



Review

Muscle tension in generalized anxiety disorder: A critical review of the literature

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ABSTRACT

Background: Generalized anxiety disorder (GAD) is a prevalent, disabling, and often chronic disorder. With a typical recovery rate of only about 40% with current psychological treatments a better understanding of potential psychophysiological mechanisms is vital. **Methods:** Since the most discriminative somatic symptom of GAD compared to other anxiety disorders is muscle tension this review qualitatively examines the literature on muscle tension as it relates to GAD and muscle relaxation therapy for GAD patients.

Results: Muscle tension in GAD is poorly understood. Experimental studies refute the often-assumed direct relationship between anxiety and muscle tension. However, muscle relaxation therapies have been as effective as cognitive interventions directly addressing the defining symptom worry.

Conclusions: Muscle tension in its objective and subjective representations may play a role in GAD through various pathways that are testable. Future research needs to better examine the different aspects and functions of muscle tension in GAD.

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First defined in 1980 with publication of the third edition of the *Diagnostic and Statistical Manual of Mental Disorders* (American Psychiatric Association, 1980) generalized anxiety disorder (GAD) is a rather new diagnosis, yet may be today's most common anxiety disorder (Hoeft-Saric, 1998). According to a review of Wittchen and Hoyer (2001) lifetime prevalence estimates for GAD in the general population (5% lifetime and 3% 12-month prevalence) are remarkably stable, despite the many changes of the diagnostic criteria over time. The latest diagnostic criteria define excessive anxiety and uncontrollable worry as the essential feature of GAD (American Psychiatric Association, 2000) accompanied by at least three additional symptoms from a list that includes restlessness, being easily fatigued, difficulty concentrating, irritability, muscle tension, and disturbed sleep. Joormann and Stober (1999) investigated in a nonclinical sample the correlation between these six somatic symptoms and pathological worry and found that only muscle tension showed a unique and substantial correlation with pathological worry across all their analyses. This suggests that muscle tension plays a prominent role among the somatic symptoms of GAD and may be related to worry, the cardinal feature of GAD.

Given prominence of muscle tension in GAD efficacy of various muscle relaxation interventions for GAD has been evaluated and shown to be effective. In their analysis of outcome studies Fisher and Durham (1999) found the most effective treatments for GAD to be both individual cognitive-behavioral therapy (CBT) and applied relaxation (AR). Even though these two treatments target different symptoms of GAD they have comparable efficacy (Arntz, 2003). However, unlike other anxiety disorders whose psychological treatments have been found to be highly effective, for example CBT programs for panic disorder, posttraumatic stress disorder, and social phobia (Butler, Chapman, Forman, & Beck, 2006), GAD remains a difficult disorder to treat. At a 6-month follow-up about 60% of GAD patients will have shown significant improvement but only 40% will have recovered (Fisher & Durham, 1999).

Hence, there is an evident need for a better understanding of the relationship between the somatic symptom of muscle tension and anxiety or worry in GAD. This review explores the various psychological and physiological constituents in this relationship, pointing out apparent methodological difficulties in their accurate assessment in most studies. Since recent systematic reviews are lacking, the efficacy of psychological treatments for GAD incorporating muscle relaxation will be compared. Although evidence from treatment studies is circumstantial, results may hint at possible mechanisms. Finally, the discussion attempts to integrate findings and expand the current view by suggesting complementary pathways contributing to muscle tension in GAD.

1. Assessment of muscle tension

Muscle tension is a complex psychophysiological phenomenon that has both subjective and objective components. Thus, the question arises how muscle tension has been assessed in studies on anxiety and how valid and

reliable assessments have been. Most studies of muscle tension and anxiety rely either solely on self-report or physiological measurement in various forms. Studies that have assessed both can provide information on the concurrent validity of each assessment modality and guide a critical evaluation of studies on muscle tension in GAD.

1.1. Self-report measurement

Measuring patients' symptomatic experience by questionnaires or standardized interviews is the gold standard method for evaluating the presence and severity of a mental disorder. Thus, most outcome studies of GAD treatments have used questionnaires to assess treatment efficacy. Often questionnaires included the item "feeling tense." An apparent problem with this term is that it can be interpreted as tension in the muscles or as a psychic or emotional state of tension. In fact, in a study of Sainsbury and Gibson (1954) on symptoms reported by anxious patients, "feeling of tension" was mostly described as a "feeling of tightness, as if muscles taut", "stiffness of the muscles", "being cramped", and "unable to relax my body". However, besides the majority of patients describing tension as something experienced exclusively in their muscles, 25% of patients experienced it solely as mental state, using phrases such as "on edge," "keyed up," "over-alert all the time," "jittery and unable to settle." Hence, the term muscle tension may be interpreted quite differently by different individuals. Furthermore, anxiety patients' interoception of muscle tension may be more sensitive to subtle changes in muscular activity compared to healthy subjects, resulting in biased ratings on items relating to tension—similarly to what has been observed with self reported heart rate in patients suffering from panic disorder (Ehlers & Breuer, 1996). In summary, self-reports of muscle tension exhibit a restricted validity and therefore need to be interpreted with caution.

1.2. Physiological measurement

Electromyography (EMG) measured on the skin provides a noninvasive way of directly assessing physiological muscle activity. It is a technology that has been known for many years and has been used, amongst others, as a biofeedback method to teach patients to relax their muscles. EMG is based on well-understood electrophysiological properties of muscles. When a muscle contracts an electrical signal is generated along the muscle fiber. This so-called action potential spreads from the muscle to the skin where it can be recorded with electrodes. The total amount of recorded voltage is proportional to the number of muscle fibers contracting simultaneously. Unfortunately, as pointed out by Fridlund, Cottam and Fowler (1982), the voltage of the integrated EMG signal depends on several factors in addition to the aggregated action potentials. These include tissue noise, amplifier noise, and electrical conductance of the skin surrounding the electrode site. Furthermore, the EMG differs between individuals depending on neural density, size of muscle fibers, and thickness of electrically insulating fatty deposits

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