Anxiety and speaking in people who stutter: An investigation using the emotional Stroop task

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ABSTRACT

People with anxiety disorders show an attentional bias towards threat or negative emotion words. This exploratory study examined whether people who stutter (PWS), who can be anxious when speaking, show similar bias and whether reactions to threat words also influence speech motor planning and execution. Comparisons were made between 31 PWS and 31 fluent controls in a modified emotional Stroop task where, depending on a visual cue, participants named the colour of threat and neutral words at either a normal or fast articulation rate. In a manual version of the same task participants pressed the corresponding colour button with either a long or short duration. PWS but not controls were slower to respond to threat words than neutral words, however, this emotionality effect was only evident for verbal responding. Emotionality did not interact with speech rate, but the size of the emotionality effect among PWS did correlate with frequency of stuttering. Results suggest PWS show an attentional bias to threat words similar to that found in people with anxiety disorder. In addition, this bias appears to be contingent on engaging the speech production system as a response modality. No evidence was found to indicate that emotional reactivity during the Stroop task constrains or destabilises, perhaps via arousal mechanisms, speech motor adjustment or execution for PWS.

Educational objectives: The reader will be able to: (1) explain the importance of cognitive aspects of anxiety, such as attentional biases, in the possible cause and/or maintenance of anxiety in people who stutter, (2) explain how the emotional Stroop task can be used as a measure of attentional bias to threat information, and (3) evaluate the findings with respect to the relationship between attentional bias to threat information and speech production in people who stutter.

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1. Introduction

There is more to stuttering than disfluencies in speech production. For example, research has shown increased psychosocial burden and negative impact of stuttering on quality of life (e.g., Beilby, Byrnes, Meagher, & Yaruss, 2013; Craig, Blumgart, & Tran, 2009; Koedoot, Bouwmans, Franken, & Stolk, 2011). One area that has received considerable attention over recent years is the relationship between stuttering and anxiety-related problems. Trait anxiety refers to the general disposition in a person to experience feelings of anxiousness, nervousness, or dread. Studies using self-report instruments such as the Spielberger State-Trait Anxiety Inventory (STAI, Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983) have shown

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higher levels of trait anxiety in people who stutter (PWS) compared to fluent speaking control participants (Alm & Risberg, 2007; Blumgart, Tran, & Craig, 2010; Ezrati-Vinacour & Levin, 2004; Mulcahy, Hennessey, & Beilby, 2008). State anxiety is the feeling of anxiousness and apprehension arising at a particular point in time or in a specific situation (e.g., being in public, answering the telephone). Research has also shown elevated levels of state anxiety in PWS (Blumgart et al., 2010; Davis, Shisca, & Howell, 2007; Ezrati-Vinacour & Levin, 2004; Mulcahy et al., 2008). While some null findings have been reported in the literature questioning whether trait and state anxiety play an important role in stuttering (e.g., Blood, Blood, Bennett, Simpson, & Susman, 1994; see review by Menzies, Onslow, & Packman, 1999), a review by Iverach, Menzies, O'Brian, Packman, and Onslow (2011) incorporating evidence from a number of recent large scale studies argues that evidence for a link is now more compelling.

From the perspective of multidimensional models of anxiety (Balsamo et al., 2013; Elwood, Wolitzky-Taylor & Olatunji, 2012; Ezrati-Vinacour & Levin, 2004) some researchers have sought to identify aspects that are relevant to stuttering. Messenger, Onslow, Packman, and Menzies (2004) found increased anxiety compared to fluent controls was experienced by PWS in social situations, but not in relation to physical danger and daily routines (see, also, Ezrati-Vinacour & Levin, 2004). The link between chronic stuttering and social anxiety, in particular, may be explained by emotions aroused through expectations of negative evaluation by others and the impact stuttering has on social interactions in general for PWS (Davis et al., 2007; Messenger et al., 2004). Other studies have confirmed increased social anxiety in PWS with a significant percentage of PWS (approximately 40%) meeting criteria for social phobia or social anxiety disorder (e.g., Blumgart et al., 2010; Kraaimaat, Vanryckeghem, & Van Dam-Baggen, 2002; Lowe et al., 2012; Mulcahy et al., 2008).

However, anxiety may be a contributing factor in the onset and/or maintenance of stuttering (Adams, 1969; Karrass et al., 2006; Messenger et al., 2004; Siegel, 1999). Kleinow and Smith (2006, see, also, Karrass et al., 2006; Smith, Goffman, Sasisekaran, & Weber-Fox, 2012; Smith, Sadagopan, Walsh, & Weber-Fox, 2010) support a multi-dimensional view, which suggests a number of factors, including language skill, emotion and temperament, combine to influence a vulnerable speech motor system that results in overt stuttering. However, studies have reported no significant correlation between measures of anxiety and estimates of stuttering severity or frequency of stuttering (Alm & Risberg, 2007; Blumgart et al., 2010; Craig, Blumgart, & Tran, 2011; Mulcahy et al., 2008, although see Koedoot et al., 2011). Studies that have examined physiological correlates of anxiety, such as heart rate, skin conductance and peripheral blood flow, have also failed to show clear differences between PWS and controls when speaking, challenging the contribution of anxiety related processes to stuttering behaviours (Alm, 2004; Caruso, Chodzko-Zajko, Bidinger, & Sommers, 1994; Dietrich & Roaman, 2001; Heitmann, Asbjørsen, & Helland, 2004; Peters & Hulstijn, 1984; Weber & Smith, 1990, although, cf. Blood et al., 1994). Therefore, while research using self-report measures has highlighted increased levels of anxiety among PWS, especially social anxiety, other studies have so far failed to provide strong support for anxiety having a more direct impact or mediating role in stuttering, although such a role has been proposed.

1.1. Cognitive processing in anxiety

Models of anxiety, including those specific to social anxiety (e.g., Morrison & Heimberg, 2013), emphasise interactions between behavioural, physiological and cognitive components (Balsamo et al., 2013; Elwood et al., 2012). Indeed, cognitive accounts of anxiety and depression related clinical disorders (e.g., social phobia, panic disorder, depression, generalised anxiety disorder, post-traumatic stress disorder) have stressed the important role cognitive processes, especially biases in attention and negative cognitive appraisals, can play in the aetiology and maintenance of those conditions (e.g., Mathews & Mackintosh, 1998; Morrison & Heimberg, 2013; Williams, Mathews, & MacLeod, 1996). Although, the focus of attention may vary with the type of emotional disorder, it has been proposed that a "vicious cycle" exists whereby attentional processes are or become hypervigilant with respect to an area of concern (e.g., bodily sensations of fear, or perceived threat of social harm or negative appraisal of others), which in turn causes an emotional response (e.g., heightened anxiety). The increased awareness and sensitivity to those concerns leads the individual to over-estimate the level of danger or degree of threat, further enhancing emotional disturbance.

A large body of research has confirmed that attentional processes in people with emotional disorders are biased towards threat-related information (Asmundson & Stein, 1994; Bar-Haim, Lamy, Pergamin, Bakermans-Kranenburg, & van Ijzendoorn, 2007; MacLeod & Mathews, 1988; Mogg, Bradley, Williams, & Mathews, 1993; Rutherford, MacLeod, & Campbell, 2004; Williams et al., 1996; Yiend, 2010). For example, one of the most widely used paradigms to investigate attentional bias is the emotional Stroop task (Williams et al., 1996). This task is a variant of the colour Stroop task (MacLeod, 1991; MacLeod & MacDonald, 2000) where naming the colour of a printed word is slowed when the word is a colour name conflicting with the response (i.e., the word *red* is in green print and the response should be "green"). The emotional Stroop task compares speed of colour naming for words that are threat related (e.g., *stupid, foolish,* for people with social phobia, or *spider, cobweb,* for people with a spider phobia) with words that are neutral (e.g., *session*). It is generally found that people with higher levels of anxiety and depression show a Stroop type effect where responding is slower to threat words compared to neutral words, even though the meaning of the word is irrelevant to colour naming (e.g., Bar-Haim et al., 2007; Rutherford et al., 2004; Williams et al., 1996). A common interpretation is that the capacity to attend selectively to the print colour is compromised because attentional resources are biased towards the meaning of the threat word (Reinholdt-Dunne, Mogg, & Bradley, 2009; Williams et al., 1996; Yiend, 2010). This interference appears to be an automatic process because slowed colour naming for