

Extracts from an article - Muscular Tension: An Explanation from
Methodological Behaviorism - by Arthur J Marr

Emotional value of choices alters the relative value of alternative choices and hence may signal the emission of covert neuro-muscular behavior. Thus it is proposed that discrepancy-elicited affect does not directly elicit sympathetic arousal, but can indirectly establish a contrast between response alternatives that does.

These concepts are easily illustrated through the facts of behavior. Specifically, sustained levels of muscular tension are commonly produced under continuous (or moment-to-moment) alternative contingencies or choices wherein any choice entails **near equivalent** feasible or avoidable losses, or dilemmas. These dilemmas may consist of two or more rationally comparable choices that are near equivalent (e.g. what choice to make in a card game, which dessert to order, watch TV or read) or two choices that represent affective choices (or affective vs. rational choices) that are near equivalent in value and cannot be logically compared ([Marr, 2006](#)). An affective choice will be defined as an anticipatory emotion or, more specifically, a priming effect due to the enhanced and sustained activity of mid-brain dopamine systems ([Berridge, 2001](#)) that provide an affective value (or ‘wanting’) to engage in (or the prospect of engaging in) positive unpredicted or novel events such as checking email, or primary drives such as ‘wanting’ an ice cream cone).

As such, this activity may occur not only at the moment a discrepancy is perceived (as represented by the primary inducer) but also from moment to moment *prior* to or in anticipation of that event (as represented by the secondary inducer). Thus, continuous decision making between alternative contingencies (Some examples - doing housework or minding a child, working or surfing the internet, staying on a

diet or eating ice cream, keeping a dental appointment or staying at home) represents irreconcilable affective and/or rational alternatives wherein one choice entails the loss of its alternative and is associated with sustained levels of tension that is painful. This was called the ‘Cinderella Effect’ from the fairy tale character who, as a harried servant girl, was first to wake and last to sleep ([Wursted, Bjorklund, & Westgaard, 1991](#), [Wursted, Eken, & Westgaard 1996](#); [Hagg, 1991](#); [Lundberg, 1999](#)). The continuous activation of type 1 muscles fibres is also called Cinderella fibers because this psycho-social ‘demand’ causes them to eventually fail. This then recruits other groups of muscles more peripheral to the original group, resulting in pain and exhaustion. In addition, as the name Cinderella suggests, these slow twitch fibers are slow to deactivate and will continue activated even during subsequent intervals of rest ([Lundberg, Forsman, Zachau, Eklo, Palmerud, Melin, & Kadefors, 2002](#)).

The aversive result of this long term activation conforms to McEwen’s model of ‘allostatic load’ ([McEwen, 1998](#)), which predicts that tension and arousal will be maladaptive when there is an imbalance between activation and recovery. Specifically, continuous low level tension results in overexposure to stress hormones, high blood pressure and resulting mental and physical exhaustion. It must be remarked that, in the aforementioned examples, low level tension is correlated with moment to moment choices between alternatives that have **low importance** and is characteristic of **common day to day choices**. However, if the choice importance was very high (wherein alternative choices represent highly important possible outcomes - such as matters of life and death) then tension and arousal would be much higher, and would be reported as anxiety or fear ([McGuigan, 1993](#)).

Finally, apart from continuous choices, intermittent choices between conflicting near-equivalent low-importance response options also correlate with tension-induced arousal. Because tension in this case is quickly followed by a period of rest and recovery, tension is still affective and painful but it is not maladaptive. It has been hypothesized to unconsciously assist in deciding between the benefit of long term choices (Damasio, 2005).

If the independent measure of contingency is added to the equation, the theoretical principle follows that **tension is the body’s specific response to near equivalent alternative response contingencies or choices**. Because tension indirectly

controls (and is controlled by) the prospect of the occurrence (or non occurrence) of future events, tension is an operant. However, although tension and accompanying sympathetic arousal may be characterized as stress, it cannot be formally defined as stress. This is because the terms of stress are not precisely defined.

Ultimately, tension is initiated by the perception of contingencies or expectations. Tension is in turn instrumental in altering affect (i.e. it produces pain), which in turn intrinsically denotes the response contingencies (i.e. avoidance behaviors) that will remove the tension that causes it. This latter position conforms to the principle in cognitive neuroscience that affect is not prior to cognition nor is automatically elicited without cognition, but must be integrated *with* cognition ([Storbeck & Clore, 2007](#)). This is particularly important in the analysis of stress, since the common metaphorical representation of stress implies that stress is a ‘reaction’ to demand-events that bypass appraisal. However, whether tension and arousal are stress (or represent a kind of stress) is immaterial to the pragmatic implications of an operant analysis of tension. Specifically, if the metaphor of ‘choice’ replaces the metaphor of ‘demand’ as the primary descriptor of the cause of tension, then simple contingencies of reinforcement may provide a much more precise and uniform description of the operational measures that will permit us to predict and control the daily tensions that beset us. Nonetheless, this argument is not won by the stinginess and precision of a learning-based explanation, but through the power of procedure to effect behavioral change. That of course is the mandate and justification of a true science of behaviour.

The Cinderella Effect

A common truism is that distractions not only cause us to get tense and remain tense during the day, but that tension ‘builds’ until we are sore and exhausted. However, the neuro-muscular processes behind this event are not widely known. Named after the fairytale character who was first to awake and last to sleep, this ‘Cinderella Effect’ represents the fact that **slight but continuous** distractions (e.g. the continuous choice opportunities of surfing the internet instead of working)

elicit the continuous activation of low threshold muscle fibres (also called Type 1, slow twitch or Cinderella fibers) of the striated musculature which, unabated, will lead to their failure and the successive recruitment of other muscular groups to take up the slack. The result is pain, exhaustion and often a literal pain in the neck. In addition, as the name Cinderella underscores, **this muscular activity does not immediately cease when distractions cease and is sustained even when we take a short break or rest.**

1. *Contrast* reflects the comparative value of two alternative means-end expectancies or response contingencies.
2. *Discrepancy* reflects moment to moment unexpected variances in the immediate predicted outcome of a behavior.
3. *Predicted Utility* reflects the value of a moment to moment response as determined by long term hedonic (e.g. food, warmth or sex.) or rational value (e.g. monetary reward).
4. *Incentive importance* reflects the relative importance of moment to moment responding under a response contingency due to the utility of a response and to affective responses elicited by concurrently perceived discrepancy.

A 'no win' situation may be also be defined as an 'approach-avoidance' conflict, wherein we are simultaneously attracted to and repelled by a goal that has positive and negative aspects. This conforms to the Dollard and Miller theory of anxiety ([Miller, 1971](#)) which posits that sympathetic autonomic arousal (anxiety) is brought about by a choice conflict and is reinforced by the avoidance of the choice situation.