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Anxiety between personality and cognition: The gray zone

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A B S T R A C T

The aim of the study was to explore relations between Gray’s revised Reinforcement Sensitivity Theory (rRST) systems (Behavior Inhibition, Behavior Activation and Fight/Flight/Freeze System – BIS, BAS and FFFS) and two cognitive vulnerabilities to anxiety disorders (Intolerance of Uncertainty – IU and Anxiety Sensitivity – AS). The sample comprised 223 participants. The results suggested that BIS was a significant predictor of all components of the anxiety vulnerability measures. However, Freeze and Flight had also significant contributions, particularly in explaining vulnerabilities to physical and social threats as well as inhibitory behaviours while facing uncertainty. The findings provide insights into the nature of AS and IU which is in accordance with the rRST.

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1. Introduction

Current views on etiology of anxiety disorders emphasize different biological, environmental, and psychological risk factors (Antony & Stein, 2009). However, a lack of effort to integrate different schools/approaches into a common frame of reference seems to be a crucial obstacle to broadening our understanding of etiological factors. Examples of such independent approaches are psycho-biological orientation in the field of personality (e.g., Gray, 1982), and the cognitive perspective in psychopathology (e.g., Reiss & McNally, 1985). On the basis of several lines of evidence, Gray (1982) in the Reinforcement Sensitivity Theory has proposed that anxiety is an innate system that controls behavior in the face of a potential threat. After a major revision of the theory, Gray and McNaughton (2003) have made a clear distinction between behaviors that are associated with anxiety and behaviors associated with the emotion of fear.

According to the rRST, BIS is a reactive system underlying behavior related to potential threat and risk-assessment. BIS is also responsible for detection of conflict between two aversive or two appetitive stimuli (Corr, 2009). There is an abundant literature that relates BIS and anxiety (e.g., Beevers & Meyer, 2002), and BIS and anxiety symptoms and disorders (e.g., Maack, Tull, & Gratz, 2012a, 2012b). BAS is a motivational system which promotes active and explorative behavior. It is activated by signals of reward and all appetitive stimuli, conditioned and unconditioned (Corr, 2009). BAS may have a certain role in shaping both anxiety- and fear-related reactions (Kimbrel, 2008). FFFS is a reactive system that underlies behavior connected to perceived actual threat and is related to the emotion of fear (Eilam, 2005; Perkins, Kemp, & Corr, 2007). Possible reactions to sudden threats, depending on proximity of these threats, may be fighting, fleeing, or freezing. Fight occurs when the threat is far enough that it can be avoided (Corr, 2009). Freeze is activated when a danger is so close that an organism sees no way out of the situation, with the resultant emotion of panic. Fight is triggered in the encounter with the immediate threat that is so close that no other reaction is possible.

Much of the past research regarding Gray’s systems was fraught with difficulties in distinguishing their relative contributions given the fact that the available scales were not discriminating between BIS and FFFS (Maack et al., 2012a). However, it is important to note that BIS and FFFS are not entirely independent systems. Recent findings indicate that it is difficult to make a clear distinction between BIS, Flight and Freeze concerning their biological bases, affective, and behavioral manifestations (Smederevac, Mitrović, Čolović, & Nikolašević, 2014). Others also noted that it is possible that a certain level of association between the fear and anxiety systems is unavoidable (Jackson, 2009). For example, both BIS and FFFS were related to test anxiety, with FFFS having a greater contribution in accounting for the test anxiety variance (Nob, 2013). Difficulties in distinguishing these systems are reflected in the current and previous classifications of mental disorders, in which anxiety/fear-related syndromes are classified as anxiety disorders. Also, comorbidity between anxiety, panic disorder and specific
phobias is common (Alpers, 2009), making it difficult to measure their indicators by questionnaires.

Another line of research regarding fear, anxiety, and their disorders follows the cognitivist perspective on emotions. Two cognitive constructs that received a lot of attention in examining risk factors for emotional disorders are Anxiety Sensitivity (AS) and Intolerance of Uncertainty (IU). AS is defined as a fear of anxiety symptoms and their consequences, which is based on a set of beliefs about catastrophic ends of various somatic symptoms of anxiety, cognitions accompanying anxiety states, or publicly observed anxiety symptoms (Lewis et al., 2010). Currently, it is accepted that AS has a hierarchical structure with one higher-order factor subsuming three lower-order factors: concerns about physical symptoms, concerns about mental incapacitation, and social concerns (Rodriguez, Bruce, Pagano, Spencer, & Keller, 2004).

Intolerance of Uncertainty (IU) implies cognitive, emotional, and behavioral reactions to negative beliefs about uncertainty and its implications (Dugas & Robichaud, 2007). Prospective Anxiety, anxiety about future uncertain events, and Inhibitory Anxiety, describing inhibitory effects of uncertainty on action and experience, are two facets of IU, reliably replicated across studies (Birrell, Meares, Wilkinson, & Freeston, 2011). Both AS and IU are related to a large number of anxiety disorders and depression (e.g., Buhr & Dugas, 2006; McEvoy & Mahoney, 2012; see also Naragon-Gainey, 2010, for a review).

There is a paucity of research examining the relation between AS and IU. Both constructs seem to share the intolerance of unknown, but in the case of AS this intolerance is related to the uncertain meaning of physiological, social and cognitive features characteristic of anxiety states (Carleton, Sharpe, & Asmundson, 2007). However, there are still some uncertainties regarding their nature and etiology. For example, Reiss and McNally (1985) indicated Anxiety Sensitivity (AS) as one of four fundamental fears because there is an identifiable threat or stimulus, such as various manifestations of anxiety, which is followed by the uncertainty regarding its consequences (Carleton et al., 2007). Hence, in terms of rRST, cognitions that are seen in individuals high in AS could be a reflection of activation of both BIS (underlying uncertainty) and FFFS (presence of the real threat). An involvement of BIS in cognitive manifestations of AS can also be inferred from the two lines of research examining the links between AS and neuroticism, on one hand, and neuroticism and BIS, on the other. Correlations between AS and neuroticism range from .30 to .50 (e.g., Lilienfeld, 1999). At the same time, a number of mood induction studies suggest that BIS and neuroticism measures seem to be similar (Gomez & Cooper, 2008). Similarly, the nature of the two subcomponents of IU is still not clearly understood, partly due to the relative recency of this construct. Uncertainty inhibition or paralysis captured by Inhibitory Anxiety might reflect either passive avoidance (BIS) or the Freeze component of FFFS.

The issue of relations between BAS and anxiety is still unresolved. A number of studies report that anxiety disorders are largely unrelated to BAS sensitivity (e.g., Kimbrel, Mitchell, & Nelson-Gray, 2010), but several of them suggest an association between BAS and anxiety (e.g., Pawluk & Koern er, 2013). Therefore, the role of BAS in anxiety vulnerabilities needs further research.

Hence, a greater understanding of the nature of AS and IU can be achieved by relating them to the constructs of rRST. The principal aim of this study is to examine the relations between AS, IU, and the dimensions of rRST. The specific role that AS and IU play in the explanation of anxiety suggests that the contribution of BIS should be the most important for all AS and IU dimensions. Besides BIS, a specific contribution of FFFS dimensions to the explanation of AS and IU can be expected because both constructs seem to be related to different classes of stimuli. Inhibitory Anxiety refers to inhibitory effects of uncertainty on behavior and experience. Therefore, Freeze, and possibly Flight, may be significant predictors of this IU dimension, besides the BIS. On the other hand, AS may be related to FFFS, particularly to Freeze, because the freezing system can contribute to the shaping of inhibitory behavior, which is primarily determined by BIS. BAS and Fight are the least expected to explain IU, because BAS was usually, but not necessarily, unrelated to anxiety disorders (Pawluk & Koerner, 2013).

2. Method

2.1. Participants

Two hundred and twenty-three adults (131 female), participated in the research, after providing informed consent. 24.2% were undergraduates enrolled at the University of Novi Sad, Serbia. The remaining participants, who also volunteered for the study, were adults recruited via the “snowball” strategy whereby the students were asked to recruit further participants. 70% of them had high-school education or higher. The mean sample age was 30.94 years (SD = 10.92).

2.2. Measures

All measures were administered in Serbian.

The Reinforcement Sensitivity Questionnaire (RSQ: Smederevac et al., 2014) was applied as a measure of rRST constructs. The questionnaire contains 29 items, grouped in five subscales: BAS, BIS, Fight, Flight, and Freeze. Discriminating between the rRST systems was one of the primary goals in construction of the RSQ. Recent findings confirm that moderate correlations between these systems are stable across different samples of participants (Mitrović, Nikošević, Smederevac, & Ćolić, 2012; Mitrović, Smederevac, Ćolić, Kodžopelić, & Đinić, 2014). Participants respond to items on a four-point Likert scale, ranging from “completely disagree” to “completely agree”. Internal consistency estimates for RSQ subscales in the current study ranged from .73 to .76.

The Anxiety Sensitivity Index-3 (ASI-3; Taylor et al., 2007; Serbian translation: Mihić, Ćolović, Jokić-Begić, & Lauri-Korajlija, 2013) is a measure of beliefs regarding catastrophic consequences of symptoms associated with anxious arousal. ASI-3 contains 18 items and comprises three subscales: social evaluate concerns (ASI-Social Concerns), fear of physical symptoms (ASI-Physical Concerns), and fear of cognitive dyscontrol (ASI-Cognitive Concerns). The items are rated on a five-point scale, ranging from “very little” to “very much”. Internal consistency estimates for the subscales in the current study ranged from adequate to good (.79, .81, and .88, respectively).

The Intolerance of Uncertainty Scale (IUS; Freeston, Rheuma, et al., 1994; Serbian translation: Mihić, Sokić, Samac, & Ignjatović, 2014) is a 27-item scale with a five-point scale, ranging from “not at all characteristic of me” to “entirely characteristic of me”. Factor analytic studies of the scale found consistently two factors: Prospective Anxiety, reflecting active seeking of certainty, and Inhibitory Anxiety, tapping paralyzing, distressing, and endangering aspects of uncertainty (Birrell et al., 2011; Mihić et al., 2014). In the current study, the subscales showed very good internal consistency reliabilities (.81 and .95, respectively).

3. Results

Table 1 provides means (M), standard deviations (SD) and Pearson’s product-moment correlations for all study variables. Univariate skewness and kurtosis had acceptable values. Missing values were estimated using the EM algorithm (Tabachnick & Fidel,
Tolerance values ranged from .49 to .80 (VIF values 1.25–2.03), suggesting no serious threat of multicollinearity. The overall pattern of inter-correlations was consistent with the expectations about the relations between the RSQ subscales and the measures of AS and IU. All RSQ subscales, except Fight, had significant relations with the measures of AS and IU.

Five hierarchical regression analyses were conducted to determine how much of the variance in the ASI-3 and IUS subscales was explained by the dimensions of the RSQ (Table 2). Predictors were entered in the following steps: Step 1 – BAS; Step 2 – Fight, Flight, and Freeze; Step 3 – BIS. Since the role of BAS in prediction of vulnerability to anxiety needs clarification, BAS scores were entered first. In order to examine the independent contribution of FFFS in explanation of the various forms of cognitive vulnerability to anxiety, Fight, Flight and Freeze scores were entered in the second step. Given the possibility that different anxious reactions can be provoked by a variety of stimuli, with which a person may have prior experience of fear, we supposed that FFFS could have significant influence on vulnerability to anxiety. Nevertheless, the expectation was that BIS would be the most significant dimension in explaining reactions to potential threat tapped by the ASI-3 and IUS items. Therefore, BIS was included as a predictor in the third step. Due to high autocorrelations observed for the IUS models (Durbin–Watson indexes 1.21 and .38), the estimator of Newey and West (1987), according to Zeileis’ (2004) suggestions, was employed.

Table 2 shows that all five regression models were significant. BIS was a significant predictor of all three ASI-3 subscales as well as both Inhibitory and Prospective Anxiety. In the third step, Freeze was a significant predictor of ASI-Physical Concerns and Inhibitory Anxiety, whereas Fight was a significant predictor of ASI-Social Concerns only. In the second step, Freeze predicted significantly ASI-Social Concerns and ASI-Cognitive Concerns, but its contribution was lost in the third step, when BIS was entered in the model. In the first and second steps, BAS emerged as a significant predictor of Inhibitory Anxiety, but its contribution was also lost in the third step. Fight did not contribute to prediction of any cognitive vulnerability construct.

### 4. Discussion

Cognitive vulnerabilities for anxiety disorders reflect differences in cognitive styles and/or a presence of biased sets of beliefs, leading to specific reactions to potentially threatening stimuli. On the other hand, rRST has shed light on fundamental differences

<table>
<thead>
<tr>
<th>Variable</th>
<th>ASI-Physical Concerns</th>
<th>ASI-Social Concerns</th>
<th>ASI-Cognitive Concerns</th>
<th>Inhibitory Anxiety</th>
<th>Prospective Anxiety</th>
</tr>
</thead>
<tbody>
<tr>
<td>BAS</td>
<td>( b = -.13, t = -1.93 )</td>
<td>( b = -.11, t = -1.58 )</td>
<td>( b = -.07, t = -1.02 )</td>
<td>( b = -.22, t = -3.33^{**} )</td>
<td>( b = -.04, t = -0.57 )</td>
</tr>
<tr>
<td>Adjusted ( R^2 )</td>
<td>( .01 )</td>
<td>( .01 )</td>
<td>( .00 )</td>
<td>( .00 )</td>
<td>( .00 )</td>
</tr>
<tr>
<td>( R^2 \text{change} )</td>
<td>( .02 )</td>
<td>( .01 )</td>
<td>( .00 )</td>
<td>( .00 )</td>
<td>( .00 )</td>
</tr>
<tr>
<td>Step 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAS</td>
<td>( b = -.06, t = -0.90 )</td>
<td>( b = -.08, t = -1.14 )</td>
<td>( b = -.03, t = -0.44 )</td>
<td>( b = -.16, t = -2.29^{**} )</td>
<td>( b = -.03, t = -0.38 )</td>
</tr>
<tr>
<td>Adjusted ( R^2 )</td>
<td>( .12 )</td>
<td>( .15 )</td>
<td>( .09 )</td>
<td>( .05 )</td>
<td>( .09 )</td>
</tr>
<tr>
<td>( R^2 \text{change} )</td>
<td>( .12 )</td>
<td>( .16 )</td>
<td>( .06 )</td>
<td>( .07 )</td>
<td>( .08 )</td>
</tr>
<tr>
<td>Step 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAS</td>
<td>( b = -.03, t = -0.35 )</td>
<td>( b = -.01, t = -0.08 )</td>
<td>( b = .03, t = -0.44 )</td>
<td>( b = -.03, t = -0.41 )</td>
<td>( b = .09, t = 1.39 )</td>
</tr>
<tr>
<td>Adjusted ( R^2 )</td>
<td>( .18 )</td>
<td>( .20 )</td>
<td>( .05 )</td>
<td>( .01 )</td>
<td>( .02 )</td>
</tr>
<tr>
<td>( R^2 \text{change} )</td>
<td>( .18 )</td>
<td>( .20 )</td>
<td>( .17 )</td>
<td>( .02 )</td>
<td>( .00 )</td>
</tr>
</tbody>
</table>

Note: \( p < .05 \) \( ** p < .01 \). Correlations corrected for multiple comparisons using “holm” method.
in the reactions of an organism to potential and actual threats, which led to a distinction between anxiety and fear (Gray & McNaughton, 2003). The most important question in this article was whether the dimensions of rRST could predict different AS and IU dimensions in order to detect subtle differences and similarities between various cognitive constructs.

The results showed that for the AS dimensions, BIS and Freeze were significant predictors of ASI-Physical Concerns, BIS and Flight explained the variance of ASI-Social Concerns, whereas BIS was the only predictor of ASI-Cognitive Concerns, once all predictors were entered. Regarding the IU dimensions, BIS and Freeze were significant predictors of Inhibitory Anxiety whereas BIS was the sole predictor of Prospective Anxiety.

For the three criteria considered in the study, there was a change in significance of the predictors after introduction of BIS in the final step. For ASI-Social Concerns and ASI-Cognitive Concerns, the significant effects of Freeze were lost after controlling for BIS. Although cognitive inefficiency which occurs in demanding situations resembles freezing behavior, the results seem to suggest that such reactions are actually generated by BIS. Therefore, although BIS and Freeze share a substantial amount of variance and may have similar behavioral outcomes, BIS appears to be the primary generator of anxious reactions in high ASI-Cognitive Concerns individuals. For IU-Inhibitory Anxiety, the effect of BAS, which was significant in the first and second step, lost significance after the introduction of BIS. It appears that inhibitory processes require termination of approaching behavior, which is controlled by BAS. Therefore, BIS and BAS have a common variance, which is reflected in a decrease of approaching reactions in anxiety-provoking situations.

The significant contribution of Freeze and BIS to the concerns about physical symptoms of anxiety is in accordance with the fundamental postulates of rRST. ASI-Physical Concerns represents a tendency to interpret various signs of tension as signals of harmful bodily dysfunctions which cannot be escaped. In such situations, Freeze and BIS are activated because freezing behavior may be triggered by the estimation that bodily sensations are not in accordance with the requirements of the situation.

Among the ASI-3 dimensions, contribution of BIS to the prediction of ASI-Social Concerns was the largest. Because BIS is activated in conflicting situations (Cott, 2009), its closest relation to social concerns might suggest that persons scoring high on ASI-Social Concerns have the sharpest approach-avoidance conflict in social situations. Such conflict occurs due to the simultaneous presence of a desire to interact with others and concerns about potential embarrassment (e.g., Kashdan, Elhai, & Breen, 2008). Besides BIS, Flight acted as predictor of ASI-Social Concerns. These results suggest that passive avoidance and escape have also a significant role in explanation of vulnerability to social anxiety.

BIS was the only rRST system related to ASI-Cognitive Concerns. The conflict that activates BIS may arise from an intensive assessment of cognitive capacities to cope with the situation, which can interfere with cognitive functioning in itself. Internal scanning of mental capacities increases self-awareness, which brings to the fore one's poor concentration, absent-mindedness, etc. Research literature suggests that persons prone to anxiety disorders tend to have negative problem-solving orientation (e.g., Dugas, Freeston, & Ladouceur, 1997). Perceptions of compromised cognitive resources, in addition to poor coping abilities can further exaggerate worrying about one's cognitive performance and mental health.

Although BIS was the best predictor of IU, contribution of Freeze was also significant. Both BIS and IU constructs seem to be relevant for information processing biases activated in dangerous or ambiguous situations (Gray & McNaughton, 2003; Kimbrel, Nelson-Gray, & Mitchell, 2012). In our study, Inhibitory Anxiety was related to the tendency to inhibit (Freeze) when confronting uncertain situations, suggesting that some inhibitory behaviours seen in individuals high in IU are due to the Freeze component of FFFS. It is possible that, in this context, FFFS becomes activated because uncertainty itself may be perceived as an unavoidable threat (Epstein, 1972). When internal resources are estimated to be insufficient to cope with such a threat, Freeze generates inhibitory behavior as the only appropriate response to the situation. Hence, our results imply ambiguity can have paralyzing effects, which are probably rooted in freezing reactions.

Similar to ASI-Cognitive Concerns, Prospective Anxiety was significantly predicted only by BIS. This IU dimension is manifested in an ongoing search for new additional information in order to resolve the uncertainty. Sensitive BIS might be responsible for overreactions to unpredictable situations and overfacilitation of preparatory behaviors (e.g., increased arousal and never-ending risk-assessment) (Gomez & Gomez, 2002).

The results of this study suggest that AS and IU dimensions have different patterns of relations with the rRST constructs. It seems that AS and IU share anxiety of the unknown (Carleton et al., 2007), which may be related to the process of scanning the environment in search of signals of danger or conflict, generated by BIS. Also, this study extends previous knowledge by demonstrating that Freeze has an important role in explaining certain aspects of AS and IU. Freeze may be responsible for inhibitory behaviours seen in the individuals who are high on Inhibitory Anxiety and who have heightened concerns about physical sensations of anxiety.

Additionally, AS and IU seem to differ in threat perceptions. ASI-Physical Concerns imply the existence of potentially threatening bodily sensations whereas Inhibitory Anxiety might involve the perception of uncertainty as a real threat. Flight, in addition to BIS, is activated when social situations are perceived not just as uncertain, but threatening. In such cases, it triggers avoidant behavior, which can temporarily reduce tensions. These results are in accordance with the basic assumptions of rRST, which imply that BIS is predominantly concerned with cognitive processing of uncertainty, while Flight and Freeze are responsible for behavioral reactions to an actual danger.

Theoretical and clinical implications of our results are strongly interrelated. They may serve as a basis for a better understanding of vulnerabilities for anxiety disorders, with an emphasis on distinguishing between BIS-related and BIS/FFFS-related vulnerabilities. Both theoretical and clinical implications of our results are in line with the core assumptions of the rRST. Namely, the rRST makes a clear distinction between anxiety and fear, and implies that BIS is associated with generalized anxiety disorder, whereas FFFS underlies phobias and panic disorders (Perkins et al., 2007). Such a distinction may be valuable in further refinement of the cognitive therapeutic approaches. For example, in BIS/FFFS-driven disorders, standard cognitive techniques could be modified to include modification of perceived distance toward threat (Riskind & Williams, 2006). Also, the results raise an intriguing theoretical issue regarding the role of BIS in a wide array of behavioral and emotional reactions. Because the findings confirm the contributions of BIS without the impact of FFFS, but not the other way round, one of the issues worth examining in future studies may be if there is any behavioral output possible without the effect of BIS?

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