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The *strong situation*: A potential impediment to studying the psychobiology and pharmacology of anxiety disorders

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Abstract

The *strong situation*, as formulated by social psychologists, refers to an experimental condition offering unambiguous stimuli predicting or constituting hedonically *strong* events that uniformly guide response sets across individuals. In relation to fear and anxiety, the *strong situation* results from the unambiguous threat of an imminent and dangerous stimulus that evokes the adaptive fear response among anxiety patients and healthy controls alike. The current paper describes evidence that *weakening* the experimental situation through reducing the certainty, temporal proximity, and/or potency of the aversive stimulus may facilitate the emergence of patient–control differences in psychobiological measures of anxious arousal. Additionally, *weak situations* may be useful for testing the clinical utility of anxiolytic agents, given that pharmacological treatments of anxiety disorders are not intended to reduce the adaptive, normative response likely evoked by *strong* threat situations.

Keywords: Anxiety disorders; Fear-induction; Psychophysiology; Psychopharmacology; *Strong situation*

Laboratory-based paradigms of pathological anxiety have often employed highly anxiogenic stressors (e.g., electric shock, painful pressure stimulus) in an effort to elicit anxious states analogous to the intense and often disabling symptoms of anxiety disorders (e.g., Grillon et al., 1994; Orr et al., 1998; Veit et al., 2002). Accumulating evidence, however, suggests that highly anxiogenic stressors may not be optimal for either identifying patient–control differences in anxious reactivity or studying the pharmacology of anxiety disorders. The current paper reviews such evidence and proposes the social psychological concept of the *strong situation* (Ickes, 1982; Mischel, 1977; Monson and Snyder, 1977) as a relevant interpretive framework for these findings.

The *strong situation* refers to an experimental condition providing unambiguous stimuli that reliably predict or constitute hedonically salient events (e.g., events producing significant activation of the appetitive or aversive motivational system) and generally yield uniform reactions, expectancies, and response sets across individuals. By contrast, the *weak situation* constitutes a less-defined event whereby experimental stimuli offer less-predictive information and/or cue hedonic events of lower salience or imminence.

Although *strong situations* are useful when effects of an experimental condition are of central interest and individual differences are a source of noise, *weak situations* attenuate the influence of the situation and increase the variance in response measures resulting from individual differences (Snyder and Ickes, 1985). For example, in the personality literature, introverted versus extroverted dispositions have little effect on social behavior between a subject and two confederates in the laboratory setting when confederates are instructed to act extremely friendly or unfriendly. In contrast, effects of the introversion–extroversion dimension of personality are enhanced when confederates are instructed to display a moderate level of receptivity to social interactions initiated by the subject (Monson et al., 1982). In this study, confederates displaying extremely high or low affability created situations with *strong* hedonic/motivational pull towards extraverted and introverted social behavior, respectively, and individual differences in introversion–extroversion were amplified as the hedonic/motivational pull of the situation was *weakened* by confederates interacting in a more neutral manner.

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1. *Strong situations* versus ceiling effects

Importantly, *strong situations* do not necessarily produce *ceiling effects*, as the characteristic outcome of the *strong situation* is the absence or near absence of individual variation whether the uniform response is low, medium, or maximal (i.e., at ceiling). This point is illustrated by theorists viewing behavioral invariance across individuals from a role theory perspective (e.g., Alexander and Knight, 1971; Touhey, 1974). These authors attribute uniformity of behavior to situational cues that clearly indicate the most socially desirable and situationally appropriate role to be played by an individual. Stopping at a red light is an example of a *strong situation* that illustrates this role theory perspective (Mischel, 1977). The uniformity of behavior in this situation is not likely due to ceiling effects of emotional systems across individuals (e.g., maximal fear elicited by the prospect of a motor vehicle accident), but is more likely driven by the availability of unambiguous cues defining the expected, normative mode of responding. This example illustrates that *strong situation*s may operate in the absence of ceiling levels of hedonic responses.

For an additional example, consider results from the earlier discussed study on introversion–extroversion (Monson et al., 1982). In this study, the *strong situation* created by the high and low affability conditions did not lead to maximal levels of extroversion and introversion, respectively, but rather led to non-significant differences in extraverted behavior across those high and low in trait extroversion. More specifically, on a scale of 1–10 where 10 reflected maximal extroversion, the mean experimenter ratings for participants in the high affability condition for extraverts (6.87) and introverts (6.58) were not maximal (i.e., maximal rating = 10) but were not significantly different. Additionally in the low affability condition, mean ratings for extroverts (3.24) and introverts (2.51) were also not maximal (i.e., maximal rating = 1) but were not significantly different. In contrast, mean ratings in the neutral affability condition resulted in a significant group contrast ($p < .001$) with ratings for extroverted participants (6.55) exceeding ratings for introverted participants (4.05). Such results demonstrate that the high and low affability conditions (i.e., *strong situations*) did not elicit ceiling levels of extroversion and introversion, respectively, but rather led to null group differences in gregariousness among those low and high in extroversion.

With regards to fear and anxiety, consider levels of anxiety among graduate school applicants prior to taking the Graduate Record Examination (GRE). Though testees may uniformly display anxious anticipation (i.e., *strong situation*), such anxiety would unlikely reach maximal levels as might be displayed in the face of a life-threatening trauma. Thus, whereas ceiling effects and *strong situations* both produce invariance across individuals, only *strong situations* may do so by eliciting uniform responses that fall below the maximum capacity for the response of interest.

2. Relevance of the *strong situation* to fear and anxiety

Emotion theorists view fear as a basic, survival-relevant emotion (Izard, 1992) motivating protective responses to threat. Thus, anxious reactivity to imminent danger is an adaptive response shared by those with and without an anxiety disorder. Danger cues clearly and reliably predicting imminent exposure to substantially aversive experimental stressors may create a *strong situation* by way of prompting the normative, adaptive fear response in patient and control samples alike. Pathological anxiety/worry, on the other hand, is thought to result from an overestimation of the probability, imminence, or aversiveness of minor or ambiguous threats (Eysenck, 1992; Street and Barlow, 1994) and is not normatively manifested. *Weakening* the experimental situation by reducing the predictive value of the danger cue, increasing the ambiguity of the threat information, and/or lowering the intensity or temporal proximity of the stressor may allow for the emergence of pathological correlates of anxiety produced by the overestimation or *catastrophizing* of such threats on the part of those disposed to clinical anxiety.

In terms of the proposed differential thresholds for threat appraisals among those prone to anxiety (Mogg and Bradley, 1998), *strong* situations may lead to supra-threshold threat appraisals regardless of psychiatric status, whereas less potent threat from *weak situations*, may cross the threshold for those with, but not without, an anxiety disorder. Once the threshold is crossed, however, patients and controls display similar physiological and behavioral changes. These similarities complicate attempts to differentiate normal and pathological anxiety states in humans (Shaffer et al., 1996). Laboratory-based methods providing *weaker* threat situations may allow for the expression of patient–control differences stemming from differential thresholds for threat detection.

3. Examples of *strong situation* effects in the literature on anxiety disorders

In two separate studies by Grillon and colleagues (Grillon et al., 1998; Morgan et al., 1995), low but not high threat experimental conditions elicited differential psychophysiological responding among post-traumatic stress disorder (PTSD) patients and healthy controls. More specifically, PTSD patients versus controls displayed greater anxiety as measured with eyeblink-startle during a period following the placement of shock electrodes when participants were not at risk of receiving a shock (low threat), but no group difference in fear-potentiated startle (FPS) was found to cues signaling the imminent delivery of electric shock presented while shock electrodes remained attached (high threat). Both PTSD patients and healthy controls showed significant FPS to the shock cues presented during the high threat condition. As per the *strong situation* perspective, the intense anxiogenic valence of the high threat condition produced uniform fear responses (startle potentiations) across those with and without PTSD, whereas the low threat condition provided a less anxiogenic, *weaker situation*, allowing for the emergence of individual differences based on diagnostic status.

A similar pattern of results was found in a recent study by Pole et al. (Pole et al., 2003). In this study, police officers with high or low levels of PTSD symptomotology were exposed to low, medium, and high threat of electric shock. In the low threat condition, participants were told they would receive shocks later in the study; in the medium threat condition, participants were fitted with the shock delivering apparatus but were told they would not receive shocks; in the high threat condition, participants continued to wear the shock apparatus and a danger cue communicating imminent shock delivery was presented. The linear increase in the hedonic salience from the low to high threat conditions reflects a corresponding increase in the *strength* of the conditions. As in studies by Grillon and colleagues, psychophysiological correlates of PTSD symptoms were only elicited by the *weaker* relative to *stronger situations*, as skin conductance responses (SCR) and eyeblink-startle magnitudes were associated with PTSD symptoms in the medium but not high threat condition.

Further evidence for the advantage of low versus high threat for the study of anxiety disorders comes from an experiment by Pitman and Orr (1986). In this study, patients with generalized anxiety disorder and healthy controls underwent classical discrimination learning whereby an angry human face was paired with shock (CS+) whereas another angry face was presented unpaired with shock (CS−). Following acquisition, shock electrodes were removed and CS+ and CS− faces were again presented in the absence of any reinforcement (i.e., extinction). Patient and control groups showed equal SCR increases to the CS+ during acquisition when the CS+ cued imminent delivery of electric shocks, and group differences emerged only after electric shocks were no longer possible during the extinction procedure. In other words, anxiety patients relative to healthy controls displayed greater SCRs to the CS+ only following the removal of shock electrodes. Similar to results from Grillon and colleagues (Grillon et al., 1998; Morgan et al., 1995) as well as Pole et al. (2003), acute threat of electric shock elicited equal levels of fear in all subjects and only when the level of threat was lower (due to the absence of threat cues or shock electrodes) did patients and controls display differential psychophysiological responses to threat.

Although results from the above studies support the *strong situation* perspective, such results have not been interpreted within a theoretical framework emphasizing that reducing the potency of experimental stressors is likely to facilitate the emergence of patient–control differences. The contribution of the current paper therefore stems from the application of the *strong situation* framework to interpret the pattern of results produced by this literature.

3.1. Relevance of the strong situation for the pharmacology of pathological anxiety

Consistent with the finding that correlates of pathological anxiety arise during experimental conditions of low but not high threat, benzodiazepines, which effectively treat the pathological symptoms of many anxiety disorders (for a review, see Foa and Kozak, 1985), reduce physiological indices of anxiety to aversive settings where electric shocks will later be delivered (low threat), but have not been found to reduce FPS to threat cues signaling imminent delivery of electric shocks (high threat) in four separate experiments reported by Baas et al. (Baas et al., 2002).

To follow-up on these findings, the effect of the benzodiazepine, alprazolam, on fear-potentiated startle has recently been tested (Grillon et al., in press) using a design developed to experimentally manipulate levels of both phasic fear to an explicit threat cue and sustained anxiety to an unpredictably threatening context (Grillon et al., 2004). Consistent with findings by Baas et al. (2002), results indicate that alprazolam reduces FPS to the threatening context but has no effect on FPS elicited by discrete threat cues (Grillon et al., in press). Given that contextual threat relative to explicitly cued threat involves less well-defined threat cues that offer less-predictive information, contextual threat may be thought of as a *weaker* stressor compared to explicitly cued threat. In turn, these alprazolam findings lend further support for the idea that medications used to treat clinical anxiety reduce anxiety to *weaker* situations (contextual threat) while leaving fear to *stronger* situations unchanged. Preliminary clinical findings, using this same threat paradigm, suggest elevated FPS to contextual but not discretely cued threat among anxiety patients (Lissek et al., 2005). Taken together with the alprazolam findings, these results lend plausibility to the idea that benzodiazepines selectively treat pathological correlates of anxiety (i.e., contextual anxiety) while preserving the more normative fear response to phasic threat cues. Though anti-anxiety agents should be tested within both hedonically *weak* and *strong situations* to comprehensively assess the effects of the compound, efficacy in *weak situations* may be an important indicator of therapeutic utility for the treatment of anxiety disorders.

3.2. Strong situation effects mediated by level of unpredictability and ambiguity

One of the primary attributes of *weak situations* is the presence of relatively ambiguous cues that do not generate uniform responses to stimuli of clear hedonic valence (Snyder and Ickes, 1985). The uncertainty produced by such ambiguity may strengthen the sensitivity of *weak situations* to patient–control differences in threat reactivity, as unpredictable stressors have been theorized as important precursors to pathological anxiety (Barlow, 2000; Grillon, 2002). Preliminary support for this theory is provided by data from an ongoing experiment in our lab in which elevated levels of fear-potentiated startle to unpredictable, but not predictable, threat have been found among those with an anxiety disorder (Lissek et al., 2005). Additional support for this idea comes from studies identifying hyper-reactivity in amygdala-based fear circuits to stimuli communicating threat-related ambiguity (fearful faces: Whalen et al., 2001) among individuals with anxiety disorders (Rauch et al., 2000; Thomas et al., 2001), as well as a recent high-risk study by Pine et al. In this study (Pine

et al., 2005), sensitivity to 5% CO_2 was compared across offspring of parents with panic disorder (high-risk group) and offspring of non-ill parents (control group). Whereas high-risk and control offspring displayed similar elevations in panic symptoms during exposure to 5% CO_2, high-risk offspring reported more symptoms of panic disorder during a 10 min CO_2-free period during which participants were told they could receive CO_2 at any point (i.e., unpredictably). Although adolescents with ongoing anxiety disorders also exhibited enhanced reactions to direct CO_2 exposure, consistent with previous studies in adult patients, the between-group differences elicited by CO_2 were generally smaller than those elicited during room-air breathing when unpredictable CO_2 exposure was anticipated. Such results are consistent with the *strong situation* perspective, as individual differences were best elicited during the unpredictable, anticipatory period that created a *weak situation* by providing only ambiguous, uncertain threat information.

Though threat uncertainty and ambiguity have been proposed to have separable relations to trait anxiety (Chan and Lovibond, 1996), the current paper treats unpredictability and ambiguity as comparable constructs. This position follows from work by Alloy and Tabachnik on individual differences in covariation assessments. Alloy and Tabachnik (1984) argue that in the presence of an objectively consistent contingency between two stimuli (e.g., a CS paired with a US) individuals form fairly uniform, and relatively accurate, perceptions of event relations. On the other hand, when relatively *weak* situational information regarding stimulus contingencies is present, idiosyncratic covariation assessments (or biases) emerge as a function of the individual's prior expectations and personal beliefs regarding relations between the stimuli. Whether the unclear signal value of the CS for predicting the US is due to threat *uncertainty* or threat *ambiguity* the consequences are similar; Individuals are led to rely on their previous experiences and cognitive schemata to interpret the signal value of the CS and in turn, individual differences in fear reactivity emerge based on idiosyncratic interpretations of the uncertain/ambiguous threat. In terms of the *strong situation*, relatively uniform fear responses across individuals are elicited by cues that predictably and unambiguously signal an adverse event (US), and individual differences in threat perception and fear reactions emerge as the relation between CS and US becomes more uncertain or ambiguous.

Though threat uncertainty and threat ambiguity may play similar roles in eliciting individual differences in responses to threat, the two may operate through separable mechanisms. The contribution of uncertainty to clinical anxiety may stem from negative *judgmental biases*, reflecting exaggerated probability and/or cost estimation for uncertain negative events (e.g., how likely are you to be mugged, and how bad would it be?) among those with clinical anxiety (e.g., Foa and Kozak, 1985; Rapee and Heimberg, 1997; Voncken et al., 2003). The contribution of ambiguity, on the other hand, may stem from negative *interpretation biases* reflecting the tendency to interpret ambiguous events as threatening as found among those with social phobia to ambiguous social scenarios (Amir et al., 1998), among those with panic disorder to ambiguous autonomic sensations (Clark et al., 1997; Harvey et al., 1993) and among those with generalized anxiety disorder (Hazlett-Stevens and Borkovec, 2004) and PTSD (Amir et al., 2002) to threat/neutral homographs.

Multiple studies suggest differentially larger anxious reactivity among those with an anxiety disorder to both threat uncertainty (Foa and Kozak, 1985; Rapee and Heimberg, 1997; Voncken et al., 2003) and threat ambiguity (e.g., Amir et al., 1998; Clark et al., 1997; Harvey et al., 1993). Judgmental and interpretation biases are viable mechanisms by which uncertain and ambiguous threat exert such influence on anxious responding. Additionally, this literature bolsters the notion that uncertainty and ambiguity, central features of *weak* situations, promote differential responses across those with and without an anxiety disorder.

3.3. Understanding the strong situation within the defense cascade framework

The defensive cascade in humans (Bradley et al., 2001) denotes a sequence of anxiety-related responses (e.g., phasic changes in skin conductance and heart-rate) that progress as anxious arousal to a threat encounter increases from *pre-encounter* to *post-encounter* (initial orienting to threat) to *overt action* (fight or flight) stages. Autonomically, the pre-encounter stage is characterized by basal levels of heart-rate, and skin conductance; the post-encounter stage is characterized by decreased heart-rate and increased skin conductance; and the overt action stage is characterized by increases in both measures. An example from the literature demonstrating how individual differences may operate within the defense cascade model is a study examining effects of mutilation pictures on cardiac activity across high and low mutilation-fearful participants (Klorman et al., 1977). Results point to tachycardia among those highly fearful of mutilation in the presence of mutilation pictures but bradycardia among those low in mutilation-fear, suggesting that mutilation images elicited the overt action stage in high's but the post-encounter stage in low's. Given that pictures of mutilation (as opposed to actual mutilated bodies) represent only hypothetical threat, such stimuli may function as relatively *weak* stressors allowing for individual differences in mutilation-fear to emerge. The *strong situation* hypothesis would predict that exposure to real mutilated bodies would uniformly elicit the overt action stage across all individuals.

An additional example comes from the literature on attentional bias to threat among those with clinical anxiety (Mogg and Bradley, 1998). In a recent study (Mogg et al., 2004), attentional bias towards angry faces among those with generalized social phobia, relative to healthy controls, was found in the initial 500 ms of face processing. Given that the post-encounter stage is comprised of the initial attentional orienting to a threat stimulus, such results suggest that the angry faces evoked the post-encounter stage in social phobics whereas healthy controls remained in the pre-encounter phase. Again, the difference across patients and controls in this study

may have been facilitated by the relatively *weak* stress induction produced by pictures of angry faces (hypothetical threat). Distinguishing between pathologic and normative fear responses may require *weak*-threat situations that elicit differential stages of the defensive cascade across those with and without an anxiety disorder.

4. Conclusion

In sum, the terms *strong* and *weak situations* offer anxiety researchers a nomenclature for describing the extent to which predicted anxiety patient responses to a given experimental condition are likely to converge on the normative response. Data from studies exploring psychobiological markers of anxiety disorders across anxiogenic situations varying in aversiveness, imminence, and ambiguity (i.e., varying in *strength*) reveal that unambiguous threat of imminent and potent stressors evoke undistinguishable responses among those with and without an anxiety disorder and *weakening* the conditions by reducing the anxiogenic salience of the situation may allow for the emergence of patient–control differences. Furthermore, past findings on the effects of anxiolytics on fear-potentiated startle suggest that benzodiazepines reduce anxiety elicited by *weak* but not *strong* threat situations. This follows logically from the notion that anti-anxiety agents are not intended to reduce adaptive, normative fear responding to genuine, hedonically *strong*, threats of physical harm. It is recommended that anxiety researchers consider the *strength* of their experimental manipulations in the designing stages to ensure the sensitivity of their experiment to individual differences and to increase the likelihood that evoked emotions are relevant to the phenomenology and pharmacology of anxiety disorders.

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