Uncertainty can be very unsettling, and research indicates that people go to lengths to cope with it. Uncertainty threats have been shown to increase conviction in important social attitudes (McGregor, Zanna, Holmes, & Spencer, 2001), to pursue personal projects that are more consistent with one’s values (McGregor et al., 2001), to increase identification with minimal groups (Grieve & Hogg, 1999), and to increase negative responses when fair process is denied (van den Bos, 2001). Uncertainty has even been shown to increase claimed religiosity (Wichman, 2010) and support for religious war among otherwise relatively liberal students (McGregor, Haji, Nash, & Teper, 2008).

These compensatory responses to uncertainty seem to be at odds with the intuitive meaning of uncertainty. Intuitively, uncertainty should make people careful information processors; it could also weaken and might even negate whatever contents of mind are active at that time. For instance, a person who is uncertain and attempting to reach a decision might continue to deliberate past the point where other people would be satisfied. Indeed, research shows that both chronically accessible and situationally activated uncertainty can cause such effects (Jacobson, Weary, & Lin, 2008). Additional research demonstrates that uncertainty can reduce participants’ use of social category information, and thus reduce stereotyping, when they make judgments about others (Weary, Jacobson, Edwards, & Tobin, 2001). Yet other research shows that situationally induced uncertainty can reduce source effects on persuasion, reducing source-stereotype-consistent judgments (Tiedens & Linton, 2001). These findings seemingly contradict data showing increased intolerance for others when uncertainty is induced (van den Bos, Euwema, Poortvliet, & Maas, 2007), or increased religiosity (Wichman, 2010) when uncertainty is induced. Uncertainty, from an intuitive perspective, should reduce intolerance, and possibly reduce religiosity, not increase it.

Fortunately, recent research suggests an answer to this contradiction. When uncertainty is situationally induced, people seem to show compensatory responses to the extent that uncertainty threatens, or signals frustration with, their currently active goals (Nash, McGregor, & Prentice, 2011). In much of the previous research showing increased processing or reduced reliance on stereotypes when uncertainty is active, the uncertainty may not have frustrated an active goal. For instance, in work demonstrating how uncertainty reduces reliance on source stereotypes for persuasion (Tiedens & Linton, 2001), uncertainty was induced by evoking emotions.
This type of uncertainty did not obviously threaten participants’ active goals.

In work by Weary and colleagues (2001), uncertainty about the causes of events may have been perceived as more threatening, but participants may have been able to access and then apply stored uncertainty-coping action plans and thus avoided compensatory responding. The best-studied action plan in response to uncertainty about the causes of events is increased processing in the service of attaining judgment accuracy (see Weary, Tobin, & Edwards, 2010 for a review). Therefore, previous research may not have shown uncertainty to increase stereotyping due to factors such as the uncertainty not being threatening to active goals (e.g., Tiedens & Linton, 2001), or habitual increased processing triggered in conjunction with uncertainty about the causes of events. If uncertainty was seen as a threat to active goals, or if uncertainty was activated in a context that did not make increased processing action plans accessible (or applicable; cf. Higgins & Brendl, 1995), uncertainty might no longer be associated with reduced stereotyping. In fact, uncertainty might trigger compensatory responses such as those discussed above when it is seen as a signal of a frustrated goal.

Responses to goal frustration always are a joint function of the person and situation, which can both either amplify or attenuate responses. The individual difference of personal need for structure (PNS; Neuberg & Newsom, 1993) is one example of a person factor that interacts with situations in affecting judgments and behavior. PNS is a measure of preference for clear structure, order, and certainty in the world. These preferences seem to be more strongly expressed when people are exposed to signals that their goals might be frustrated. For instance, Terror Management Theory researchers have demonstrated that when high PNS individuals are reminded of their mortality (presumably a signal that their goals ultimately will be frustrated), compared with low PNS individuals, high PNS individuals show increased perceptions of meaning in their lives (Vess, Routledge, Landau, & Arndt, 2009), increased preference for interpersonal balance and just-world thinking, but decreased liking for behaviorally inconsistent targets (Landau et al., 2004). Of special interest, a PNS-related variable, Need for Closure (NFC; Kruglanski, Webster, & Klem, 1993), has been shown to interact with reminders of death such that higher NFC, compared with low NFC, is associated with greater (less) liking for stereotype-consistent (inconsistent) targets. Importantly, NFC affected liking this way only under conditions where participants had been reminded of their mortality (Schimel et al., 1999). All of these findings are consistent with need for structure as a person factor that moderates responses to signals that goals may be frustrated.

One way to think about uncertainty is that it can threaten our goals to predict, organize, and control events. Because PNS predicts preference for predictability and order, it is logical to assume that people high, compared with low, in PNS would react more strongly to experiences that threatened their sense of predictability, certainty, or control. Uncertainty threat is one such experience. The current study investigated whether uncertainty about the causes of events would cause increased threat responding among higher PNS individuals.

Responses to psychological threat have been examined in many forms. Preference for arguments that do or do not uphold one’s worldview (Lavine, Lodge, & Freitas, 2005), liking for charismatic political candidates (Gillath & Hart, 2010), attitudes toward essay writers who criticize one’s ingroup or not (Arndt, Greenberg, Solomon, Pyszczynski, & Simon, 1997), conviction in important social attitudes (McGregor et al., 2001), reactions to fairness violations (van den Bos, 2001), identification with potentially extremist groups (Hogg, Sherman, Dierselhuis, Maitner, & Moffitt, 2007), and others, all have been examined.

The current research examined how uncertainty threat, in conjunction with PNS, might affect stereotyping. The PNS both allowed for the identification of individuals who should be more threatened by this uncertainty, and suggested how these individuals might react to this psychological threat. As a general hypothesis, people high in PNS under uncertainty were expected to respond by attempting to impose order on their environment, in this case, by stereotyping. People high in PNS should experience the uncertainty threat as more relevant to their desires for order and structure, and might respond by affirming the very desires for order and structure threatened by the uncertainty. More specifically, people higher, as opposed to lower, in PNS were expected to show increased stereotyping under uncertainty, using a measure of implicit stereotyping described below.

Method

Participants completed packets as part of a voluntary class project. Participation was anonymous, and participants were randomly assigned to condition. After first indicating their ethnicity and gender, participants completed a measure of their desire for predictability and order. They then went on to complete either an uncertainty or control induction, followed by a filler task, and ultimately the measure of implicit stereotyping, which they subsequently scored themselves. A debriefing followed.

Materials

PNS scale. The PNS scale (Neuberg & Newsom, 1993) served as an index of participants’ desire for control, predictability, and order (e.g., Moskowitz, 1993). The PNS has 12 items, such as “It upsets me to go into a situation without knowing what I can expect from it.” And “I don’t like situations that are uncertain.” Items were answered on a 1 = strongly disagree to 6 = strongly agree scale. People scoring higher on this scale prefer to organize information in simple ways and are more likely to stereotype than those low on this scale (Neuberg & Newsom, 1993).
**Uncertainty manipulation.** Uncertainty condition participants responded to the following two questions, based on previous work by van den Bos (2001) and Wichman, Brunner, and Weary (2008): “Please briefly describe the thoughts that you have when you are uncertain about why something has happened” and “Please jot down, as specifically as you can, what you think physically and emotionally happens to you when you feel uncertain about why something has happened.” These questions were designed to activate uncertainty about why things happen, and to threaten needs for structure and control as measured by the PNS. Control condition participants answered parallel questions about watching TV.

**Filler task.** All participants completed the PANAS-X affect measure (Watson & Clark, 1994) as a filler task. Previous research has shown that uncertainty effects often occur only once a delay period has passed (e.g., Wichman et al., 2008). The PANAS-X provided for this delay.

**Dependent measure.** Participants completed the stereotypic explanatory bias measure (SEB; Sekaquaptewa, Espinoza, Thompson, Vargas, & von Hippel, 2003) to index implicit stereotyping. The SEB presents participants with African- and European-American stereotype-consistent or stereotype-inconsistent sentence stems. Participants then complete the stem as they wish to make a complete sentence. For instance, an African American stereotype-consistent sentence would be “DeShawn purchased some baggy pants,” whereas a stereotype-inconsistent stem would be “Jamal was the only student who answered the problem.” Stereotypically African American and European American names were counterbalanced across sentence stem type so that in one counterbalance condition, a stem might be African American stereotype consistent, but in the other counterbalance condition, a stereotypic European American name was used to make the sentence appear inconsistent with European American stereotypes. A number of neutral filler items were included to reduce suspicion as to the nature of the task (see Appendix A for the sentence stems used in this task).

To the extent that participants endorse stereotypes as a way to make sense of the world, stereotype-inconsistent behaviors described in sentence stems should elicit explanations. According to Sekaquaptewa et al. (2003), the explanatory bias occurs when participants are more likely to explain stereotype-inconsistent behaviors than they are to explain stereotype-consistent behaviors (see also Hastie, 1984). Therefore, a response to the above sentence about DeShawn’s pants reading, “and went out with his friends” (no explanation of a stereotype-consistent behavior), and completing the sentence about Jamal with “because he had taken advantage of tutoring help” (explanation of a stereotype-inconsistent behavior) would be interpreted as stereotyping. The SEB measure is scored by counting the number of explanatory versus nonexplanatory sentence completions for stereotype-consistent and -inconsistent behaviors, then subtracting the number of stereotype-consistent behaviors explained from the number of stereotype-inconsistent behaviors explained (see Sekaquaptewa et al., 2003; Sekaquaptewa & Espinoza, 2004, for greater detail on scoring the SEB). To the extent that participants explain stereotype-inconsistent behaviors, but do not explain stereotype-consistent behaviors, this is interpreted as stereotyping (Sekaquaptewa et al., 2003). Previous research shows that participants showing stronger SEB ask more stereotypic questions when interacting with an out-group member (Sekaquaptewa et al., 2003). The SEB is thus a measure of the extent to which people use stereotypes to interpret their world. Explanations in the SEB are an indicator of the perceived inadequacy of the preferred, stereotype-driven, processing style, and thus are thought to reflect stereotype usage. As might be expected for a stereotyping measure, research shows that the SEB predicts discrimination when participants are interacting with an out-group member (Sekaquaptewa et al., 2003).

After completing the sentences, participants were asked to indicate for each sentence completion whether it in some way explained why the behavior described in the sentence stem occurred (see Appendix B for these instructions). Participants’ ratings then were used to compute SEB scores, as described below.

**Results**

A total of 75 participants (61 female) completed the experimental materials anonymously and voluntarily. Of the 75 participants, 53 were European American, 14 were African American, 5 were Hispanic American, and 2 were Asian American. Previous research shows that the SEB is more sensitive to stereotyping when targets are low-status group members, as opposed to high-status group members (Sekaquaptewa & Espinoza, 2004). To capitalize on this sensitivity and to avoid difficulties with the smaller samples of non-European Americans, analyses focused on the responses of the higher (in the United States) group status European Americans.

To begin, PNS items were rescored and averaged so that higher scores indicated greater need for structure (Cronbach’s $\alpha = .87$). The PANAS-X (Watson & Clark, 1994) filler task was examined next. Uncertainty induction condition had no effect on general negative or general positive affect (respectively Cronbach’s $\alpha = .78$ and .67). $t_{\text{PosPANAS}}(1, 52) = 1.34, p = .19$; $t_{\text{NegPANAS}}(1, 52) = 1.57, p = .12$.

The SEB was scored by using participants’ ratings of whether their sentence completions were explanations of the behavior described in the sentence stem. As in previous research (e.g., Sekaquaptewa et al., 2003), two SEB scores were computed for each person. SEB scores for African American and European American targets were separately created by subtracting for each ethnic group the number of explanations for stereotype-consistent behaviors from the number of explanations for stereotype-inconsistent behaviors.
Higher values on the SEB score therefore meant higher levels of implicit stereotyping (SEB_{BlackTarget} M = 0.15, range = −4 to +4; SEB_{WhiteTarget} M = −0.22, range = −4 to +2). These two SEB scores then were checked to see if they differed across counterbalancing condition. As expected, counterbalancing of stereotypically African- and European American names had no effect on SEB scores, $t_{BlackSEB}$ (1, 52) = −1.20, $p = .24$; $t_{WhiteSEB}$ (1, 52) = −0.95, $p = .35$. Counterbalance condition was not further considered as a factor.

To investigate the main hypothesis, PNS scores first were standardized, and uncertainty condition was dummy coded (uncertainty was the comparison condition, coded 0). SEB scores then separately were regressed onto these variables and their interaction. For African American targets, this analysis showed a PNS by uncertainty interaction, $\beta = −1.09$, $t (1,49) = −3.48$, $p = .001$, $\eta^2_{partial} = .17$. This interaction was plotted at ±1 SD on the PNS distribution (cf. Aiken & West, 1991) and is depicted in Figure 1. Simple slopes tests (Aiken & West, 1991) showed that whereas PNS was nonsignificantly negatively associated with stereotyping in general ($\eta^2_{partial} = .17$, it positively and significantly predicted SEB scores for Black targets in the control condition, $\beta = −0.45$, $t (1,49) = −1.69$, $p = .10$, $\eta^2_{partial} = .17$, it positively and significantly predicted SEB for Black targets in the uncertainty condition, $\beta = 0.639$, $t (1,49) = 2.92$, $p = .005$, $\eta^2_{partial} = .15$. Furthermore, whereas uncertainty condition had no significant effects for participants low in PNS, $\beta = 0.507$, $t (1,49) = 1.05$, $p = .30$, $\eta^2_{partial} = .02$, as PNS scores increased to +1 SD, the uncertainty induction as compared with the control group showed greater implicit stereotyping, $\beta = −1.68$, $t (1,49) = −3.48$, $p = .001$, $\eta^2_{partial} = .20$.

This finding that uncertainty increased explanations relatively more for stereotype-inconsistent than stereotype-consistent sentences shows that uncertainty in this case does not simply increase people’s tendency to explain events. Instead, uncertainty in this case specifically increased explanations when behaviors were stereotype inconsistent, indicating that uncertainty increased the use of stereotype-consistent expectancies for behavior.

SEB scores for European American targets also were coded as described above and regressed onto uncertainty condition, PNS, and their interaction. Unlike SEB scores for African American targets, there were no significant effects for European American SEB scores (all $p$s > .20). Whereas uncertainty threat interacted with PNS to predict increased stereotyping of African American targets, it did not do so for European American targets. This finding is consistent with previous research (e.g., Sekaquaptewa & Espinoza, 2004), but also has some possible implications, which are described below.

### Discussion

These findings provide evidence that uncertainty threats can increase stereotyping. They add to the many effects that previously have been linked to uncertainty threats, and demonstrate how PNS can amplify responses to such threats. When exposed to uncertainty, high PNS individuals explained more counterstereotypic behaviors for stereotypic African American names. This effect was not found for stereotypically European American names.

Although some previous research has found that PNS is positively associated with stereotyping in general (Neuberg & Newsom, 1993), PNS scores in the control condition for African American targets were nonsignificantly negatively associated with stereotyping. This trend was unexpected, but other researchers have discovered a similar trend. Conceptually, consistent with the relationship between PNS and stereotyping under uncertainty threat as reported here, Schimel et al. (1999; Study 5) found that NFC (Kruglanski, Webster, & Klem, 1993) positively predicted liking (dislike) for stereotype-consistent (-inconsistent) targets under psychological threat conditions induced using mortality salience. However, also conceptually consistent with the (nonsignificant) relationship between PNS and stereotyping in the control condition reported here, they found that NFC (nonsignificantly) negatively predicted liking (dislike) for stereotype-consistent (-inconsistent) targets. The meaning of these trends in the control conditions of these studies is unclear, but these trends in no way detract from the essential finding: It appears that uncertainty threats sometimes can cause stereotyping.

One might expect that uncertainty threat, as a threat to prediction and control needs, would increase attempts to explain all types of events and behaviors, rather than only stereotypically inconsistent behaviors performed by outgroup members. The fact that stereotyping under uncertainty...
threat was confined to out-group members suggests some social motivation for this effect.

This finding can be interpreted in a number of ways. One interpretation is that prediction and control needs are especially important when thinking about out-groups, whose behaviors demand explanation so that intergroup relations can function smoothly. This is consistent with evidence showing that we are more likely to remember stereotype-consistent out-group behaviors than we are to remember stereotype-consistent in-group behaviors (Koomen & Dijker, 1997). In this case, stereotype consistency appears to be more important for out-groups than in-groups. Phrased differently, possibly threatening out-groups who behave in stereotype-consistent ways are predictable; stereotype-inconsistent behavior demands explanation if we wish to maintain predictive control.

Another interpretation is that those participants most strongly under psychological threat (those with higher PNS scores) felt the need to adhere to (for them) socially dominant worldviews. These worldviews codify the stigmatization of some out-groups by embedding them in a matrix of stereotypically prescribed behaviors. Stereotype-inconsistent behaviors, then, break free of the matrix and threaten the worldviews that participants normally would rely on to maintain predictive control. This interpretation of the role of uncertainty threat is broadly consistent with Kay and Friesen’s (2011) work on how the status quo of social systems tends to be upheld more strongly under conditions of low personal control. The uncertainty threat used here was designed to challenge prediction and control beliefs, and may have caused increased out-group stereotyping for this reason.

Although these explanations are plausible, work with the SEB has shown that the stereotype explanatory bias is most likely to occur for low-status targets. That is, when targets are described as low status (opposed to high status), SEB scores are higher (Sekaquaptewa & Espinoza, 2004). Uncertainty threat is therefore clearly only one of a number of factors contributing to stereotyping on this measure in this case. Future research might investigate whether uncertainty threats cause differential stereotyping on other measures, such as the implicit association task (Greenwald, McGhee, & Schwartz, 1998). Another avenue for future research could be whether uncertainty threat can even increase stereotype-consistent behavior predictions based on photographs of targets from different groups. In considering what these different groups might be, it could be useful to investigate the generalizability of this effect to other social categories—to religion, gender, and perhaps age.

Along with the other studies demonstrating compensatory responses to uncertainty threat in areas as varied as fairness research (van den Bos, 2001) and in-group bias work (Hogg et al., 2007), these results add to our understanding of the many forms compensatory responses to uncertainty threat can take. They also increase our knowledge of how individual difference factors can operate in conjunction with environmental factors to amplify and channel our responses.

People vary in their needs for structure, predictability, and control. In situations where uncertainty is frequent, such as scientific research, investing, or intergroup conflict, high needs for structure may cause overreliance on established ways of thinking. To the extent to which uncertainty stems from established ways of thinking to begin with, this overreliance may trigger a vicious cycle of ever-more rigid thinking.

There is a need to better understand how cycles like this can be controlled. Some existing work (e.g., Wichman, 2010) provides insight into this, but more work is needed. The present research suggests that low needs for structure may protect against uncertainty that targets our perceptions of being able to predict and structure our worlds. Prediction and control are important motives, but if we care about them too much, we lose our ability to respond flexibly when we are threatened.

Appendix A

SEB Materials

Participants were asked to complete the following materials. Names for stereotype-relevant behaviors were counterbalanced, to create two separate forms. These forms were randomly distributed across conditions and participants. Names in parentheses indicate the name used in the alternate form. The stereotype relevance of each item is given next to the sentence. Participants saw only the sentences, and not these relevance labels.

“Below are sentences that students from previous sessions have written as part of our ongoing study. We want you to respond to these sentences as part of our ongoing study on student life. As part of a new procedure, we would like you to respond to what the previous students wrote by continuing the sentences with whatever occurs to you first. That is, just pick up where the previous students left off and finish the sentence. You can add on anything you like so long as it forms a grammatically correct sentence.”
Appendix B

Instructions for Self-Rating of SEB Sentence Completions

Please go back to the sentences you completed earlier. You could have completed these sentences in any way you chose.

Go back to the sentences and place an “E” next to each sentence that has a completion that explains what the main character did.

For instance,
Brandon easily made the basketball team “because he practiced a lot.” is an explanation of why he made the basketball team.

Please go back and put an “E” in capital letters next to each sentence that you think you completed in a way that explains the actions of the subject in the first portion of the sentence that was already printed when you filled out this packet. We are interested in what you think your explanations are. Do not worry too much about being “correct.” If you think your sentence ending explains why the first portion of the sentence happened, please put an “E” next to that sentence. Thanks.

Appendix A (continued)

Neutral  1. Stephen changed the flashlight battery
Black Stereotype  2. Brandon (Devon) easily made the basketball team
White Stereotype  3. Devon (Brandon) used the computer
Black Stereotype  4. Lamont (Andrew) danced in the classroom
Neutral  5. Manuel watched the TV news
Black Stereotype  6. Malik (Andrew) received a C+ on the exam
White Stereotype  7. Andrew (Malik) did well on the SAT
Neutral  8. Kuzu opened the package
White Stereotype  9. Jamal (Justin) was the only student who answered the problem
White Stereotype  10. Justin (Jamal) worked late into the night on statistics homework
Neutral  11. Jerome caught a bad cold
Black Stereotype  12. DeShawn (Mathew) purchased some baggy pants
Neutral  13. Hank paid for the book
Neutral  14. Juan went to Florida on Spring Break
White Stereotype  15. Matthew (DeShawn) hung out in the library
Neutral  16. Darnell walked down the street
Neutral  17. Theo gave a birthday present to a friend
Black Stereotype  18. Josh (Lavon) wore three gold chains
Neutral  19. Greg read the newspaper
White Stereotype  20. Lavon (Nathan) stayed after class to discuss a question with the professor
Neutral  21. Todd gave the dog a bath
Black Stereotype  22. Nathan (Lavon) tackled the quarterback

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