The Operant of Tension

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A description of the covert behavior of muscular tension through a formal theory of learning has never been attempted in psychology, as tension has been attributed instead to obscure S-R mechanisms, or so called 'flight or fight' responses that are independent of learning. These responses are described and modified through the complex metaphors of literal language that are employed in the psychological and psychotherapeutic analysis and treatment of anxiety and tension. An alternative explanation of muscular tension is provided using the data language of operant conditioning rather than literal language. Muscular tension and its sustaining physiological concomitants are demonstrated to co-vary with non-consciously perceived moment to moment variances in response contingencies, and tension is reinforced due its mediation of the experiential avoidance of the pain of perceived loss. It is concluded that tension is an operant behavior that can be consciously or non-consciously perceived, and may be manipulated through testable procedure

Keywords- somatic marker, choice tyranny, behavioral contrast, allostasis, experiential avoidance

Learning and the Non-conscious

In learning theory, fundamental conditioning processes are described through the analysis of fine grain relationships between information and behavior that are not accessible to ordinary experience or awareness. Indeed, almost all learning is non-conscious (Lewicki, 1992, Kihlstrom, 1987, Bargh & Chartrand, 1999), or represents the processing of a wealth of informative detail that is perceived by an individual but yet is not subject to conscious awareness. The conditioning procedures that access and control non-conscious information are described not by literal language, but through conceptual metaphors derived from formal data languages such as classical and operant conditioning. These metaphors can specify or describe fine grain moment to moment co-variances between stimuli and behavior that are difficult or impossible to account through common language. The advantage of these data languages is that they can describe and predict the elementary components of behavior with a simplicity and economy of terms that are easy to communicate and replicate. In addition, complex biological responses may also be dependent upon the perception of these co-variances, and these responses can be described as their indirect products.

For operant conditioning, the processes that underscore the response of muscular tension and the attendant neuro-biological response of anxiety are a case in point. If tension and anxiety are initiated by abstract perceptual elements of experience rather than literal reasoning, then these abstract properties can be described and manipulated without recourse to the complex metaphorical constructions of language. It is proposed that tension and anxiety are due to moment to moment co-variations between subtle features of contingencies that cannot be revealed by common language, but only through empirical investigations that are interpreted by conceptual metaphor that controls *for or limits* language. In other words, a formal and concise data language such as provided in the language of operant conditioning is necessary and sufficient to understand anxiety and suggest procedures for its management and control.

Tension and Anxiety

Anxiety has not been a topic of interest in behavior analysis because anxiety has no essential or non-reducible component (Friman, Hayes, & Wilson, 1996). This conclusion may prove to be premature, as characteristics of decision making and its relationship to anxiety have yet to be systematically examined (Ernst & Paulus, 2005). Indeed, although the somatic components of anxiety are well established (Antony et al. 2001), the process components, or the working interdependencies of the components of anxiety, are not (Marr, 2006). The content of anxiety is broad, and encompasses a wide range of behavioral and physiological events. However, the *causal* or initiating components of anxiety are generally reduced to specific (as in fear) or diffuse stimuli that can reflexively elicit emotional responses that trigger these responses sub-cortically without input from cortically instantiated processes of conditioning (Ledoux, 1997) . This affective primacy reflects a non semantic activation process (Zajonc, 1984). However, this 'low level' pathway for fear and anxiety may not exist or be active among primates or humans (Clore et al., 2005), and semantic processing may consistently precede the retrieval of affect (Storbeck & Robinson, 2004, Storbeck, Robinson & McCourt, 2006). Assuming that the experience of affect necessarily follows the appraisal of information, appraisal may occur because of consciously enabled verbal or rule based declarative reasoning or through nonverbal or nonconscious associative reasoning (Sloman, 1996). If not affective but semantic primacy (Clore & Ortony, 2000) is necessary for the elicitation of affect, then it follows that appraisal must also be necessary for the somatic event of muscular tension, which as a painful or aversive event also represents affect. Tension will be defined as the sustained contraction of small low threshold motor units of the striated musculature (Hagg, 1991), and can be measured directly through EMG (electromyogram) or indirectly through measures of autonomic arousal (e.g., skin conductance response or SCR; galvanic skin response or GSR) elicited by tension. The SCR and GSR are used extensively in bio-feedback relaxation therapies to train muscular relaxation, and are equivalent in effectiveness to procedures such as progressive relaxation and meditation that do not use such feedback devices (Yucha & Gilbert 2004).

If tension is caused by a stimulus like event that bypasses conditioning or learning, then tension must be defined through process components that are indicated by reflexive *homeostatic* mechanisms (e.g. hunger, thirst) that are relatively uninfluenced by information or conditioning. As defined by Berridge (2004), "In behavioral neuroscience of the past 50 years, homeostasis usually means a specific type of regulatory system that uses a built in goal value or set point to maintain a stable physiological state, and physiological mechanisms that activate appropriate responses (e.g. sleep). These responses provide negative feedback that corrects the deficit and brings physiological reality back to the set point." Homeostasis thus is a stimulus-response (S-R) mechanism, that like a thermostat, automatically regulates and restores specific physiological states. In Selye's formulation of stress (1980), the stimulus of demand followed by the response of tension and concurrent autonomic arousal represent an S-R-S mechanism that brings the organism back to a set point of resting homeostasis. However, if tension is initiated by information or appraisal, then it is necessarily modulated by subsequent changes *in* information rather than reflexively moving to a fixed physiological set point of homeostatic rest, and thus is an S-R-S* behavior. That is, it must have the properties of a conditioned response because it is determined by a flexible (S*) rather than a fixed (S) stimulus outcome. Furthermore, since sustained generalized muscular contraction elicits the activation of autonomic processes(e.g. increased hormonal release, blood pressure, heart rate, etc.) that sustain ongoing tension (Gellhorn, 1967, 1972), then those processes must represent *allostatic* processes that are dependent *upon* the behavior of muscular tension. Allostatic events refer to internal changes in the individual that maintain 'stability through change', and represent biological processes that sustain behavior (or in this case behavioral change) and are initiated *by* behavior and its eliciting cognitive demand (Schulkin, 2005). In other words, the principle of allostasis proposes maintenance of stability outside of the normal homeostatic range, where an organism must vary all the parameters of its physiological systems to match them appropriately to chronic demands(Sterling & Eyer, 1988). These processes along with tension will be defined *behaviorally* as anxiety, and conform with the general operationalization (Loewenstein et al., 2001)of anxiety in studies of affect and choice. That is, in contrast to literal definitions of anxiety that may define anxiety independently of or uncertainly related to underlying neuromuscular activity, a behavioral definition of anxiety is always coextensive with specifically defined behavior, thus eliminating the problem of the verifiability of private events (Zuriff, 1985, Lamal, 1998).

Conditioning and Anxiety

From a learning prospective, anxiety has long been interpreted as a conditioned or acquirable response that functions to motivate avoidance responding (Mowrer, 1939, Miller, 1992). Because anxiety was accorded the status of a practically indivisible 'drive', the question of what physiological element of anxiety was subject to conditioning was never posed. But if as other research suggests tension physiologically initiates and is sustained by autonomic arousal, and if arousal cannot occur without tension (McGuigan, 1991) then only tension and *not* arousal could be a conditioned response. This conclusion is of not only of theoretical but practical significance. Specifically, just as it would be a impractical to assume that the rapid heart beat that sustains running is a conditioned response because it would require a too complex integration of different sets of often hidden discriminative stimuli that separately control heart rate, running and their integration, so too would it be impractical to assume that sub-elements of autonomic arousal (which also includes elevated heart rate) that sustains tension are directly or even incidentally controlled through learning. By postulating that only one physiological aspect of anxiety, namely muscular tension, is the primary independent measure of autonomic arousal, then the analysis of anxiety becomes subject to the experimental procedures of behavior analysis, and its study can be greatly simplified and result in testable predictions.

If the hypothesis is made that tension initiates through physiological mechanisms a state of autonomic arousal, then anxiety can be controlled through the simple behavior modification of tension rather than the more complex prospect of separately modifying tension and the myriad somatic elements that comprise arousal. This is exemplified in progressive relaxation techniques (Jacobson, 1970) that focus on learning the proprioceptive stimuli associated with relaxed states as a way to counteract stress. Nonetheless, despite the testable promise of an explanation of tension as a function of experience or learning, a prevailing assumption has been that tension is not a conditioned response, and occurs independently of information denoted by response-outcome or R-S contingencies. Tension and arousal reflect instead a reflexive response to a metaphorical point like stimulus of 'demand'(Selye, 1980), or is an evolutionary determined 'fight or flight' response, or more simply, an S-R response. As an incidental rather than causal component of anxiety, muscular tension was one of a host of somatic events that occurred with near simultaneity as a reaction to a broadly defined stressful stimulus or demand. The appearance of simultaneity was prima facie evidence of a lack of causality, hence tension and anxiety were not subject to information or contingency, and were non-behavioral events that represented the body's reflexive or automatic attempt to return to stability, or homeostasis. Tension represented not a behavior, but an aspect of the cumulative 'wear and tear' on the mind and body due to demand. But the appearance of simultaneity does not logically demonstrate the *fact* of simultaneity, as the operant may simply be hidden from casual observation.

This argument may be illustrated through the consideration of the very perceptible operant of running. Consider an animal chasing after prey. The initiating neuro-biological event of hunger initiates and precedes the emission of the operant of seeking and eating food, which brings the body back to a homeostatic set point of satiation. Alternatively, the repeated flexion of the musculature that occurs while chasing prey elicits an array of somatic behaviors from hormonal release to increased heart rate that stabilize the animal and sustain the altered topography of its behavior, or in other words allow it to keep running. The operant of running is incidental to the homeostatic mechanisms supporting hunger, as hunger occurs no matter what the animal 'does'. On the other hand, running is essential to the occurrence of the allostatic mechanisms that support it, hence the activation of those mechanisms is *dependent upon* the operant. Because the allostatic responses elicited by running are indirectly controlled by running, modifying the response contingencies that necessitate running allow one to control for the painful or pleasurable effects that are concomitant with running. However, if running occurred without the perceptible markers signified by overt movement, then it could easily be conflated with the allostatic responses that mediate it. That is, if the repeated tension and flexion of the striated musculature in running occurred covertly rather than overtly, its influence on behavior would be difficult to ascertain, and would most likely be overlooked. But is this the case with anxiety?

The key question is ultimately what comes first. If tension reliably precedes and causes the somatic responses that comprise anxiety, or in other words if anxiety responses are an example of allostasis rather than homeostasis, then anxiety may be controlled through the simple behavior modification of muscular tension. The questions raised are twofold. One, does substantive research on the biology of anxiety support this position? Secondly, can tension be reliably correlated with specific aspects of response contingencies, and if so, can those contingencies be controlled?

The fact that tension control is key to the management of stress is incontrovertible. Indeed, all remedies for stress from meditation to massage emphasize the dependent measure of muscular relaxation as both necessary and sufficient to eliminating anxiety or stress. Thus, the component neurobiological markers of stress from blood pressure to cortisol return to normal levels with the onset of muscular relaxation, and cannot be reduced independently of muscular relaxation. Furthermore, the argument that muscular tension instigates somatic responses that are subsumed under the label 'anxiety' is amply confirmed in the research literature. It has been repeatedly demonstrated (Gellhorn, 1967, 1972, Jacobson, 1970, Malmo, 1975) that because of a bi-directional connection between the reticular arousal system and muscle efferents, a dramatic decrease or increase in muscle activity throughout the body can respectively stimulate decreases or increases in sympathetic arousal. The behaviorist F. J. McGuigan (1991) took this concept further and speculated that every bodily tension has both meaning and effect. That is, tension occurs because it does something, namely modulating thought, which in turn modulates tension. This presumptive bi-directional link between thought and relaxation is implicit in relaxation protocols such as meditation that induce relaxation by eliminating or parsing thought. Nonetheless, thinking per se has no positive correlation with tension, and indeed can be demonstrated to have a negative correlation with tension. For example, declarative reasoning is enhanced during states of rest (Grecius et al. , 2003, Raichle et al., 2001), thus leading to the opposite conclusion that tension is deleterious to effective thinking. Moreover, proprioceptive feedback from the musculature is not required for problem solving (Taub et al. 1966, Teuber, 1972), and executive attention and conscious feeling are not interdependent but are dissociable events (Naccache et al. 2004). Finally, peripheral feedback does not reliably influence decision making accuracy, and may reflect the end product of decision making rather than a key feature in its development (Dunn et al., 2006). This suggests that tension occurs for reasons apart from enhancing declarative reasoning, and that reasoning or decision making per se does not cause tension. But if tension occurs because of a non-verbal or affective aspect of experience, what is the meaning or function of that experience?

The Functionality of Affect

An emerging consensus in behavioral neuroscience is that affective events are functional events that provide an hedonic valence or value to each successive moment of behavior (Clore et al., 2005) and are in turn modulated *by* the perception of moment to moment changes *in* behavior. Affect thus occurs because it indirectly changes behavior to meet functional ends. Nonetheless, as the experimental literature demonstrates, the molecular or moment to moment value of affect does not necessarily cohere with the rationally appraised molar or overall utility of the individual behaviors that are modulated by affect.

In its rudiments, affect occurs through the very act of deciding between response options, and parallels the ubiquitous unpredictability of the results of choice. In decision making, unpredicted positive or negative changes in the discriminative function of a response will elicit bio-chemical changes in the brain that will accentuate or attenuate attention, increase or decrease the ability to attend and hence the ability to optimize decision, and be subjectively rendered as either painful or pleasurable. The role of unpredicted positive changes in discriminative stimuli is reflected in discrepancy theories of reward or reinforcement (Donahoe & Palmer, 1993, Berridge, 2001) that demonstrate how positive unexpected variances in the functional relationship between behavior and reward co-vary with changes in the activity of dopamine neurons, and code the difference between the expected and actual value of outcomes (Schultz, 1998). Unpredicted negative changes or counterfactual changes in the discriminative function of a stimulus (Camille et al. 2004, Zeelenberg, 1998) perform a similar function by also coding a difference between actual and expected values. Behaviorally, unpredicted positive and negative changes (Shepperd & McNulty, 2002) respectively result in self reports of elation or regret, and the anticipation of discrepant events will also elicit affective responses and corresponding approach or avoidance behavior (Mellers & McGraw, 2001).

The affective events of elation and regret and their respective neurological representation code for the valence or 'goodness' or 'badness' of molecular choices that successively occur during the moment to moment responses that from a molar perspective are required in sum to achieve some discrete result, *but they do not specifically code for the goodness of that end result as otherwise cognitively or rationally determined*, and can have a positive or negative relationship to the normative results of decision making. This is because the affective events that guide molecular choice are dependent upon unpredicted variances of the schedule of reinforcement that are unrelated to the goodness of the response set that is in turn dependent upon logically or cognitively derived measures of utility. Thus, although affect may give value to moment to moment behavior, it may not be coherent with the overall rational value *of* that behavior. For example, a gambler knows full well that the end result of a day spent at the slot machine will almost certainly result in a net loss, yet will find individual pulls on the lever attractive because of the anticipated positive discrepancy of an immediate pay off. The question is whether affective events such as tension and autonomic arousal also code for the goodness of moment to moment as opposed to molar response characteristics. The answer is presently a subject of ongoing debate in behavioral neuroscience, but also appears to be yes.

Damasio's Error

Affective events as mapped to the activity of dopamine systems are teaching signals that determine the relative 'goodness' of individual moment to moment behaviors under a contingency, but these same events cannot determine the goodness of the results of those behaviors when considered as a whole. These affective events correlate with and parallel the somatic event of muscular tension, which is an element of systemic autonomic arousal that has been hypothesized as instrumental in determining the overall goodness of a specific course of action, or in other words cohering with a rationally determined behavioral option. In Antonio Damasio's (1994) widely influential theory of the somatic marker, muscular tension and associated autonomic arousal occur because of previous socialization or learning, and occur prior to the consideration of response options to alert one to or pre-determine the 'goodness' of a particular response set. In other words, tension and arousal allow one to make a proper choice between response options prior to their rational consideration. The somatic marker (Damasio, 1994) "forces attention on the negative outcome to which a given action may lead, and functions as an automated alarm signal which says: Beware of danger ahead if you choose an option that leads to this outcome. The signal may lead you to reject, *immediately*, the negative course of action and thus make you chose among other alternatives. The automated signal protects you against future losses, without further ado, and then allows you to *choose from among further alternatives*. There is still room for using a cost/benefit analysis and proper deductive competence, but only *after* the automated step drastically reduces the number of options." Damasio's somatic marker hypothesis coheres with Easterbrook's (1959) cue utilization hypothesis, which posits that arousal causes a reduction of attention to non-essential environmental cues, but adds to the theory by positing that arousal occurs because of learning or experience.

Although somatic events including tension comprise arousal, Damasio did not specify what sequence of cognitive and somatic events *lead to* arousal (Rolls, 1999). Specifically, the existence and form of non-conscious or pre-conscious cognition (i.e. non-consciously perceived response contingencies) as a precursor to tension was not considered in the somatic marker hypothesis, and tension itself was a-priori assumed to be a non-salient corollary event *to* arousal, ignoring the abundant empirical evidence for tension's role as an initiating cause *for* arousal. Finally, because the use of the SCR as the primary indicator of somatic arousal was used instead of more specific measures of muscular activity such as the EMG (Dunn et al. 2006), Damasio's experiments could not determine the specific role for tension as a prospective initiator of autonomic arousal.

This somatic marker hypothesis derived from a now classic experiment surnamed the Iowa Gambling Task, or IGT (Damasio,1994). As described by Tomb (2002) "A subject was presented with four decks of cards. After turning over a card, participants either win or lose varying amounts of play money. Unknown to the participants, picking from two of the decks ('good' decks) will result in summary gain, whereas picking from the other two decks ('bad' decks) will result in summary loss. The task ends after the selection of the 100^{th} card, when most normal individuals have picked more cards from the good than the bad decks." After several rounds of picking cards, it was found that 'anticipatory' muscular tension and associated arousal, as measured indirectly by the SCR, was significantly higher for bad decks rather than good." Thus arousal acted to non-consciously alert the individual of the bad deck before its 'badness' could be rationally determined.

These experiments demonstrated that human performance on variable ratio or VR schedules of reinforcement (characteristic of variable outcomes implicit during the course of the card game) is consistently marked by measurable fluctuations in skin conductance (Bechara et al., 1997), an indirect indicator of autonomic arousal elicited by the covert behavior represented by the sustained micro-behavioral tensing and flexing of the striated musculature. Specifically, prospective changes in the VR schedule co-vary with an 'anticipatory' skin conductance response (SCR) that occurs prior to or in anticipation of incorrect choices (Bierman et al. 2005), and the magnitude of the SCR co-varies with the importance of the reinforcer (Tomb et al. 2002). For example, for the VR schedule inherent in a gambling task (e.g. choosing cards from a deck, such as in a poker game), the level of the SCR is driven by the amount and likelihood of money to be gained or lost per each turn of the card, regardless of whether the total value of all the cards in the deck is positive or negative.

As indirectly measured by the SCR, tension occurs and co-varies with the moment to moment perception of the size of schedule variances of the deck and the magnitude of the loss those individual variances signify, but *not* the sum of those variances. That is, in contrast to Damasio's hypothesis, tension does *not* co-vary with the overall goodness of the response set under a contingency, but only with the magnitude of the individual variances *within* the contingency. Tension indeed is agnostic to the goodness of overall responding. For example, if a good deck (i.e. summary results of all card turns that result in a net positive gain) contained cards with much a greater variance between individual values than the bad deck, tension and arousal (Tomb et al., 2002) would be more likely to occur while choosing cards from the good deck rather than the bad. In this case, the findings of the IGT experiment as replicated by Tomb are reversed, with tension and arousal signaling a good deck rather than a bad deck!

Finally, tension and arousal may occur when the relative goodness of the decision is already known but not available for conscious or verbal introspection (Maia, 2004). This 'cognitive penetrability' represents a nonconscious or intuitive awareness of the likely good or bad outcome of a card pull. Maia demonstrated in his replication of the IGT experiment that subjects possessed significant knowledge of the relative goodness of response choices prior to choice and prior to the occurrence of somatic arousal. Thus, Maia showed tension and arousal can *follow* the perception of information regarding the relative outcome of a behavior, and not necessarily precede it. Thus the somatic marker does not necessarily predetermine outcomes prior to rational or conscious consideration as Damasio holds, but rather can be interpreted as a *consequence* of non-consciously perceived knowledge.

Behavioral Contrast and Tension

As interpreted by Damasio, the IGT experiment demonstrated that the goodness of patterns of successive decisions (choosing the cards from good card decks vs. bad) can be known in advance of intuitive (i.e. non verbal) or declarative (i.e. verbal) reasoning through the intervention and guidance of the 'alarm bell' of systemic arousal (i.e. the somatic marker). Yet there are many situations when the goodness of a decision clearly can be known not prior to but as a result of intuitive or declarative reasoning, and still be associated with a somatic marker. Specifically, when a survey of a plenitude of choices results in a surprising change of the *relative* or contrasting goodness of a response, regret and tension and associated arousal subsequent to a perception of that information. Thus, tension will occur not only with and in anticipation of a discrepant negative variance while performing under a response contingency, but also concurrently with a discrepant negative variance between alternative schedules of reward, as illustrated by the concept of *behavioral contrast* (Williams, 1997). This occurs when the goodness or badness of a reinforcer is determined through its contrast to other reinforcers or response options that are revealed *subsequent* to choice. In the many situations when a plenitude of options or reinforcers make their goodness difficult or impossible to logically calculate, choosing one option will more likely result in a subsequent interpretation of loss or regret when comparatively better choices are revealed in hindsight. For example, choosing to wait in one check out line among several at a grocery store will result in regret and tension when other lines move faster relative to yours. Similarly, choosing one pair of clothes among a myriad options at a clothing store will more likely result in regret upon the subsequent appraisal of options foregone. This 'tyranny of choice' (Schwartz, 2004) has been repeatedly demonstrated by social psychological observations of the correlation of tension, anxiety, and stress with multiple choices.

Finally, the goodness of alternative reinforcing events may be difficult to calculate not because of the lack of information, but also because their respective values are determined by incommensurable *types* of information whose 'goodness' is assessed in different time scales (Marr, 2006). Behavioral incentives are the product of separate but interactive processes that are different behaviorally and neurologically (Berridge, 2001). Specifically, incentive or value may be rooted to logical principles that map to molar means-end expectancies or response contingencies, or to molecular abstract and analogical principles derived from the affective events that are elicited through the perception of positive or negative discrepant events. Choosing between such rational and affective events will always result in loss because they cannot be logically ordered or compared. That is, from moment to moment, an affective choice may have greater value over a logical alternative, but over time and experience that choice will habituate and the logical choice may become more important, resulting in regret (which also occurs because of an estimation of cumulative or molar behavioral events) over opportunities lost. For example, choosing between raiding the refrigerator and staying with a diet, stopping in a hallway to chat or going about one's business at work, or watching television rather than doing household chores all represent choices between affective and rational choices where we must literally experience or 'live' to regret, creating prospective loss and hence tension regardless of what option is taken.

The conclusion follows that moment to moment 'surprising' or discrepant outcomes, occasioned or represented by variances in primary or alternative (i.e. contrasting) reinforcement schedules that mismatch prediction and outcome because of the quality or type of available information co-vary with neurochemical and neuro-muscular changes that can predict the value or goodness of an individual response, but not a response set. Thus these changes as somatic markers predict not the goodness of molar responses indicative of a particular response set, but rather the goodness of molecular responses that indicate the appropriateness of moment to moment responding. By correlating tension with the discriminative function of negative variances in schedules, the perceptual events or discriminative stimuli that account for tension are empirically described. This is in contrast to Damasio's somatic marker hypothesis, in which no adequate account is given of which perceptual or cognitive stimuli elicit peripheral changes (i.e. tension) that lead in turn to systemic autonomic arousal or emotion (Rolls, 1999), or how such changes may be induced. But as we will see, neurochemical activity may positively or negatively correlate with muscular tension. That is, muscular tension may increase or decrease in tandem with identical neuro-chemical changes, thus leading to the conclusion that the respective 'affective' functionality of neurochemical and neuro-muscular events are not the same.

Experiential Avoidance

In an earlier example, it was postulated that an individual will modulate or change his behavior due to somatic events that are generated by that behavior. Thus a runner will slow down when his muscles ache, or keep up or even quicken the pace when he experiences a 'runner's high' due to the body's natural release of endorphins to relieve pain (Sparling et al., 2004). Assumptions such as these are trivially true, since many behaviors from drinking to eating are modulated due to bodily feedback from satiation to a stomach ache that are perceived as affective events. But overt avoidance and approach behaviors are also mediated by the affective valence of neurochemical events that mark discrepant outcomes for moment to moment responding. We are more inclined to engage in behaviors that are rich in positively discrepant outcomes, and contingencies that are fine tuned to create them through the matching of skill and task such as mountain climbing, creating art, playing games, etc. (Csikszentmihalyi, 1990) are actively pursued because of their affective value, or 'intrinsic' reinforcing properties. This 'flow experience' is characterized by a sense of euphoria and total relaxation (Perry, 1997; Bargdill, 2000) marked by the affective appraisal of continuous positive prediction error, a fact that is neurologically verified by the observed release of the neuromodulator dopamine in events that are characterized as flow producing, such as gaming and creative behavior (Fried et al., 2001, Koepp et al., 1998). On the other hand, we are inclined to avoid behaviors that are equally plentiful in negatively discrepant outcomes, and are quick to avoid painful or 'frustrating' activities where responding is marked by repeated and unexpected failure. Negative variances do elicit neurological changes that are painful (Camille et al., 2004), and presumably by themselves should increase avoidance behaviors, yet the additionally painful event of muscular tension often occurs when these variances are affectively perceived as the emotion of regret. This is in contrast to 'flow' producing contingencies that only produce positive variances and are highly correlated with relaxation. But what decision rule is followed that may predict the occurrence of tension when negative variances are perceived?

The moment to moment functionality (e.g. fine tuning of executive attention as an element of cognition) of affective events as represented by the activity of mid-brain dopamine systems is nativistically and reflexively determined by the element of discrepancy or surprise that is an intrinsic aspect of a discriminative stimulus that has an implicit positive or negative cognitive valence or value to an individual (e.g. a winning or losing spin on a roulette wheel, or a 'eureka' moment in thought). However, if peripheral input is not required for or is deleterious to effective thinking, the moment to moment functionality of somatic responses such as muscular tension must serve another purpose. As common experience suggests, tension occurs when an individual is able but not certain to avoid the loss that occurs when moment to moment behavioral outcomes are surprisingly negative or are anticipated to be negative. But because these outcomes are also represented by and elicit an affective neurological response (i.e. recognizing loss is painful), loss therefore represents not just a cognitive or computational event, but an affective or analogical one as well. That is, it is perhaps not the knowledge of loss that initiates avoidance, but the actual discomfort (e.g. worry, regret) that that information elicits or causes (Borkovec et al. 2004). Similarly, tension also occurs when the discriminative function of a stimulus does not cause affect, and is merely *correlated* with negative affect. For example, to revisit Damasio's gambling experiment, given ongoing experience with the good and bad results of selecting among decks of cards, an individual will experience tension in anticipation of selections from bad decks that will elicit the discomfort of regret. Yet, if all the cards were dealt face up for an entirely neutral deck (i.e. cards that have no inherently bad or good discriminative function) , and with the subject possessing full knowledge of what card will come next, the pairing of a specific card with a noxious stimulus (e.g. a very mild shock) would also cause an individual to feel tense in anticipation of that event. In this case, tension could not somatically mark decision because information about the response contingency was fully known, and more likely mediates the avoidance of choice rather than enhancing the ability to choose.

Finally, the correlating event of tension in turn mediates avoidance because it is also painful. Pain interrupts and redirects attention, and imposes a new action priority to escape (Eccleston & Crombez, 1999), and it follows that the pain of tension serves the same function. Like an individual becoming apprehensive or tense in anticipation of the discomfort of a day at the dentist or at the gym, the discomfort of tension also attends the anticipated discomfort of regret. Similarly, the occurrence of tension in anticipation of painful events, whether neurological or physiological in origin, will be mitigated or disappear when avoidance is not possible. Thus, a individual will be less anxious if he cannot avoid the inevitability of a dental exam or a day of lifting weights, or a student who is experiencing test anxiety becomes less anxious if avoidance is eliminated through a 'time out' (Gresham & Kern, 2004) that extinguishes tension by reducing the prospect of avoiding prospective loss. Although the student may still experience loss and the regret it entails, muscular tension will not occur because it cannot be reinforced. Similarly, individuals who perceive the moment to moment uncertainty that they will suffer a significant loss of life or property (e.g. a hurricane or disease) will feel tense when there is still a prospect that the loss will be avoided, and merely regretful or depressed when they know it cannot.

For any decision, there is always the loss of the opportunity to do something else. For predictable and unavoidable losses that reflect decisions that we could not have avoided or would never have chosen (e.g. death and taxes), tension and regret do not occur. Thus, we do not become anxious or regretful because these losses are unavoidable or inevitable. On the other hand, unpredictable or regretful losses or the anticipation of possible loss and regret will always correlate with tension *if* the decisions that lead to them can be altered or avoided. It is thus hypothesized that *the somatic event of tension occurs not to modulate the effectiveness of decisions, but to increase the speed and likelihood of our avoidance of the perceived moment to moment loss due to present or anticipated (but not certain) negative information perceived in the process of making a choice and the pain that information will entail*. This may be done through the alteration or outright avoidance of that behavior (whether exercised through an overt change in behavior or covertly through rumination regarding other response options or 'worry'), or through parsing behavior by completing that behavior more rapidly. As peripheral feedback, generalized muscular tension has no functional role in increasing the efficacy of decision making, or is merely 'noise' (Rolls, 1999), yet Rolls' position that tension merely prepares an organism for 'action' must be altered, as tension does not merely prepare an organism for action, it *is* action. Because tension is painful or uncomfortable, tension *acts* by calling attention to and indirectly expediting avoidance behavior. That is, because tension does not increase the efficacy of decision making through preparing an individual to make a correct decision or allowing him to correctly parse between decisions, its only logical role is to expedite the avoidance *of* decision. As such the somatic marker does more than merely signal behavior, it indirectly *operates* on behavior, or is in other words an operant. Similarly, when avoidance behavior is not reinforced, the non-behavioral state of relaxation or muscular inactivity will occur. This position that tension mediates avoidance conforms with Zajonc's (1998) argument that emotions are designed to help individuals make approach-avoidance distinctions, and contrasts with the true-false determinations that are mediated by Damasio's somatic marker (Damasio, 1994). Finally, the fact that tension and regret embody an *affective* quality distinguishes the hypothesis from the computational role assigned by Damasio. That is, tension and regret do not mark value because they are perceived, but rather they mark value because they are perceived to hurt. This affective value of tension and tension induced arousal serves as a mechanism to interrupt and redirect cognitive processing by bypassing cognitive filtering and thus expediting action (Lowenstein et al., 2001, Armony et al., 1997). It is through this facilitation of action that tension is reinforced.

If tension occurs to mediate avoidance of loss, it will not occur when avoidance is impossible, and will occur when avoidance *is* possible. Furthermore, tension will have no correlation with situations that require problem solving or declarative reasoning, and thus cannot somatically determine or mark the correctness of decisions. Thus, as a general rule, relaxation will occur in circumstances where there is no avoidable loss, such as situations where only moment to moment gain is perceived (e.g., flow experiences), or when no moment to moment gains or losses are perceived, as in parsing or eliminating thought, or attending to thoughts that have no negative or positive import (e.g., meditation, mindfulness meditation, resting). However, in our workaday lives, moment to moment gains and losses are randomly interspersed, and the positive affect of gain is intermingled with the regret and accompanying tension due to loss. This concept of 'eustress', a neologism that merges the terms of euphoria and stress (Selye, 1972), conflates the causes of negative affect and tension with positive affect, rather than representing them as two different types of perceived events that elicit two very different neurological and behavioral outcomes. For example, during a closely contested football game, at times a fan will perceive negative prediction error, as when a play goes for a loss, or positive prediction error, as when the play results in a score. In this case, resulting disappointment, tension and euphoria seem to merge into a combined emotion of 'eustress', even though they are respectively due to different informative causes. Since positive surprises almost always come with the potential 'cost' of negative turns of fortune, the cost of feeling good is at times to feel bad! Furthermore, since positive discrepancy is necessary for effective learning and the motivation to learn, its invariable accompaniment with negative discrepancy leads to the conclusion that the latter's entailments of tension and regret seem to become necessary for effective decision making, even though they are in fact incidental and detrimental *to* effective decision making. Because tension facilitates avoidance, it will always decrease the efficiency of information processing and prevent critical information from entering the 'cognitive system' (Tataryn et al., 1989).

These observations underscore the fact that incentive motivation engages different neural and neuro-muscular processes that can be respectively defined as 'arousing', but represent separate and independent psychological and physiological processes. Indeed, 'arousal' is a theoretically incoherent term, as it may apply to distinctive neuro-physiological processes that have equally distinctive causes (Robbins, 1997). Yet, in classical and contemporary accounts of performance motivation and arousal (Yerkes & Dodson, 1908, Easterwood, 1959, Damasio, 1994), these processes are not separated or controlled for, resulting in the confounding of their differing respective causes and effects. Thus, although neurologic arousal as marked by heightened alertness may or may not occur concurrently with the somatic response of tension and autonomic arousal, both are commonly combined and used as a practically indivisible state of arousal. Indeed, the classic inverted U curve (Yerkes & Dodson, 1908, Easterbrook, 1959) correlating the relationship between performance and arousal is better explained through the recognition that arousal in incentive motivation may represent not one but *two* separate dependent variables that co-vary with different independent causes. For example, if task performance is plotted across the level of demand, the likelihood of moment to moment gain would at first offset the likelihood of loss, a circumstance that would reverse itself as demand increases. Thus, as a function of increasing demand, alertness and performance increases, but eventually decreases with a corresponding rise in tension due to an increased rate of 'bad news' implicated by high demand. Yet high demand does not necessarily implicate difficult, unsuccessful, or unattainable performance. Indeed, remove the negative but not the positive discrepancy entailed by moment to moment performance and retain the demand *for* performance, and tension and autonomic arousal will not increase with demand, and demand itself will correlate with a steady state of relaxation and low autonomic arousal. In addition, performance will not trail off and deteriorate with demand, but increase, and corresponding affect will be positive and quite pleasurable. This resulting 'flow' experience thus demonstrates how escalating demand increases alertness and performance, yet when discrepancy is controlled for, increasing demand will not result in increased tension and autonomic arousal (or stress) and decrements in performance as the Yerkes-Dodson model predicts.

Finally, although tension initiates and sustains autonomic arousal, it's affective nature or 'feeling' may be dissociated *from* autonomic arousal. This proposal is supported by the fact that the affective nature of tension does not necessarily return to a set point when arousal declines, and may be a function of the *persistence* of tension in time rather than how it is modulated with arousal. That is, the pain due to tension does not necessarily have to occur concurrently with arousal, and can be evident and even worsen when arousal declines. For example, an athlete's autonomic system is elevated through constant exertion, yet when his system returns to normal (i.e. catching one's breath), minor consequential exertion may be more painful because of muscular strain. The same process holds for even minor tension. As observed, minor variances in schedules will elicit tension for incidental moment to moment choices that entail discrepant loss. For the IGT experiment, these variances only existed intermittently during the short span of the experiment, yet if such variances are more frequent or near constant, they will result in pain and exhaustion even though autonomic arousal is low. For example, an individual clenching his fist would not suffer any discomfort at first, but would experience high muscular pain but low autonomic arousal if he sustained that motion for many minutes at a time. Similarly, the small variances that continuously occur while uncertainly striving to meet a deadline at work, or choosing between rational and affective outcomes (e.g. browsing the internet vs. keeping focused on one's job) result in sustained low level muscular tension that can 'build', thus causing end of day muscular pain and exhaustion, even though accompanying arousal or anxiety is insignificant. Surnamed the 'Cinderella Effect' (Wursted et al. 1991, 1996; Hagg, 1991), the continuous tensing of low threshold motor units or muscles (or Cinderella fibers) because of psycho-social 'demand' causes them to eventually fail, and thus recruit other groups of muscles more peripheral to the original group, resulting in pain and exhaustion. This result conforms with McEwen's model of 'allostatic load' (1998), which predicts that tension will be maladaptive when there is an imbalance between activation and rest/recovery. Specifically, continuous tension results in overexposure to stress hormones, high blood pressure, and resulting mental and physical exhaustion.

Although autonomic arousal is low given a day filled with distractions, muscular pain and exhaustion is pronounced because of constant low level activation of the musculature. In other words, a day at the office may not be anxiety filled, but nonetheless is physically exhausting because our decisions are continually mediated by muscular tension. Ultimately, this cannot be ascertained by indirect indices of tension, such as the SCR, which cannot measure muscular exhaustion but only the autonomic arousal mediated by tension. It is of note that studies (e.g. Hagg, 1991, Mcguigan, 1991, Jacobson, 1970) that use direct observation of muscular tension through the application of the EMG as opposed to more general and indirect measures of tension and concomitant arousal (SCR) clearly focus on tension as an affective and operant behavior that *in itself* modulates decision making. Thus it may be argued that tension is ignored as a specific independent measure of resulting arousal or anxiety because the measuring instrumentality (i.e. the SCR rather than EMG) cannot tease out the independent measure of tension and separate the affective nature of tension from the affective nature of arousal.

The Covert Operant of Tension

Tension is an operant because it indirectly speeds avoidance behavior. Technically, it fits the basic description of an operant behavior as a behavioral event that is modulated or changed by its consequences. Like an operant, it can be conditioned to occur under the stimulus control of the neutral visual and auditory discriminative stimuli that comprise the setting in which it is reinforced (Melin & Lundberg, 1997, Melin et al. 1996). This explains why tension can be sustained even when its original eliciting stimuli are not present, as when office workers become tense by simply remaining in the office environment that occasioned their tension (Lundberg, 1999). Tension also meets a common criterion of an operant as encompassing a general kind of response, namely the activity of the striated musculature. Nonetheless, it is distinguished from other operant behaviors such as running, talking, or grasping because it is a behavioral event that is modulated by discriminative stimuli whose moment to moment correlation with behavior is not consciously perceived due to the faintness or subtlety of those stimuli. In addition, tension itself may at first be subliminally perceived, and remains so until it 'builds' as a Cinderella response. In other words, tension is affective and instrumental because the pain of tension speeds decision making by interrupting and redirecting attention faster than cognition alone, and thus facilitates avoidance). Yet the operant nature of tension is non-conscious not because an individual is unaware that tension generally changes behavior, but because one is unaware of tension's fine grain correlation (i.e., how it is modulated from moment to moment) or relationship to equally subtle controlling discriminative stimuli, and because tension may be nearly imperceptible itself. Fortunately, this discrimination can be brought to awareness and thus experimentally demonstrated through the prosthetic enhancement of discriminative events or through the highlighting of discriminative stimuli through well known procedures of operant conditioning.

The prosthetic enhancement of discriminative stimuli is well established with covert responses such as salivation (Frezza & Holland, 1971) or brain waves (Rosenfeld et al., 1995), that are enhanced and made available to private and public observation through mechanical instrumentalities. This permits such behavior to be instrumentally or operantly reinforced. Thus, through bio-feedback heretofore 'involuntary' or reflexive responses can be made 'voluntary' or instrumental. Similarly, an individual may be aware of behavior, but not aware of the discriminative stimuli that control it because he has not attended to those stimuli. That is, the operant may be hidden from private observation because there is no reason to attend to its controlling stimuli. In this case the prospective control of the operant is not due to the use of prosthetic instrumentalities, but through training (i.e.,. defining behavior to be changed and directing attention to that behavior by charting or recording instances of its occurrence) that allows subtle discriminative stimuli to be observed and their relationship to behavior to be ascertained. For example, through a misdirection of attention through a magician's sleight of hand, the audience doesn't know what to look for and cannot replicate the trick. Yet a trained magician in the audience would be able to note the slight but observable behaviors that result in a rabbit being pulled from a hat, and replicate the trick through observational learning. Thus a feat of magic, like a golf swing, acting performance, etc. can be reinforced only through first isolating the successive approximations of behavior comprising a skill set. These approximations are brought to awareness not only by trial and error (hitting a golf ball until you get it right), but also by externally derived knowledge (reading a how-to book on golf that tells you the right stance, swing, club selection, etc.). That is, as with any discipline from magic to sports to accounting, you don't know what to look for until you are imparted with information as to what salient aspects of behavior are key to a performance. The question is, what can we learn of the regularities of affect through the a more acute observation of our daily decisions, and can we codify this knowledge into effective procedures for self control?

The Paradox of Choice

If the pain of tension and regret is the result of surprising knowledge of the negative moment to moment results of choice, and muscular tension occurs to expedite the avoidance of regret once it is perceived, then tension and regret may be avoided *before* they are experienced by simply avoiding knowledge of the negative results of choice. This avoidance may be accomplished incidentally or intentionally. For example we can choose a spouse, a career, or waste time at work without regret because the prospective losses for alternative choices are only obscurely perceived, and we thus have no perceptible cause *for* tension or regret. On the other hand, we may intentionally avoid perceiving the potential negative implication of choice by avoiding sources of information that may provide counterfactual information that conflicts with the perceived goodness of our decisions. Thus, if we refinance our house, buy a new car, or make reservations for a plane flight, subsequently refusing to access information that demonstrates that we could have made more cost effective choices effectively avoids the regret they will elicit.

A third approach to avoiding regret is to simply postpone decision. We can if we choose window-shop 'forever', and pleasurably appraise the novel implications of future choices. The appraisal of future positive choices elicits the same neurological events that underscore feelings of pleasurable anticipation (Nestler et al. 2001), but because actual choice is not entailed, loss is not perceived and tension or regret is not experienced. In the past, this was more often incidentally rather than purposively performed, but an aspect of modern life is that appraised values may be chosen at any time. For example, in times past making phone calls, watching TV, shopping, etc. could only be performed at certain times and places. Nowadays, these diversions can be chosen at any time, thus making choice much more portable than before. Besides the increasing portability of choices, the fact that the pleasurable appraisal of response options is sustained through the ever increasing multiplicity of new or novel choices leads to the conclusion that a surfeit of options is a good thing. But this results in a behavioral paradox, as multiplying future choices is good for anticipation, but bad for choosing. That is, increasing choices increase the pleasure of anticipating them as future events, but also increases the likelihood that actually choosing between them will be attendant with negative variances that parallel tension and regret. This results in a paradox of choice. Like Aladdin beholding the untold treasures in the Magician's cave, we marvel and take pleasure appraising all options of choice, but incur distress when we have to make a choice. So, to have one's cake but enjoy *apprehending* eating it too, choice is deferred or perhaps not even made. The irony is that approach or consumnatory behavior will be reduced, even though the summary appraised value increases with the number of available options. In other words, just 'wanting' to eat the cake is reward enough.

Finally, the *actual* rather than prospective experience of regret and tension can be mitigated by avoiding rumination that entails considering what options or judgements to take, or through re-conceptualizing the event so the source of regret is interpreted as inevitable or unavoidable. Avoiding judgments that can result in the pain of regret is represented in mindfulness or acceptance based psychotherapeutic procedures (Hayes et al. 2006) that contrast with cognitive therapies (e.g. Alford & Beck, 1997) that involve the reformulation rather than avoidance of judgment.

The Pragmatics of Tension Control

Ultimately, to avoid tension is to simply eliminate the circumstances in which it can be reinforced. That means to be relaxed, one must simply avoid or postpone making choices large and small that entail avoidable loss. Schwartz (2004) calls controlling significant choices 'satisficing', when options are limited by choosing agents who will choose for you, by restricting response options before choice, or by restricting the times when one can choose. But the many incidental or micro-behavioral choices of a workaday life that elicit tension also can be avoided or postponed. This strategy indeed conforms with the everyday heuristics we use to manage our emotional lives. We commonly exclude in working environments any choices that can seriously impede our productivity by simply removing ourselves to office environments where we cannot be distracted by affective choices (e.g. TV, refrigerator) that abound at home or otherwise consistently avoid indulging in them during working hours. This in effect separates decisions that are hindered by conflicting values that are determined by logical (molar) and affective (molecular) choices. Theoretically, by eliminating all affective distractions (e.g. chatting, checking email, personal phone calls) for the span of a working day, there can be no regret during the day for time misspent, and thus no tension or stress. But we don't as a rule go to this extreme. The reason for this is the presumed inefficacy of a higher *degree* of avoidance as a means to reduce tension. It is simply not generally conceived that the indulgence in minor distraction is just as responsible for tension as major distractions. One reason for this is that the slight tension of the musculature that correlates with minor distractions is at first only subliminally perceived, and as the Cinderella Effect suggests only becomes perceptible when such tension is continually sustained through a chain of small distractions or demands. Because the cumulative pain of tension lags the discriminative events that signal tension, the sense of discomfort and exhaustion of a 'hard day at the office' is difficult to specifically associate with those same events. Finally, the benefits of the *avoidance* of distraction is generally equated with the *indulgence* in distraction, and although tension is meliorated by taking a time out *to* chat, surf the internet, or take a coffee break (as opposed to taking a time out *from* distractions, as in rest), its reinforcement by such activity will sustain such distractions as a continuous prime for future choices and attendant tension. In other words, the ongoing loss of the opportunity to pursue distracting events will elicit tension if this loss is perceived as avoidable, but will not if such loss cannot be avoided, as when such options are made *consistently* unavailable.

This radical and consistent reduction of distraction shares much in common with meditative disciplines that achieve relaxation through reducing or attenuating thought, yet it is not thought that causes tension and anxiety (Hayes et al. 2006), but the non-verbal appraisals that are precursors to choice. Indeed, the radical reduction of appraisal or judgement is core to mindfulness techniques (Kabat-Zinn, 1993) that are commonly used separately or in conjunction with meditative procedures as a means of reducing or preventing tension or stress. Ultimately, if the control of tension is dependent upon the moderation of an abstract property of thought (i.e. judgement or appraisal) rather than parsing or attenuating thought, then the popular and academic conceptions of the etiology and treatment of stress must substantially change.

Learning Theory and Tension

In magic, the misdirection of attention to an impossible move (magic) causes the possible move (subtle behavior of magician) to be ignored. Thus the audience leaves without ever knowing how the trick was performed, yet also leaves knowing that there was no real 'magic' involved, thus keeping the magicians art separate from the art of the confidence game. In psychology, magic is not entirely dispensed with, as psychological procedures are as confidently exercised without distinguishing the impossible or magical from the possible and mundane. Unfortunately, the implementation of procedure without proper experimental controls that *precisely* define dependent and independent variables can often adduce behavior to incorrect causes, and cause entire subject matters to be in time discredited or cast into doubt (e.g. meditation (Holmes, 1984, 1988), hypnosis (Barber, 1969), psychotherapy (Dawes, 1994) when subtle elements of independent and dependent measures are experimentally and systematically controlled. Nonetheless, in spite of well founded scientific skepticism, psychological magic does occur in spite of the devil being in the details, as the continuous survival of spurious psychological procedure and equally spurious explanation continuously demonstrates.

As defined by the generalized relaxation of the musculature, resting states are dependent upon the elimination of subtle discriminative stimuli or distractions that correlate with tension. This connection is often not obvious, as tension often initially occurs as a subliminal and painless event that only becomes conscious and painful after the continuous activation of the musculature. Because the relationship of discriminative stimuli to the actual event of tension is immediate, but often significantly precedes the *discriminated* or consciously felt event of tension, this relationship can only be experimentally (through more timely and direct measures such as the EMG) rather than subjectively demonstrated. Nonetheless, because the causes for tension are seemingly non-discrete, tension is commonly adduced to general rather than specific events. For tension and non-tense (i.e. relaxed) states, this has resulted in their attribution to a metaphorical S-R mechanics that is as impossibly obscure as the magician's magic. Thus tension becomes a reflex, and its opposite of relaxation is viewed not as a non-response, but as a reflexive 'relaxation response' (Benson, 1975) that is adduced to obscure S-R linkages between attention and relaxation. However, these linkages are metaphorically and not empirically derived (Marr, 2006), and have no more added efficacy in producing relaxation then the necessarily concurrent act of resting (Holmes, 1984, 1988).

Unfortunately, it remains a widely held tenet in psychology is that relaxation is commonly the reflexive result of the 'stimulus' of focused attention, and tension is the reflexive product of the 'stimulus' of demand. In turn, tension becomes a subset of a reflexive fear based mechanism, or a 'flight or fight' response. But the difficulties extend beyond an empirical to a semantic realm. Namely, 'attention' (Donahoe & Palmer, 1993) and 'demand' are taxonomies for general and not specific events, and demand rarely implicates a threat to well being, as is essential to fear. In fact, the use of attention and demand as literal and specific causes can result in plainly erroneous predictions. For example, if stress is due to demand, then any demanding activity is stressful, and if focused attention causes relaxation, then any activity that leads to focused attention is relaxing. These predictions of course are absurd for an individual who is relaxed while reading a book due to the demand of a homework assignment, or for a nervous individual who is attentively focused on finishing a final exam.

In the academic and popular literature of stress, because the independent measure of muscular tension and anxiety is defined through non specific categories or taxonomies of events such as demand or attention, the 'cures' for stress are equally as broad. Thus relaxation occurs through focusing attention or eliminating demand. There is no fine grain relationship of behavior and the environment that can be controlled, and we can only be relaxed by secluding ourselves from the world rather than making adjustments to our world. Thus elements of choice are not even considered as causal factors for muscular tension and anxiety. Specifically, fine grain co-variations between stimuli and behavior are not considered as independent measures of tension, and are subsumed under molar concepts such as 'attention' or 'demand' that are only indirectly and imperfectly contacted through the use of literal language. For therapies that employ literal language, an individual becomes therefore less regretful or tense if his appraisal of response options is altered through sources that reinterpret information, and thus change abstract relationships between events. Although this may describe how psychotherapeutic interventions (or the helpful advice of a friend) mitigate stress, the underlying molecular causes of tension remain unaddressed. Because tension results from events that are far broader in kind and much higher in frequency than intermittent interpersonal causes, therapies for tension and stress such as meditation and rest must center on the mundane rather than the personal choices of our lives.

Yet even the mundane origin of tension is attributed to S-R metaphors that cannot describe how tension co-varies with ongoing experience. Near universally accepted explanations for stress that posit relaxation (Benson, 1974) and tension (Selye, 1980) as reflexive events to simple stimuli encapsulated as attention or demand are incapable of describing tension, stress, and its remedies except in the broadest terms. If the metaphor of choice replaces 'demand' or 'threat' as the primary descriptor of the etiology of tension and anxiety, then the management of simple contingencies of reinforcement are implicated in the origin, prediction, and control of everyday tension and stress. But this avenue has scarcely been researched due in no small measure to the a-priori rejection of learning as a valid explanatory perspective. Ultimately, this argument is won not by the parsimony of a behavior analytic explanation, but through the power of procedure to effect behavioral change. That of course is the mandate and justification of a true science of behavior.

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