset) x 2 (High Sensitivity vs. Low Sensitivity) MANOVA was used to analyze the content-coded dimensions: Forecast Quality, Ethicality, Recognizing Circumstances, Anticipating Consequences, Considering Others, Questioning Judgment, and Looking Within. The multivariate test (see Table 2) revealed non-significant main effects for mindset, ($F(7, 184) = 1.27, p > .05, \text{partial } \eta^2 = .04$), and SPS ($F(7, 184) = 1.07, p > .05, \text{partial } \eta^2 = .05$). The interaction between mindset and SPS, however, exhibited a significant effect ($F(7, 184) = 2.25,$

$p < .05$, partial $\eta^2 = .08$). Significant univariate interaction effects were obtained for Ethicality ($F(1, 190) = 6.38$, $p < .05$, partial $\eta^2 = .03$), Recognizing Circumstances ($F(1, 190) = 4.41$, $p < .05$, partial $\eta^2 = .02$), Considering Others ($F(1, 190) = 5.66$, $p < .05$, partial $\eta^2 = .03$), and Questioning Judgment ($F(1, 190) = 5.72$, $p < .05$, partial $\eta^2 = .03$; see Table 3). The pattern of means was such that participants who were highly sensitive performed worst in the implementation condition, while participants who were low in SPS performed the best in the implementation condition (see Table 4 for group means).

[Insert Table 1 here]

[Insert Table 2 here]

[Insert Table 3 here]

[Insert Table 4 here]

PMIS Dimensions

In order to examine H1b, RQ1b, and RQ2, a 2 (Deliberative vs. Implementation Mindset) x 2 (High Sensitivity vs. Low Sensitivity) MANOVA was used to analyze the dimensions of the PMIS instrument: ethical dilemma identification, ethical judgement, ethical intentions, magnitude of consequences, social consequences, probability of effect, temporal immediacy, proximity, and concentration of effects (see Table 5). The multivariate tests for mindset, SPS, and the interaction between the two variables were not significant ($F(9, 181) = .97$, $p > .05$, partial $\eta^2 = .04$; $F(9, 181) = .75$, $p > .05$, partial $\eta^2 = .05$; and $F(9, 181) = .70$, $p > .05$, partial $\eta^2 = .03$, respectively).

[Insert Table 5 here]

Discussion

The present study examined the effects of analytic mindset and SPS on ethical decision-making. The findings of this study revealed an interaction between analytic mindset and SPS, such that individuals who are high in SPS perform better on ethical decision-making when they engage in a deliberative mindset, whereas individuals who are low in SPS perform better when they engage in an implementation mindset.

Before turning to the implications of these findings, a few limitations should be noted. First, this study used a low-fidelity simulation decision-making task. While the problem described in the simulation vignette was designed to be complex and representative of real-world problems, it is possible that different results would be found if the problems were real, with actual consequences for the people involved. Therefore, future research should examine the interaction between SPS and mindset in real-world settings in order to determine if the present findings are applicable to real-world environments. Additionally, the participants of the present study were college students. While young adults and older adults are likely to use similar cognitive processes when they are faced with an ethical dilemma, it would be valuable to study ethical decision-making and analytic mindset as they related to sensory processing sensitivity in older adult populations. It would be particularly useful to examine these variables in working adults, using ethical dilemmas that they experience in their work, in order to address these two limitations at the same time. A related limitation is that the sample in this study was quite young (just under 20 years of age, on average). There is research to suggest that SPS decreases with age (Ueno, Takahashi, & Oshio, 2019), so it is possible that SPS would not impact decision-making in the same way as one ages. Thus, examining these dynamics in older adults would be informative.

Additionally, while the effects obtained in the present study were interesting and potentially important, the effect size estimates were not overwhelming. The effect size estimate for the interaction between mindset and SPS was partial $\eta^2 = .08$, which suggests that the interaction between these two variables accounts for about 8% of the variance in the content-coded dimensions. When looking at the univariate effect sizes, they range from .02 for recognizing circumstances, to .03 for ethicality, considering others, and questioning judgments. Taken as a whole, these are small to medium effect sizes, based on Cohen's (1969) recommendations of .01 as a small effect, .06 as a medium effect, and .14 as a large effect. Therefore these effects are not large, but they are likely to be large enough to indicate that SPS and analytic mindset effect the way people think about ethical problems. Therefore, these findings are probably relevant considerations in designing interventions aimed at improving ethical decision-making.

Additionally, several of the content-coded dimensions are highly correlated with each other, and thus there is some doubt about whether they are distinctly different dependent variables. For example, the two strategies Questioning Judgment and Looking Within have an $r = .91$ correlation coefficient. The other strategies have correlation coefficients ranging from .821 to .896. While it is not surprising, from a theoretical perspective, that ethical decision-making strategies would be highly correlated with each other, it is still something that should be considered in evaluating the results of the present study. Of note, despite their high correlations with each other, not all strategies were significant with respect to the interaction between mindset and SPS. For example, despite the high correlation between Questioning Judgment and Looking Within, only Questioning Judgment was found to be significantly affected by the

independent variables. Thus, it does appear that the individual strategies are capturing unique constructs to some extent.

Furthermore, the implementation dimension of the mindset manipulation check questionnaire did not reach statistical significance. It is possible that this lack of statistical significance is an indication that the implementation manipulation failed. However, the deliberative mindset manipulation check questions were significant, indicating that the deliberative group was significantly more deliberative in their problem-solving than the implementation group. Read a different way, this significant manipulation check demonstrates that the implementation group was significantly less deliberative than the deliberative group. Thus, this is one piece of evidence that the manipulation was, in fact, successful. Additionally, the non-significant manipulation check scores are not necessarily indicative of a failed *manipulation*, but they may very well be indicative of a failed *manipulation check*. It is thus possible that the questions did not capture an adequate quantification of the implementation mindset. Additionally, though not significant, the means on the implementation questions were in the correct direction.

Despite these limitations, the results of the present study have important implications for understanding the dynamics of SPS and analytic mindset as they apply to the cognitive processes involved in ethical decision-making. The findings of this study suggest an important conclusion: that interventions designed to improve ethical decision-making should *not* take a “one size fits all” approach. Indeed, there may be individual differences which influence the effectiveness of different types of interventions. The present study found no main effects for SPS or analytic mindset, but there was a significant interaction between these two variables. HSPs performed best on a number of ethical decision-making indicators when they were in the deliberative

condition. Specifically, HSPs in the deliberative mindset condition made better ethical decisions and were more likely to recognize circumstances, consider others' perspectives, and question their own judgment. The findings of the present study have important implications for both theory and practice.

Theoretical implications

The present study supports previous research on the construct of SPS, and extends the literature to demonstrate a specific situational variable (analytic mindset) and context (ethical decision-making) in which SPS is relevant. The findings that HSPs performed the best when they were compelled to solve an ethical problem using a deliberative mindset is consistent with previous research that has found that HSPs naturally take a more thoughtful, deliberative approach to solving problems (Aron et al., 2012). SPS is a relatively new construct to describe individual differences in sensitivity to stimuli, both internal and external (Aron, 2004), and it has only recently begun to be examined in organizational settings in terms of its outcomes (Cooper, 2014, Evers, Rasche, & Schabracq, 2008; Jaeger, 2004; Lindsay, 2017). Thus, examining SPS in other contexts and with other outcomes is an important step in filling out the nomological network of this construct.

Second, the present results also suggest that when HSPs are compelled to engage in a problem-solving process that is out of line with their natural tendencies, their problem-solving results are less than optimal. However, when an HSP is allowed to think in the manner they prefer, they can reach higher quality, thoughtful, ethical decisions. This finding is consistent with previous research that has shown SPS to be linked with a heightened sense of empathy and engagement in problem scenarios. HSPs particularly experience increased empathy when the

possibility of causing physical or social harm to others exists (Acevedo et al., 2014), which is certainly the case with ethical problems.

The null finding regarding the cognitive process of forecasting and the cognitive strategy of anticipating consequences also may have important implications for an understanding of how analytic mindset interacts with SPS. HSPs tend to focus more effectively on the smaller details in a dilemma, rather than an overall solution (Aron et al., 2012). This may imply that they are more focused on the present when they are faced with a new or conflicting issue; this certainly aligns with the core of SPS theory that supports the processing of input over output stimuli (Aron & Aron, 1997). Thus, any perceived direct, proximal consequences of an ethical problem on others may take priority over more long-term consequences or even indirect consequences of the problem.

Additionally, the present study obtained null results with regard to perceptions of the ethical problem, for both the main effects of SPS and analytic mindset, and the interaction of the two. On one hand, this result is somewhat surprising. HSPs are theorized to have a preference of input and to tend to more conflicting or potentially damaging cues and situations (Aron & Aron, 1997); thus, it could be expected that perceptions would be related to SPS. On the other hand, manipulating analytic mindset affects the cognitive approach to problem-solving; thus, the finding that only the cognitive aspects of decision-making were affected by the manipulation is consistent. Additionally, the finding that only the cognitive aspects of decision-making were affected by the interaction of SPS and analytic mindset suggests that perhaps the mechanism that leads to heightened emotionality in HSPs has a cognitive basis, rather than perceptual. This finding should be examined in future studies to determine the role of perceptions in the decision-making processes of HSPs.

Practical Implications and Future Directions

The findings of the present study highlight the importance and utility of taking individual differences into account for reasons of increased ethicality and thoughtfulness in institutions and possibly society in general. Based on the present study, a few suggestions can be made concerning real-world ethical problem-solving within organizations and for ethical decision-making training programs. First, simply acknowledging the various and distinct ways each individual naturally processes problems such as ethical dilemmas may prove to have real effects on ethical outcomes. This acknowledgment can lead to a more grounded approach to ethical decision-making in organizations as well as ethics interventions. For ethical decision-making training interventions, this is especially vital, as the primary purpose of such trainings is to improve the cognitive approach of individuals by teaching them key strategies. Specifically, when developing ethical decision-making interventions, it may be a good idea to include a discussion of individual differences in problem-solving, and that the best way for one person to solve a problem may be different than what is optimal for another person. Using an approach that is unnatural to the learner may actually *decrease* cognitive processing and ethicality.

A related practical implication is that it might be useful for ethics interventions to include a discussion and assessment of sensory processing sensitivity. Interventions can assess participants so that participants will be aware of their status as a highly sensitive person (or not), and then the interventions can make recommendations for the types of problem-solving activities that tend to work better for HSPs (deliberative) and non-HSPs (implementation). By increasing awareness of the nature of sensory processing sensitivity as an individual difference, individuals can take proactive measures to better align their problem-solving approach to be consistent with what is most likely to work for them (Redfearn, van Ittersum, Stenmark, 2020).

Additionally, considering that SPS is linked to increased deliberation, the amount of time it may take HSPs to solve the same problem (especially a conflicting emotional or social one), as compared to non-HSPs may be longer. This relates to the cognitive processes of SPS that results in tending to more subtle and new details in an even manner, until the salient aspects of each situation have been isolated (Aron et al., 2012). Furthermore, SPS theory notes that an increased tendency toward emotionality may mean that the HSPs in any scenario may be more emotionally involved and reactive to any perceived conflicting dilemma (Baumeister, Vohs, DeWall, & Zhang, 2007). This could result in an even longer deliberative process for HSPs, and in some cases, it could also lead to some behavioral difficulties, due to the natural behavioral inhibition when thinking through problems (Aron & Aron, 1997). Thus, an awareness on the part of the individual and his or her manager and organization regarding his or her natural, optimal problem-solving tendencies can help managers and other organizational leaders to allow employees the time and informational resources they need to process such important problems to maximize problem-solving effectiveness.

Additionally, it would not be unreasonable to suspect that HSPs and non-HSPs each would display different strengths in certain aspects of ethical decision-making processes and planning for future solution implementation. For example, non-HSPs are likely perform better when there are time constraints, whereas HSPs would likely do better when they have more time to fully deliberate (Aron et al., 2012). Or, as suggested by the results of the present study, non-HSPs are likely to be better at focusing on practical, concrete, workable solutions, whereas HSPs are better at considering all aspects of the problem situation. These different areas of strength could be potentially leveraged together in order to present a more holistic solution that would

include both vital details and concrete overall considerations for a dilemma. From this vantage point, decisions, judgments and subsequent decisions could be improved upon.

Finally, because HSPs are more reactive to the emotions of other people (Jaeger, 2004), they tend to be more strongly affected by the negative moods of others (Cooper, 2014). This has implications for the types of problems that are best suited to be solved by an HSP or a non-HSP. It might be better for non-HSPs to work on problems that are particularly emotional, because they are less likely to be affected by the heightened emotions. Alternatively, if an HSP is faced with a particularly emotional problem, it might be a good idea to seek the help of a non-HSP who can approach the problem more objectively. Having a problem-solving team which includes HSPs and non-HSPs could allow for a more balanced approach to solving emotional problems.

Future studies should examine the unique decision-making processes of HSPs compared to non-HSPs to determine their compatibility and to identify areas in which they conflict or complement each other. Such research may offer suggestions on optimal team composition for teams that regularly make difficult ethical decisions. Additionally, other situational factors, such as time constraints, which may interact with SPS to affect ethical decision-making should be studied. Finally, the dynamics of analytic mindset, SPS, and ethical decision-making in real-world organizational contexts should be investigated, using decisions with real consequences in order to determine the generalizability of the present findings.

In conclusion, the present study found that HSPs should be allowed to deliberate over all aspects of an ethical decision in order to make the best decisions, whereas people who are low in sensitivity do best when they focus on finding a concrete solution. Thus, interventions may do well to provide instruction on multiple approaches to solving ethical problems, and note that it

may be best to engage in the problem-solving approach which best fits with an individual's natural, preferred, problem-solving style.

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Table 1.

Correlations Among Dependent Variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. ID Ethical Dilemma		.004	-.097	-.050	-.022	.114	.035	.016	.080	.235**	.115	.228**	.245**	.181*	.167*	.196**
2. Ethical Judgment			.071	.011	.246**	.146*	.080	.189**	-.020	.055	.080	.014	.067	.053	.046	.075
3. Ethical Intentions				.207**	-.339**	.021	.231**	-.080	.319**	-.116	-.098	-.140	-.132	-.117	-.154*	-.178*
4. Magnitude of Consequences					-.124	.078	.380**	.166*	.271**	-.142*	-.144*	-.171*	-.176*	-.124	-.117	-.146*
5. Social Consensus						.071	-.134	.212**	-.258**	.033	.119	.040	.073	.075	.070	.067
6. Probability of Effects							.191**	.203**	.139	.016	-.018	-.026	.034	.071	.035	.021
7. Temporal Immediacy								.090	.419**	-.116	-.078	-.129	-.132	-.077	-.102	-.139
8. Proximity									-.055	.041	.000	.010	.044	.038	.025	.042
9. Concentration of Effects										-.132	-.176*	-.126	-.157*	-.127	-.122	-.207**
10. Forecast Quality											.450**	.824**	.884**	.697**	.754**	.751**
11. Ethicality												.741**	.678**	.802**	.749**	.791**
12. Recognizing Circumstances													.896**	.850**	.890**	.888**
13. Anticipating Consequences														.821**	.854**	.873**
14. Considering Others															.854**	.861**
15. Questioning Judgment																.914**
16. Looking Within																

Note: ** $p < .01$; * $p < .05$

Table 2

2 (Cognitive Sensitivity) x 2 (Mindset) Multiple Analysis of Variance for Content-Coded Dimensions

<i>Effect</i>	<i>df</i>	<i>F</i>	<i>p</i>	<i>Partial η²</i>
Cognitive Sensitivity	7	1.37	.22	.05
Mindset	7	1.07	.38	.04
Cognitive Sensitivity x Mindset	7	2.50	.03	.08

*Note: ** $p < .01$*

Table 3

Univariate Effects of the Interaction Between Cognitive Sensitivity and Mindset on Content-Coded Dimensions

<i>Source</i>	<i>df</i>	<i>F</i>	<i>p</i>	<i>Partial η^2</i>
Forecast Quality	1	1.89	.17	.01
Ethicality	1	6.38*	.01	.03
Recognizing Circumstances	1	4.41*	.04	.02
Anticipating Consequences	1	2.55	.11	.01
Considering Others' Perspectives	1	5.66*	.02	.03
Questioning Judgment	1	5.72*	.02	.03
Looking Within	1	1.74	.19	.01
Wilks' Lambda	7	2.50*	.03	.08

*Note: * $p < .05$*

Table 4.

Rated Variable Group Means for the Interaction Between Sensory Processing Sensitivity and Analytic Mindset

<u>Variable</u>	<u>Deliberative</u>				<u>Implementation</u>			
	<u>Low Sensitivity</u>		<u>High Sensitivity</u>		<u>Low Sensitivity</u>		<u>High Sensitivity</u>	
	<u>Mean</u>	<u>SD</u>	<u>Mean</u>	<u>SD</u>	<u>Mean</u>	<u>SD</u>	<u>Mean</u>	<u>SD</u>
Forecast Quality	2.61	0.09	2.67	0.09	2.65	0.09	2.45	0.1
Ethicality*	2.77	0.08	2.88	0.08	2.93	0.08	2.64	0.08
RC*	2.82	0.08	2.89	0.08	2.93	0.08	2.67	0.08
AC	2.53	0.08	2.51	0.08	2.64	0.08	2.35	0.09
CO*	2.43	0.07	2.5	0.06	2.61	0.06	2.37	0.07
QJ*	2.67	0.08	2.77	0.08	2.83	0.07	2.56	0.08
LW	2.63	0.08	2.63	0.08	2.74	0.08	2.53	0.08

*Note: * indicates a significant interaction at $p < .05$*

Table 5

2 (Cognitive Sensitivity) x 2 (Mindset) Multiple Analysis of Variance for PMIS Dimensions

<i>Effect</i>	<i>df</i>	<i>F</i>	<i>p</i>	<i>Partial η²</i>
Cognitive Sensitivity	9	.97	.47	.05
Mindset	9	.75	.66	.04
Cognitive Sensitivity x Mindset	9	.70	.71	.03