

**AN EXAMINATION OF ANXIETY AND
COMMUNICATION APPREHENSION
IN PRESCHOOL CHILDREN WHO STUTTER**

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ABSTRACT

People who stutter (PWS) tend to have increased levels of anxiety compared to people who do not stutter (PWNS), particularly in social situations (Messenger, Onslow, Packman, & Menzies, 2004). In addition, children who stutter (CWS) as young as 3 years of age reportedly have more negative communication attitudes than their fluent peers, and these attitudes appear to worsen with age and stuttering severity (De Nil & Brutton, 1990, 1991; Vanryckeghem, Brutton, & Hernandez, 2005). The present study sought to examine generalized anxiety and communication apprehension in preschool CWS. Seven CWS aged between 3;3 and 4;11 years, and seven sex and age-matched children who do not stutter (CWNS) provided salivary cortisol samples at three distinct sampling times across a one-week period. They additionally provided a conversational speech sample, and were administered the Communication Attitude Test for Preschool and Kindergarten Children Who Stutter (Vanryckeghem & Brutton, 2007). Parents were required to complete the Preschool Anxiety Scale (Spence & Rapee, 1999) to provide estimates of their child's anxiety level. Results revealed no significant differences between CWS and CWNS in generalized anxiety or communication apprehension. No relationships were found between stuttering severity and generalized anxiety or communication apprehension either. Thus, it is concluded that generalized anxiety and communication apprehension are not associated with early childhood stuttering. Any changes in anxiety levels are likely to occur with increased chronological age and stuttering chronicity.

INTRODUCTION

Theories of Stuttering

Stuttering is described as unusually frequent disruptions in the flow of speech (Guitar, 2006). These disruptions include phoneme, syllable, or word repetitions, phoneme prolongations, and airflow or voicing blocks. Additional symptoms include facial grimacing, fixed articulatory postures, and obvious fear during speech attempts, or anticipation of speech failure prior to speech attempts (Sheehan, 1975). Nevertheless, these overt symptoms of stuttering are only a small part of the disorder, resulting in the analogy of stuttering as an iceberg (Sheehan, 1975). The audible and visible signs of stuttering are likened to the tip of an iceberg that rises above the water level. Yet, far greater and more detrimental is its submerged portion, which when likened to stuttering, comprises feelings of fear, shame, guilt, anxiety, hopelessness, isolation, and denial.

A variety of theories have been formulated in an attempt to describe the nature and etiology of stuttering. Examples of theories that describe the nature (or moment) of stuttering are the Neuropsycholinguistic Theory (Perkins, Kent, & Curlee, 1991) and the Covert Repair Hypothesis (Postma & Kolk, 1993). The Neuropsycholinguistic Theory (Perkins et al., 1991) describes disfluent speech as an incoordination between the linguistic and paralinguistic mechanisms of speech, which are habitually organised in different parts of the brain and culminate together to produce speech. Stuttering is therefore defined as speech disruptions that occur as the result of a loss of control when the speaker is under time pressure to speak. The Covert Repair Hypothesis (Postma & Kolk, 1993) suggests that speakers self-repair potential speech errors through the use of

an internal monitoring device before speech is articulated. Because correcting speech errors covertly prior to speech articulation naturally interferes with fluent articulation, it is thus demonstrated that stuttered speech results when speakers continuously attempt to repair their speech programmes before speaking.

Examples of theories that explain the cause of stuttering are the Cerebral Dominance Theory (Travis, 1931), the Neurotic Theory (Fenichel, 1945), the Diagnosogenic Theory (Johnson, 1942), and the Demands and Capacities Theory (Andrews et al., 1983; Sheehan, 1970, 1975; Starkweather, 1987). The Cerebral Dominance Theory (Travis, 1931) proposes that, unlike normal speakers who demonstrate clear dominance of one neurological hemisphere over the other, one hemisphere is not sufficiently dominant over the other in people who stutter (PWS). The Cerebral Dominance Theory arose from the observation that attempting to alter left-handed children's handedness served to exercise the less dominant (right) hemisphere, thereby diminishing the difference in dominance between the two hemispheres and causing stuttering. This theory has recently received a revival of attention based on results obtained from various cerebral imaging techniques (Moore & Haynes, 1980; Wells & Moore, 1990). The Neurotic Theory (Fenichel, 1945), which was developed from the fields of psychiatry and psychoanalysis, states that stuttering occurs because of an underlying unconscious wish to do so. Conversely, a more traditional theory, known as the Diagnosogenic Theory (Johnson, 1942), asserts that stuttering is caused by parents misdiagnosing their children's normal speech disfluencies as disordered disfluencies. Johnson found it difficult to distinguish between children who stutter (CWS) and children who do not stutter (CWNS) according to their speech disfluencies. However, he believed

that CWS tended to be parented in a perfectionist and overanxious manner, or had a familial history of stuttering, thus rendering their parents extremely sensitive to speech disfluencies. The Demands and Capacities Theory (Andrews et al., 1983; Sheehan, 1970, 1975; Starkweather, 1987) proposes that stuttering emerges when a child has greater demands for producing fluent speech than they have the capacity to produce. Demands on children's speech production may be the result of high expectations placed on them by their parents, or difficulties comprehending their parents' fast speech rates and complex language. Alternatively, such demands may arise from the rapid linguistic development that children experience between the ages of 3 and 7 years. A child's capacities include the ability to efficiently organise and plan the movement sequences and coordination necessary to produce speech. Despite the vast amount of research that has occurred over the past 60 years in the area of stuttering, few (if any) of these theories are sufficient to account for all that is known about stuttering.

Of particular interest in the present research is the role of anxiety in stuttering. There are several well known theories that have been developed which focus on anxiety and stuttering. For example, the Two-Factor Theory of stuttering (Brutten & Shoemaker, 1967) suggests that listeners' negative reactions to the speech of PWS conditions a link between speech and anxiety. An individual's consequent avoidance of phonemes and words they perceive as difficult, or even avoidance of speech situations due to apprehension of stuttering, results in stuttering, and thus reinforces the link between speech and anxiety. A similar theory, known as the Anticipatory Struggle Hypothesis (Bloodstein, 1987; Hulit & Haasler, 1989), suggests that some children simply consider speech a demanding task. This is primarily due to experiencing difficulty and frustration

associated with normal childhood disfluencies. Such difficulties need not necessarily be related exclusively to stuttering. In fact, Bloodstein (1987) found that experiences leading to the belief that speech is difficult might also contribute to generalized delays in speech and language, as well as cluttering¹. A perfectionist personality or the desire to meet high parental expectations for speech may also intensify feelings of frustration during speaking. Consequently, such children tense their speech musculature as their apprehension of speech failure builds, which when faced with speaking situations, causes them to stutter.

On the other hand, the Approach-Avoidance Conflict Theory, proposed by Sheehan (1953), is based on the notion of internal conflict. Typical types of internal conflict include approach-approach, avoidance-avoidance, and approach-avoidance. People face approach-approach conflicts when having to make a decision between two desired options. Conversely, avoidance-avoidance conflicts occur when a choice must be made between two unfavourable alternatives. Stuttering, as it relates to anxiety, is likened to an approach-avoidance conflict. Although PWS desire to speak in social situations, they are also afraid of speaking for fear of stuttering. The Approach-Avoidance Conflict Theory maintains that stuttering arises when PWS experience an internal conflict between wishing to speak and wishing to remain silent. When the avoidance of not speaking by remaining silent exceeds the approach drive to speak, PWS remain silent. Alternatively, when the desire to approach speaking is stronger than the avoidance of not speaking (and instead remaining silent), for example when wishing to convey great enthusiasm or in emergencies, PWS are able to speak fluently. However,

¹ Rapid bursts of speech, characterised by misarticulations, word and phrase repetitions, revisions, and pauses (Guitar, 2006).

when the internal drives to approach versus avoid speaking tasks are relatively equal, stuttering occurs. PWS avoid speech for several reasons, including fear of stuttering on certain words or in certain speaking situations, anxiety about the emotions they may express, or an unpleasant relationship with their communication partner.

The Approach Avoidance Conflict theory was further developed by Sheehan (1975), based on earlier work by Miller (1944), and described as the Double Approach-Avoidance Conflict Theory. In a Double Approach-Avoidance Conflict (Miller, 1944; Sheehan, 1975), there are approach and avoidance tendencies for both speaking and remaining silent. Firstly, when PWS desire to approach speaking to fulfil their social obligations, they are simultaneously faced with a fear of stuttering during their speaking attempts (Johnson & Knott, 1936). The alternative to speaking is silence, which appears an appealing approach tendency, since it bypasses the potential risk of stuttering that is associated with speaking. However, silence is also a threat to social standing. Hence, should they speak, PWS may stutter and experience listeners' negative reactions towards their disfluent speech. Yet if they remain silent to eliminate the danger of speaking, they may be perceived as disinterested or unsociable. For that reason, while they desire to avoid speaking in order to avoid stuttering, they are also afraid to be silent. Struggling between the possibilities of speaking and remaining silent, together with an inability to resolve this inherent conflict, consequently results in stuttering. An additional facet of the Double Approach-Avoidance Conflict Theory is the association of negative emotions to either speaking or remaining silent. In the event of speaking, the trade-off is shame and guilt, whereas in remaining silent, feelings of frustration and guilt are experienced. Because both choices result in guilt, a choice must be made between experiencing either

shame or frustration. Regardless of the option selected, speakers feel regret as the avoidances of the alternative choice become insignificant and it appears that the alternative choice would indeed have been a more beneficial option to have selected.

Adulthood Anxiety and Stuttering

Anxiety is a negative emotion and consists of state and trait components (Bennett, 2006). State anxiety is specific to a given situation and may be triggered by factors associated with social interaction (Ezrati-Vinacour & Levin, 2004). Trait anxiety refers to an individual's general level of anxiety, regardless of situational factors that are likely to evoke anxiety (Menziez, Onslow, & Packman, 1999). In contrast to state anxiety, trait anxiety develops gradually over time (Ezrati-Vinacour & Levin, 2004).

It is commonly believed that anxiety is related to stuttering, despite conflicting evidence in the literature with regard to the precise nature of this relationship (Blood, Blood, Bennett, Simpson, & Susman, 1994; Craig, 1990; Ezrati-Vinacour & Levin, 2004; Miller & Watson, 1992; Poulton & Andrews, 1994; Weber & Smith, 1990). PWS often report anxiety related to producing particular sounds or words, or participating in certain communicative situations (Blood et al., 1994). In addition, stuttering severity appears to be dependent on factors such as communication partner status or the number of addressees, novelty, formality, and familiarity with the speaking situation, and feelings of conspicuousness (Buss, 1980; Porter, 1939; Siegel & Haugen, 1964). Because stuttering severity is associated with emotions such as embarrassment, frustration, and apprehension of negative social evaluation, greater anxiety levels in PWS compared to people who do not stutter (PWNS) are to be expected (Craig, Hancock, Tran, & Craig,

2003). Nevertheless, it remains unclear at present, whether PWS are more anxious in general than PWNS.

A Generalized Anxiety Concept has been proposed to suggest that PWS show overall high state and trait anxiety (Craig & Hancock, 1996). There is conflicting evidence in the literature to support this concept (Craig, 1990; Craig et al., 2003; Fitzgerald, Djurdjic, & Maguin, 1992; Kraaimaat, Janssen, & Van Dam-Baggen, 1991; Miller & Watson, 1992). For example, Craig (1990) found that PWS experienced state anxiety specific to speaking situations prior to treatment, as well as overall higher levels of trait anxiety than PWNS, regardless of whether they had had treatment or not. Further, Craig et al. (2003) found higher levels of generalized anxiety in severely affected PWS who were currently (or had been previously) involved in treatment than in PWNS. The researchers concluded that PWS who stuttered most severely showed clear evidence of heightened generalized anxiety, whereas those who had not been involved in treatment did not differ significantly from PWNS. Kraaimaat et al. (1991) also found differences between PWS and PWNS on both state and trait anxiety components. In contrast, Miller and Watson (1992) found no differences in state or trait anxiety, as measured by the State-Trait Anxiety Inventory (STAI) (Spielberger, Gorsuch, & Luschene, 1970) between PWS and PWNS aged between 16 and 68 years.

Despite conflicting evidence in the literature with regard to the Generalized Anxiety Concept (Craig, 1990; Craig et al., 2003; Fitzgerald et al., 1992; Kraaimaat et al., 1991; Miller & Watson, 1992), several researchers have concluded that trait anxiety is comparable between PWS and PWNS, with primary differences between the two groups related to state anxiety (Ezrati-Vinacour & Levin, 2004; Van Riper, 1982). For example,

Ezrati-Vinacour and Levin (2004) did not find any differences between the trait anxiety levels of individual PWS as a function of stuttering severity, however they did find a difference in state anxiety levels specific to social situations.

It is generally accepted that PWS do indeed experience increased levels of state anxiety compared to PWNS, particularly in social situations (Messenger, Onslow, Packman, & Menzies, 2004). This is termed, “communication apprehension” (McCroskey, 1978). The familiarity of negative emotions in association with speaking experiences of the past serves to condition communication apprehension in PWS (Alm, 2004). In support of this claim, several questionnaire studies have confirmed the presence of negative communication attitudes in PWS (Baumgartner & Brutton, 1983; Bloodstein, 1975; Vanryckeghem & Brutton, 1996). Bloodstein (1975) surveyed PWS regarding their state anxiety related to communication situations and found that anxiety plays a role in increasing disfluency. Miller and Watson (1992) found that the communication attitudes of PWS appeared to deteriorate with worsening self-ratings of stuttering severity. Additional findings indicated that PWS with mild and moderate stuttering severity exhibited a significant positive correlation between measures of communication attitudes and both state and trait anxiety. Conversely, PWS with severe stuttering showed no significant correlations between anxiety and communication attitudes. It is also thought that PWS often underestimate the severity of their communication apprehension, perhaps as a form of denial (Pennbaker, 1990; Sackeim & Gur, 1978).

In summary, although the exact role of anxiety in adults who stutter remains unclear at present, it is generally believed that PWS have greater state anxiety specific to

speaking situations than PWNS. Research investigating the Generalized Anxiety Concept in PWS has generally been rejected (Ezrati-Vinacour & Levin, 2004; Miller & Watson, 1992; Van Riper, 1982).

Childhood Anxiety and Stuttering

Anxiety disorders often originate early in child development (Treon & Dempster, 2006). Epidemiological studies have suggested that up to 20 percent of children in the general population may be affected by psychological disturbances, such as anxiety and depression (Sawyer et al., 2001). Yet more distressing, at preschool age, the prevalence of psychiatric disorders is estimated at 10 to 15 percent, and these have been shown to persist into adolescence (Briggs-Gowan, Carter, Irwin, Wachtel, & Cichetti, 2004; Konold, Hamre, & Pianta, 2003; McGee, Feehan, & Williams, 1995; Warren, Huston, Egeland, & Sroufe, 1997).

Spence (1998) examined anxiety levels in school children aged 8 to 12 years using the Spence Children's Anxiety Scale (SCAS) administered verbally and answered in writing. The SCAS (Spence, 1998) examines the frequency with which anxiety symptoms characteristic of specific diagnosed anxiety disorders are experienced by children. The five distinct types of anxiety measured by this questionnaire are social phobia, separation anxiety, generalized anxiety, obsessive-compulsive disorder, and fears of physical injury. Overall, the younger children reported greater levels of anxiety than the older children, with the exception of social phobia symptoms. In addition to a significant difference in anxiety levels as a function of age, results also revealed a clear sex difference. Girls reported significantly greater levels of anxiety than boys on all but

the obsessive-compulsive symptoms. Spence, Rapee, McDonald, and Ingram (2001) investigated subtypes of anxiety in preschool children ranging in age from 2;5 to 6;5 years using a parent questionnaire, known as the Preschool Anxiety Scale (Parent Report) (Spence & Rapee, 1999), which includes a wide variety of anxiety symptoms typically noted in preschoolers. They found that groups of factors denoting the same five distinct types of anxiety described above in Spence (1998) were closely correlated, indicating a lack of ability to differentiate between these disorder types at an early age. This led to the conclusion that, although symptoms tended towards different categories of anxiety disorders, preschoolers appeared to experience more generalized anxiety, which would only separate into a distinct type of anxiety disorder later in childhood (Spence et al., 2001). In addition, preschool children showed no significant differences in generalized anxiety levels according to sex (Spence et al., 2001).

Children diagnosed with a speech disability have an increased risk of developing anxiety disorders in early adulthood (Baker & Cantwell, 1987). In fact, the development of anxiety disorders in early childhood interestingly coincides with the initial emergence of stuttering (Wingate, 2002). Research specific to anxiety in CWS is limited. The type of research undertaken with CWS has been mainly dominated by questionnaire studies administered to parents of CWS or direct questioning of CWS. For example, Fowlie and Cooper (1978) distributed an adjective checklist to mothers of 34 stuttering and 34 nonstuttering school-aged males and found that mothers of CWS tend to regard their children as more anxious overall than mothers of typically developing children. Mothers of CWS perceived their children as being significantly more anxious, introverted, fearful, sensitive, withdrawn and insecure than mothers of CWNS. Andrews and Harris (1964)

directly examined anxiety in CWS and CWNS using Sarason's General Anxiety Scale for Children (Sarason, Davidson, Lighthall, Waite, & Ruebush, 1960) and found no significant differences between groups. Craig and Hancock (1996) also investigated anxiety directly in 96 CWS aged 9-14 years and 104 age and education matched CWNS using the State-Trait Anxiety Inventory for Children (STAIC) (Spielberger et al., 1970). They also found no differences in either state or trait anxiety between age-matched CWS and CWNS. No significant relationships between stuttering frequency, age, or sex and anxiety were found. The authors concluded that anxiety may be less common in CWS compared to adult PWS.

Further research regarding the anxiety levels of adolescent PWS has yielded results similar to Craig and Hancock (1996). Blood, Blood, Maloney, Meyer and Qualls (2007) administered the Revised Children's Manifest Anxiety Scale (RCMAS) (Reynolds & Richmond, 2002) to 36 adolescent PWS and 36 adolescent PWNS aged 12 to 18 years and found that adolescent PWS, although generally evidencing higher levels of generalized anxiety than their fluent peers, still scored within normal limits. However, those adolescent PWS with co-occurring speech-language (e.g., articulation, phonology, expressive language, receptive language, SLI), or other disorders (e.g., central auditory processing, attention deficits, behavioural disorders, reading problems, neurological disorders) experienced greater levels of generalized anxiety than adolescent PWS without co-occurring disorders. Moreover, Davis, Shisca, and Howell (2007) found no differences in trait anxiety between adolescent PWS, adolescents who had recovered from stuttering, and adolescent PWNS aged between 10 and 17 years.

Parental reports have indicated that CWS are aware of their stuttering shortly after its onset, and thus has the potential to affect social interaction from an early age (Ambrose & Yairi, 1994; Packman, Onslow, & Attanasio, 2003). Although research evaluating the relationship between anxiety and stuttering in CWS is limited, there is evidence to support a difference in communication apprehension between CWS and CWNS (De Nil & Brutten, 1990, 1991; Vanryckeghem & Brutten, 1996, 1997; Vanryckeghem, Brutten, & Hernandez, 2005; Vanryckeghem, Hylebos, Brutten, & Peleman, 2001). CWS as young as 3 and 4 years have been found to experience more negative or mal-attitudes towards speech than CWNS, and these attitudes appear to worsen with age and stuttering severity (De Nil & Brutten, 1990, 1991; Vanryckeghem, 1995; Vanryckeghem & Brutten, 1997; Vanryckeghem et al., 2001, 2005). In contrast, such attitudes tend to improve with age among CWNS (Vanryckeghem, 1995; Vanryckeghem & Brutten, 1997). Vanryckeghem et al. (2005) piloted the Communication Attitude Test for Preschool and Kindergarten Children Who Stutter (KiddyCAT) (Vanryckeghem & Brutten, 2007), a self-report measure of communication attitudes for preschoolers, in 45 CWS aged 3 to 6 years and 63 sex and age-matched CWNS. They found that the CWS group displayed significantly more negative communication attitudes than their nonstuttering peers. Vanryckeghem et al. (2005) concluded that the communication attitudes of CWS differed at the onset of stuttering, which is consistent with the finding that both preschool aged CWS and CWNS are aware of the differences between fluent and stuttered speech (Ambrose & Yairi, 1994; Ezrati, Platzky, & Yairi, 2001). There is thus demonstrable evidence to confirm the presence of state anxiety, based on communication apprehension in CWS at the onset of stuttering.

In summary, there is mixed evidence to suggest that PWS demonstrate a broader and more heightened generalized anxiety condition (Blood, Blood, Bennett, Tellis, & Gabel, 2001; Craig et al., 2003). However, communication apprehension appears to occur in individuals who stutter across all ages, including children as young as 3 years (Vanryckeghem et al., 2005), which suggests that state anxiety is a relatively common condition in PWS. Perkins (1986) proposed that PWS demonstrate negative communication attitudes that result from continuous experiences involving episodes of disfluent speech and listeners' consequent negative reactions towards them. This condition could potentially be psychologically weakening and eventually result in increased generalized anxiety (Craig et al., 2003). Because negative communication attitudes have been found to hinder therapy effects for adults who stutter (Guitar, 1979), it is critical to identify and target negative communication attitudes early during intervention with CWS in order to facilitate the best possible treatment effects and reduce the possibility of these children developing increased state anxiety in speaking situations (i.e., communication apprehension) (Vanryckeghem & Brutten, 1997; Vanryckeghem et al., 2001, 2005).

Research to date focusing on anxiety in CWS has relied exclusively on questionnaire based studies administered to parents of CWS or directly to CWS themselves. In addition, a majority of these studies have investigated primarily participants older than 5 years. By this age, it is likely that stuttering is already fully developed, so it follows that only state anxiety (i.e., communication apprehension) would be elevated under experimental conditions. The present study was designed to examine state and trait anxiety at age periods closer to the onset of stuttering. Assuming past

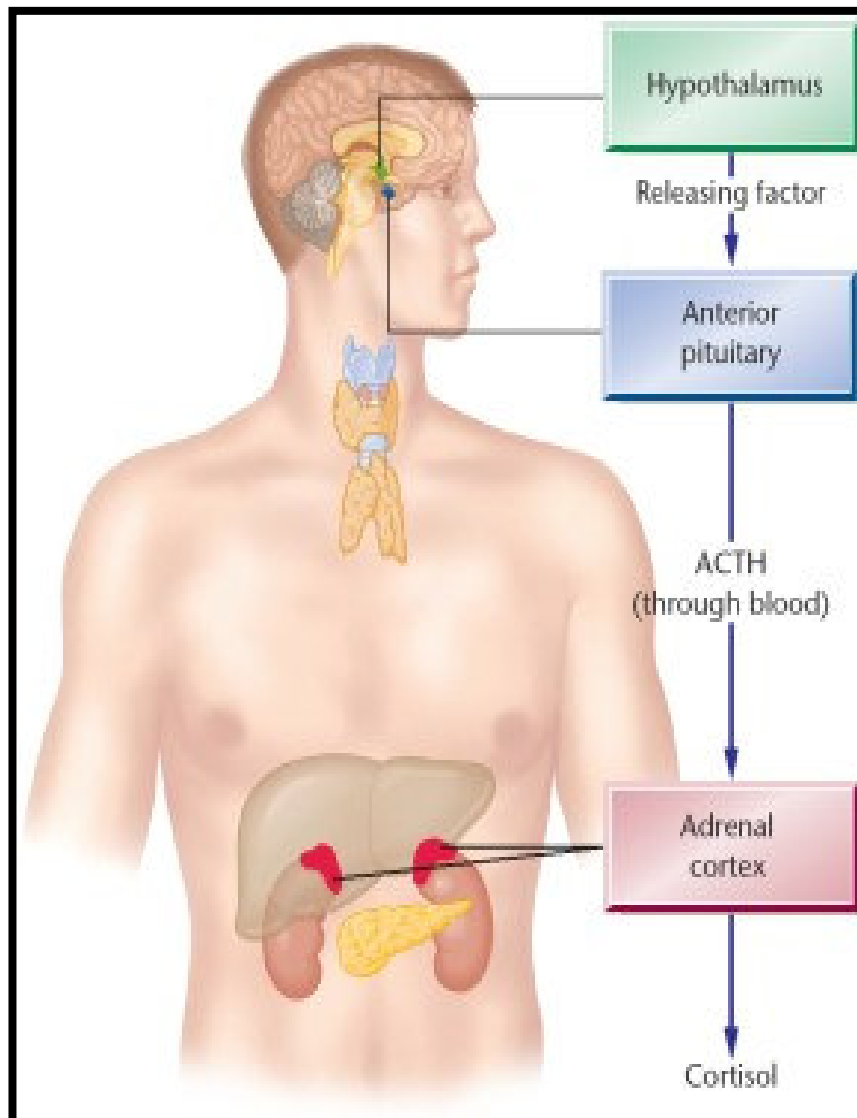
research for older children and adults who stutter indicates primarily elevated state anxiety (in the form of communication apprehension), a similar pattern would be expected in young children at the onset of stuttering.

Cortisol and Stuttering

Research exists attempting to assess anxiety in PWS using physiological measures. Measures such as changes in heart rate, galvanic skin response, and autonomic nervous system activity arousal have all led to inconclusive or equivocal results (Weber & Smith, 1990). Cortisol, a steroid stress hormone, has been extensively used as a measure of generalized, trait, and state anxiety in various populations (see Abplanalp, Livingston, Rose, & Sandwisch, 1977; Benjamins, Asscheman, & Schuurs, 1992; Wang, Kulkarni, Dolev, & Kain, 2002). However, it appears heightened cortisol levels are not indicative of generalized or trait anxiety; rather, they suggest increased state anxiety levels (Craig & Hancock, 1996).

Cortisol is the main glucocorticoid hormone in humans and is released from the adrenal cortex during periods of stress and physiological arousal (Lueken, 2000). It is known to affect energy levels, immunity, learning, memory, neural plasticity, and emotions (Klimes-Dougan, Hastings, Granger, Usher, & Zahn-Waxler, 2001), and is positively associated with daily fluctuations in anxiety, even in healthy individuals (Axelrod & Resine, 1984; Francis, 1989). Cortisol is secreted following hypothalamic-pituitary-adrenal (HPA) activation in stress-provoking situations (Schiefelbein & Susman, 2006). The hypothalamus is responsible for regulating emotions. When stress or anxiety is felt, it triggers the release of several hormones to the pituitary gland,

including epinephrine and norepinephrine (to initiate the fight-or-flight response), adrenaline, and cortisol. The hormones enter the blood stream and are carried into the adrenal cortex, where the fight-or-flight response is activated. This process of HPA activation results in increased cortisol secretion from the adrenal cortex (see Figure 1).



Source: http://www.vitalifenetworks.com/VL_Cortisol.php

Figure 1: Illustrating the process of cortisol secretion at the initiation of stress or anxiety.

Hormones are released from the hypothalamus and enter the adrenal cortex via the anterior pituitary, in order to activate the fight-or-flight response.

Cortisol levels fluctuate throughout the day, with a peak shortly before waking and gradual decreases until low levels are reached in the evening (Kirschbaum & Hellhammer, 1989; Levine, Zagoory-Sharon, Feldman, Lewis, & Weller, 2007). Cortisol is measured in blood, urine, or saliva (Kirschbaum & Hellhammer, 1989). Salivary cortisol measures, in contrast with blood or urine measures, are non-invasive and allow repeated sampling at identical time points (Lewis, 2006). Although cortisol is present only in low concentrations in saliva, sensitive analyses are performed to determine fluctuations in cortisol levels (Kirschbaum & Hellhammer, 1989). Salivary cortisol samples are analysed using radioimmunoassays following centrifugation (Kirschbaum & Hellhammer, 1989).

There are a limited number of studies that have examined cortisol in PWS and these studies have been limited to adults. In order to measure cortisol responses as a measure of anxiety in PWS, Blood et al. (1994) collected saliva samples from 11 male PWS and 11 sex, age and education-matched PWNS. The samples were obtained at a baseline session, and following both a low stress and a high stress condition. Low and high stress conditions were determined subjectively, in that participants were asked to report to the researchers on a “stress-free” day for assessment under a low stress condition, and prior to a stressful event or on a day when “everything was going wrong” for assessment under a high stress condition. Participants were additionally required to complete the State-Trait Anxiety Inventory (STAI) (Spielberger et al., 1970) to measure state, trait, and generalized anxiety and the Personal Report of Communication Apprehension (PRCA) (McCroskey, 1978) to measure communication apprehension. Results revealed significant differences between PWS and PWNS in cortisol levels after

the high stress condition, however there were no differences in cortisol levels between groups in the low stress condition, neither were there any differences between groups with regard to communication apprehension. Blood et al. (1994) concluded that cortisol responses may be elevated in PWS as a result of an increased perception of high stress or anxiety.

A further study by Blood, Blood, Frederick, Wertz, and Simpson (1997) measured communication apprehension and cortisol responses to a laboratory stressor in 11 PWS and 11 PWNS aged 18 to 28 years. Participants were administered the PRCA (McCroskey, 1978). They were also required to produce a baseline saliva sample to measure cortisol responses, and an additional sample following a laboratory stressor. The laboratory stressor involved completing mental arithmetic aloud for a period of five minutes. A final baseline saliva sample was collected several minutes later. Participants who demonstrated high communication apprehension on the PRCA also showed cortisol responses following the laboratory stressor that were significantly higher than the individuals who were regarded as having low communication apprehension. However, no significant differences in cortisol responses were detected between PWS and PWNS following the laboratory stressor.

Findings from the two cortisol studies completed by Blood and colleagues (1994; 1997) appear to be inconclusive. Blood et al. (1994) found a significant difference in cortisol response between PWS and PWNS under a high stress condition with no apparent link to communication apprehension. Yet, Blood et al. (1997) found no significant differences in cortisol response between PWS and PWNS following a laboratory stressor, although a link was shown between communication apprehension and

cortisol levels. Inconsistencies in the findings of these studies could be attributed to differences in cortisol sampling, as well as the determination of low and high stress conditions. As such, it appears the use of cortisol levels has yet to provide persuasive evidence of a strong physiologic link between anxiety and stuttering in PWS.

To date, no research has been conducted to investigate cortisol levels as a measure of anxiety in CWS, although there are studies that have examined anxiety in children with other disorders through the use of cortisol. For example, Tennes, Downey, and Vernadakis (1977) found no significant changes in state anxiety, as measured by mean urinary cortisol responses, in normal 1 year old infants when separated from their mothers for one hour. However, larger variability in cortisol secretion was noted on the stress day. Tennes and Kreye (1985) examined children's cortisol levels in relation to elementary school class tests and found significantly increased cortisol levels indicative of heightened state anxiety on test days compared to normal school days, particularly for low-achieving children and those achieving above average. Cortisol levels in socially phobic adolescent girls have also been investigated and proved a sensitive measurement of anticipatory anxiety, but did not reveal any differences between the socially phobic and control participants in generalized anxiety (Martel, Hayward, & Lyons et al., 1999). Furthermore, Carrion et al. (2002) examined cortisol levels in children subjected to posttraumatic stress disorder and found significant differences in trait anxiety between affected and control participants, as well as significantly greater cortisol levels in girls compared to boys.

In summary, measures of salivary cortisol have been found to reflect levels of anxiety in both adults and children. There is limited research examining cortisol levels in

PWS. Research to date has focused exclusively on adults, and the results from these studies are inconclusive (Blood et al., 1994; 1997). Therefore, examining cortisol levels in CWS may serve to clarify whether there is a physiological difference in anxiety levels between people who do and do not stutter. Further, examining cortisol levels in young children at the onset of stuttering may prove revealing regarding the early relationship between anxiety and stuttering.

Statement of the Problem

One of the major drawbacks associated with past work evaluating anxiety in stuttering is that the work has focused primarily on adults. Such being the case, it is difficult to determine whether (1) the heightened anxiety in these individuals is a consequence of stuttering or (2) these individuals show a predisposition for heightened anxiety, regardless of stuttering. Ideally, research evaluating possible physiological correlates of stuttering is best performed near the onset of early stuttering behaviour (i.e., young children). Although the Generalized Anxiety Concept (i.e., both state and trait anxiety) has been challenged in the literature regarding adults who stutter, there is a paucity of research investigating anxiety in CWS. Is it still correct to assume that anxiety is not generalized and is specific to communication apprehension (i.e., state anxiety)? Research has shown that negative attitudes towards speaking situations play a role in the stuttering behaviours of both adults and children, but perhaps young CWS are actually different in regard to generalized anxiety measures compared to CWNS and only with time does their anxiety become linked exclusively to communication. Therefore, the

present study attempted to determine whether CWS are indeed more anxious than CWNS, as measured by generalized anxiety, communication attitudes, and cortisol.

The following hypotheses were investigated in the present study:

- 1) CWS will not differ significantly from CWNS on measures of generalized anxiety.
- 2) CWS will differ significantly from CWNS on measures of communication apprehension.
- 3) There will be no significant relationship between generalized anxiety and stuttering severity.
- 4) There will be a significant relationship between communication apprehension and stuttering severity.

METHOD

Participants

Seven CWS and seven CWNS were recruited to participate in this study. The CWS group consisted of five males and two females, and ranged in age from 3;3 to 4;11 years, with a mean age of 4;1 years. Initial criteria for inclusion for the CWS participants was the presence of stutter-like disfluencies (SLDs), which was determined through participants' current involvement in stuttering therapy, or parental concern regarding their disfluent speech. The CWS participants' percentage of words stuttered was determined by a 250-300 word conversational speech sample. Single syllable word repetitions, part-word repetitions, prolongations, blocks, and broken words were considered to be SLDs (Guitar, 2006). Other disfluencies (ODs) consisted of phrase repetitions, interjections, and revisions. The percentage of overall disfluency ranged from 3% to 24% and averaged 10% for the group. In all cases, the percentage of SLDs was equal to or exceeded 50% of the total disfluencies. CWS are defined as children whose production of SLDs is greater than 50% of their total number of disfluencies, and who utter SLDs at a rate of at least 3% (Yairi, 1997a, b). The time since stuttering onset (TSO) for each CWS and whether they were currently in treatment were determined by parent report.

The CWNS were matched to the CWS group according to both sex and age. The group consisted of five males and two females and ranged in age from 3;2 to 4;10 years, with a mean age of 4;1 years. Both CWS and CWNS were judged to display age appropriate speech and language skills as determined by (1) calculations of mean length of utterance (MLU) in grammatical morphemes, (2) the Peabody Picture Vocabulary

Test-R IIIA (PPVT) (Dunn & Dunn, 1981), and (3) informal assessment of speech sound production skills. All speech and language assessments were performed by the researcher, who is a qualified Speech-Language Therapist. In addition, all children were judged to have normal hearing, based on parent report. The general characteristics of the CWS and CWNS groups are listed in Tables 1 and 2, respectively. The study was approved by the University of Canterbury Human Ethics Committee (HEC) and informed consent was obtained from the parents of each child. The HEC, as well as the participant information sheet and consent form are provided in Appendix A.

CWS							
Participant	Sex	Age	% WS	TSO (months)	Treatment Status	MLU	PPVT
1	M	4;2	6	23	Yes	5.92	128
2	M	4;11	9	12	Yes	3.48	95
3	M	3;5	6	6	No	2.06	107
4	M	4;9	3	28	Yes	5.20	101
5	F	3;3	11	6	No	3.92	111
6	M	4;5	24	12	Yes	3.98	127
7	F	4;0	9	12	No	3.60	104
Mean		4;1	9.71	14.14		4.02	110
SD		0;7	6.32	7.72		1.15	11.73

Table 1. Characteristics of the children who stutter (CWS). Table includes sex, age, percentage of words stuttered (% WS), time since stuttering onset (TSO) in months, treatment status, mean length of utterance (MLU), and Peabody Picture Vocabulary Test (PPVT) standard scores. Means and standard deviations (SD) are also reported.

CWNS				
Participant	Sex	Age	MLU	PPVT
1	M	4;2	3.93	114
2	M	4;10	5.33	108
3	M	3;4	3.02	110
4	M	4;8	4.16	121
5	F	3;2	3.30	106
6	M	4;5	4.15	105
7	F	4;1	3.08	118
Mean		4;1	3.85	111.71
SD		0;7	0.75	5.67

Table 2. Characteristics of the children who do not stutter (CWNS). Table includes sex, age, mean length of utterance (MLU), and Peabody Picture Vocabulary Test (PPVT) standard scores. Means and standard deviations (SD) are also reported.

Anxiety Measures

Assessment of each child's anxiety was determined on the basis of three measures as follows:

Parent Questionnaire

The Preschool Anxiety Scale (Parent Report) (PAS) (Spence & Rapee, 1999) was administered to one parent of each participant. The PAS is designed to provide an overall measure of anxiety, in addition to an indication of specific subtypes of anxiety in children. It has good construct validity and reliability in comparison to other anxiety measures (Spence et al., 2001). The PAS consists of five subscales, namely separation anxiety, physical injury fears, social phobia, obsessive compulsive disorder, and generalized anxiety disorder, as well as a total score. Parents are required to rate their child's behaviours on a scale from 0 to 4. The items are then grouped into the subtypes of anxiety. Particular emphasis in the present study was placed on the Social Phobia subscale, which is an estimate of state anxiety, as well as the Generalized Anxiety Disorder subscale, which is an estimate of generalized anxiety. In addition, the total score across all the subscales was considered. There are a total of 28 items on the PAS, with the total possible score ranging from a minimum of 0 (i.e., rating of '0' on all items) to a maximum of 112 (i.e., rating of '4' on all items). Among both the CWS and CWNS groups, six mothers and one father completed the questionnaire.²

² In instances where parents were unable to rate their child's behaviours on the scale, dummy variables were calculated by substituting the mean value scored on the remaining items relating to that particular subscale (Spence, personal communication).

Child Questionnaire

The Communication Attitude Test for Preschool and Kindergarten Children Who Stutter (KiddyCAT) (Vanryckeghem & Brutten, 2007) was administered to each child. The KiddyCAT is designed to determine the presence of negative communication attitudes in preschool CWS. It has impressive reliability, as well as good content, criterion and construct validity (Vanryckeghem & Brutten, 2007). The KiddyCAT consists of 12 questions presented verbally to the child (e.g., ‘Do your parents like the way you talk?’, ‘Is it hard for you to say your name?’). Participants are required to answer ‘yes’ or ‘no’ to each question.³ The total possible score on the KiddyCAT ranges from 0 (i.e., score of ‘0’ on all items) to 12 (i.e., score of ‘1’ on all items).

Cortisol Measures

Each participant was required to provide three saliva samples to measure cortisol levels. The samples were collected by having the child chew softly on a citric-acid flavoured Aktiengesellschaft & Co. Sarstedt Salivette® dental roll for approximately 30-60 seconds. The rationale for using citric-acid flavoured Salivettes was to stimulate increased saliva flow, as well as to make the task appealing to the child. Following collection, the samples were frozen at -20C before they were sent to a steroid and immunobiochemistry laboratory (Canterbury Health Laboratories), where they were analysed by a Steroid Biochemist.

³ A score of ‘1’ was assigned in instances where children answered ‘sometimes’ to the questionnaire items.

Data Collection Procedures

The data collection process involved two sessions that spanned a one-week period for each child. A flow chart of the sequence of data collection is provided in Figure 2. The first session was dedicated exclusively to the collection of a saliva sample. This initial sample was referred to as the Basal sample. It was collected at approximately 11:00 am. The 11:00 am sampling period was selected because it was assumed that cortisol levels tend to remain stable between 11:00 am and 12:00 pm (Kirschbaum & Hellhammer, 1989). Both the researcher and the participant donned Ansell SensiClean® powder-free latex gloves on one hand prior to handling the Salivette. The participant was instructed to put the whole Salivette in their mouth and chew it without swallowing. They were told that it would taste like a fruit and asked to determine which fruit it tasted like. The researcher supervised participants during the collection of all saliva samples due to the potential risk of swallowing or choking on the Salivettes. Once the Salivette was saturated with saliva, the researcher asked the participant to remove it and replace it in its airtight plastic holder. The holder was then labelled with the participant's initials, the date, and the letter 'B' to denote it as the Basal sample.

The second data collection session occurred exactly 7 days later. The rationale for this was to control for daily individual variation in cortisol levels (Kirschbaum & Hellhammer, 1989). During this session, two more saliva samples were obtained. A saliva sample was collected, again at 11:00 am, following the procedures outlined above. This sample was referred to as the Pre-conversation sample. Salivettes for this sample were labelled with the participant's initials, the date, and the letters 'Pre' to denote them as the Pre-conversation sample. Following collection of the saliva sample, participants

engaged in spontaneous conversation with the researcher for approximately 10 minutes on topics of immediate relevance to the participant concerned. Parallel play, using a variety of participants' own toys, was used to begin the conversation. In instances where parallel play did not promote conversation, participants were shown pictures of typical childhood experiences (e.g., going to the dentist, having a birthday party at a McDonalds restaurant, digging a sandcastle) and asked to share their own similar experiences. All conversations were audio taped using a cassette recorder [Transonic TC656PC] and an external microphone [DSE Z111], which was placed no more than 20 centimetres from the participants' mouths.

Following this conversation period, the third and final saliva sample was collected and referred to as the Post-conversation sample. Approximately 15 minutes elapsed between the collection of the Pre- and Post-conversation samples. Salivettes collected at this stage were labelled with the participant's initials, the date, and the letters 'Post' to denote them as the Post-conversation sample. Following collection of the Post-conversation sample, the researcher administered the PPVT (Dunn & Dunn, 1981) and the KiddyCAT (Vanryckeghem & Brutton, 2007) to the child. Administration of these assessments was randomised to eliminate order effects. During this time, one of the parents was required to complete the PAS (Spence & Rapee, 1999). At the conclusion of the second data collection session, participants were rewarded for their co-operation with a colourful sticker, as well as their choice of either blowing soap bubbles or playing a game of Skittles.

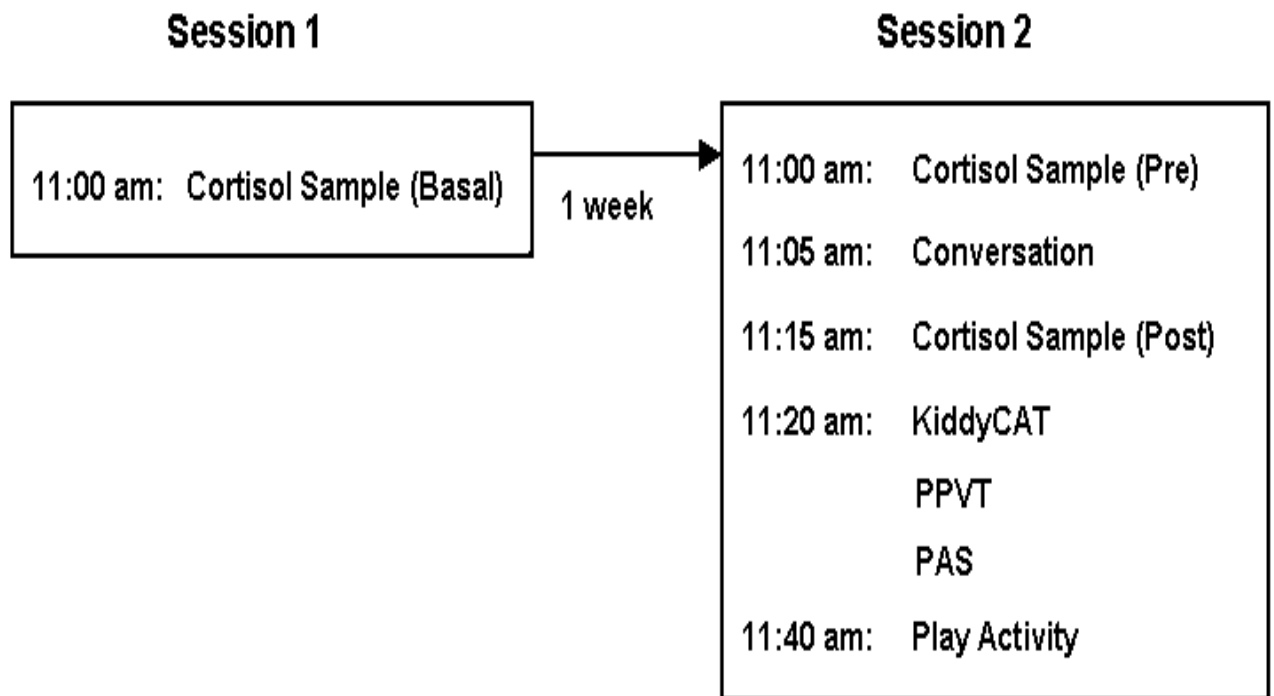


Figure 2. Flowchart of the sequence of data collection spanning a one-week period.

Session One involved collection of the Basal cortisol sample. Session Two involved collection of the Pre- and Post-conversation cortisol samples, as well as a conversational speech sample. The conclusion of Session Two involved administration of the KiddyCAT (Vanryckeghem & Brutton, 2007), the PPVT (Dunn & Dunn, 1981) the PAS (Spence & Rapee, 1999), and a play activity.

Data Analysis

Data collected from the communication measures were analysed to determine stuttering severity (for CWS participants only), as well as MLU to gain information on participants' general expressive language ability. Results from the PPVT (Dunn & Dunn, 1981) were used to determine receptive language ability. The KiddyCAT (Vanryckeghem & Brutten, 2007) and PAS (Spence & Rapee, 1999) scores were calculated and compared between the CWS and CWNS groups to determine differences in communication attitudes and generalized anxiety, respectively.

The salivettes (42 in total) were delivered to the Steroid and Immunobiochemistry Laboratory of the Canterbury District Health Board. The specific procedures involved in the extraction of the saliva from the samples and the determination of cortisol levels are detailed in Appendix B. These specific procedures were provided to the researcher by the Steroid Biochemist (Dr J. Lewis), who performed the analyses. Upon completion of the cortisol analysis, the researcher was provided with specific cortisol values that corresponded to the Basal, Pre- and Post-conversation samples collected for each child. These values were summarised for the participants belonging to the CWS and CWNS groups.

Reliability

To evaluate reliability associated with the determination of stuttering severity, both intra-judge and inter-judge measurements were performed. Two of the CWS participants were randomly selected. The percentage of words stuttered during their conversational speech samples was recalculated by the researcher to determine intra-

judge reliability, and independently by another qualified Speech-Language Therapist to determine inter-judge reliability. The initial percentages of words stuttered for the two participants were 6% and 9%, respectively. Intra-judge reliability revealed calculations of 8% and 9% of words stuttered for the two samples, and inter-judge calculations were 5% and 6%, respectively.

RESULTS

The results are presented in four sections. The first section concerns data related to the language measures, MLU and PPVT (Dunn & Dunn, 1981). The second section concerns data for the anxiety measures of the PAS (Spence & Rapee, 1999) and the cortisol analyses. The third section reports data for the KiddyCAT (Vanryckeghem & Brutton, 2007), and the fourth section reports the correlational analyses conducted separately for the CWS and CWNS groups.

Language Measures

The results related to MLU and PPVT are reported in Tables 1 and 2 for the CWS and CWNS respectively. Among the CWS, MLU ranged from 2.06 to 5.92, with a group average of 4.02. Among the CWNS, MLU ranged from 3.02 to 5.33, with a group average of 3.85. To determine whether MLU differed significantly between the two groups, a two-tailed *t*-test was performed. The test was not significant [$t(1,12) = 0.302$, $p < 0.76$], indicating comparable expressive language abilities between the groups.

Among the CWS, PPVT scores ranged from 95 to 128, with a group average of 110.

Among the CWNS, PPVT scores ranged from 105 to 121, with a group average of 111.

To determine whether PPVT scores differed significantly between the two groups, a two-tailed *t*-test was performed. The test was not significant [$t(1,12) = 0.241$, $p < 0.81$], indicating comparable receptive language abilities between the groups.

Anxiety Measures

The results for the PAS are listed in Table 3. The PAS Total score for the CWS group ranged from 5 to 37, with a group average of 20. For the CWNS group, the PAS Total score ranged from 1 to 51, with a group average of 21. To determine whether the PAS Total score differed between the two groups, a two-tailed *t*-test was performed. The test was not significant [$t(1,12) = 0.150, p < 0.88$], indicating that parents of CWS and CWNS judged their children to have equivalent levels of overall anxiety. For the Social Phobia subscale of the PAS, scores ranged from 0 to 18 for the CWS with a group mean of 7, and from 1 to 20 for the CWNS, also with a group mean of 7. A two-tailed *t*-test was performed and found not significant [$t(1,12) = 0.083, p < 0.93$], indicating little difference in state anxiety between children as judged by parents in each group. Scores for the Generalized Anxiety Disorder subscale of the PAS range from 0 to 9 with a group mean of 2 for the CWS, while scores for the CWNS group range from 0 to 10 with a group mean of 3. A two-tailed *t*-test was performed and was found to be nonsignificant [$t(1,12) = 0.210, p < 0.83$], indicating little difference in generalized anxiety between children as judged by parents in each group. The means for the CWS and CWNS groups for PAS Total score, as well as the Social Phobia subscale and Generalized Anxiety subscale scores are displayed in Figure 3.

The overall results for the cortisol analysis are found in Table 4. For the CWS, the Basal sample ranged from 5.8nmol/L to 14.6nmol/L, with an average result of 9.23nmol/L. The Pre-conversation measure, conducted prior to the conversational speech sample, ranged from 7nmol/L to 14.3nmol/L, with a mean of 9.34nmol/L. The Post-conversation measure, conducted immediately following the conversational speech

sample, ranged from 5.7nmol/L to 12.3nmol/L with an average result of 8.49nmol/L. For the CWNS, results for the Basal sample ranged from 5nmol/L to 10.9nmol/L, with an average result of 7.94nmol/L. The Pre-conversation sample ranged from 5.3nmol/L to 28.8nmol/L, with a mean of 12.16nmol/L, and the Post-conversation sample ranged from 6.5nmol/L to 50nmol/L with an average of 14.01nmol/L. In order to determine whether cortisol levels differed significantly between the CWS and CWNS groups, a two-way repeated measures ANOVA was calculated. The within groups factor was sampling period (Basal, Pre-, Post-conversation), and the between groups factor was fluency (CWS, CWNS). The test revealed no statistically significant differences between the CWS and CWNS groups based on sampling period [$F(2,2) = 0.898, p < 0.42$] or fluency [$F(1,12) = 0.525, p < 0.48$] and no interaction between the groups [$F(2,24) = 1.248, p < 0.30$]. The cortisol values for the individual CWS and CWNS participants at the Pre- and Post-conversation sampling periods are displayed in Figure 4. Mean cortisol values for the CWS and CWNS groups at each of the three sampling periods are displayed in Figure 5.

Upon examining the individual data obtained for the CWS and CWNS participants, it was apparent that the two groups yielded similar cortisol levels across the three sampling periods. However, there was an exception to this pattern, specifically Participant 7 of the CWNS group. This participant's cortisol levels were considerably higher at each sampling interval. To control for the effect of this participant being an "outlier", her cortisol results were replaced by the corresponding mean CWNS values derived from the remaining six participants. Separate *t*-tests were then performed between the CWS and CWNS groups for the Pre- and Post-conversation sampling

periods. The tests revealed no significant differences between groups for either the Pre-
[$t(1,12) = 0.026, p < 0.97$] or the Post-conversation [$t(1,12) = 0.908, p < 0.39$] cortisol
sampling data. Results of this adjustment were used as support for the original ANOVA
results, indicating no group differences in cortisol levels.

Group	CWS						CWNS					
Participant	Separation Anxiety	Physical Injury Fears	Social Phobia	Obsessive Compulsive	Generalized Anxiety Disorder	Total	Separation Anxiety	Physical Injury Fears	Social Phobia	Obsessive Compulsive	Generalized Anxiety Disorder	Total
1	1	0	5	0	0	6	2	6	1	0	0	9
2	2	9	8	2	3	24	0	5	2	0	0	7
3	4	9	18	0	2	33	9	4	14	5	8	40
4	1	3	0	1	0	5	3	10	8	5	3	29
5	2	9	5	0	0	16	3	1	6	0	2	12
6	2	2	6	3	6	19	0	0	1	0	0	1
7	7	10	8	3	9	37	7	14	20	0	10	51
Total	19	42	50	9	20	140	24	40	52	10	23	149
Mean	2	6	7	1	2	20	3	5	7	1	3	21
SD	1.98	3.85	5.08	1.28	3.23	11.41	3.16	4.56	6.72	2.26	3.81	17.50

Table 3. Subscale and total scores from the Preschool Anxiety Scale (PAS). The participants refer to the parents' report of the children who stutter (CWS) and the parents' report of the children who do not stutter (CWNS). The means and standard deviations (SD) for each group are also listed.

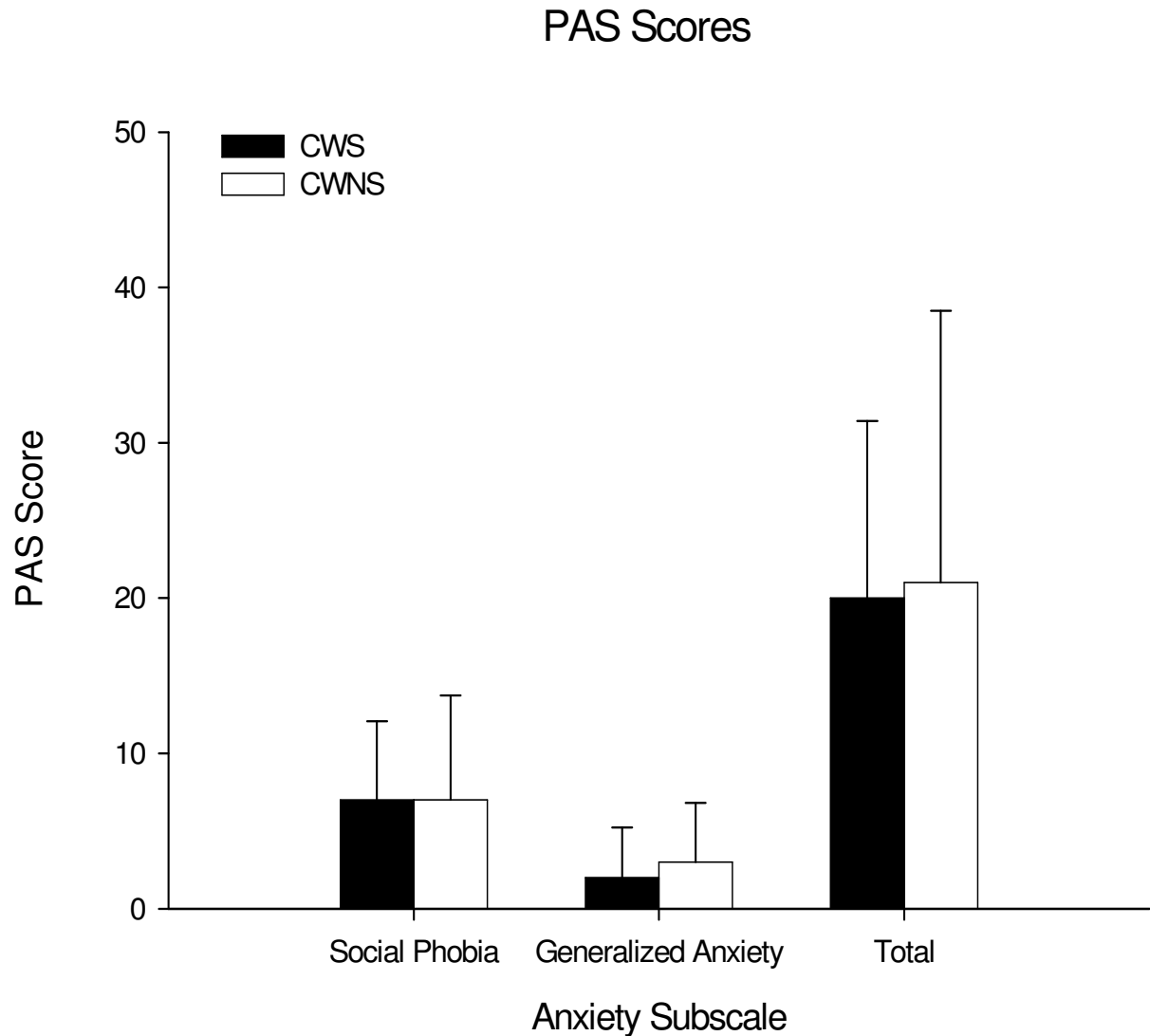


Figure 3. Mean scores for the Social Phobia and Generalized Anxiety Disorder subscales and the total score of the Preschool Anxiety Scale (PAS) for the respective groups of children who stutter (CWS) and children who do not stutter (CWNS). Standard deviations for each group on the three measures are also indicated.

Group	CWS			CWNS		
Participants	Cortisol (nmol/L)			Cortisol (nmol/L)		
	Basal	Pre	Post	Basal	Pre	Post
1	7.4	8.3	6	5.5	6	6.8
2	11	14.3	9.9	5.9	12.6	9.1
3	5.8	7	5.7	8	5.3	6.5
4	9.3	7.7	6.8	10.9	9.8	7.1
5	8.8	6.6	12.3	5	10.2	9.1
6	7.7	11.4	8.9	10.3	12.4	9.5
7	14.6	10.1	10.5	10	28.8	50
Mean	9.23	9.34	8.59	7.94	12.16	14.01
SD	2.66	2.57	2.32	2.31	7.29	14.74

Table 4. Salivary cortisol levels collected at Basal, Pre- and Post-conversation sampling times for the individual children who stutter (CWS) and children who do not stutter (CWNS). The group means and standard deviations (SD) are also included.

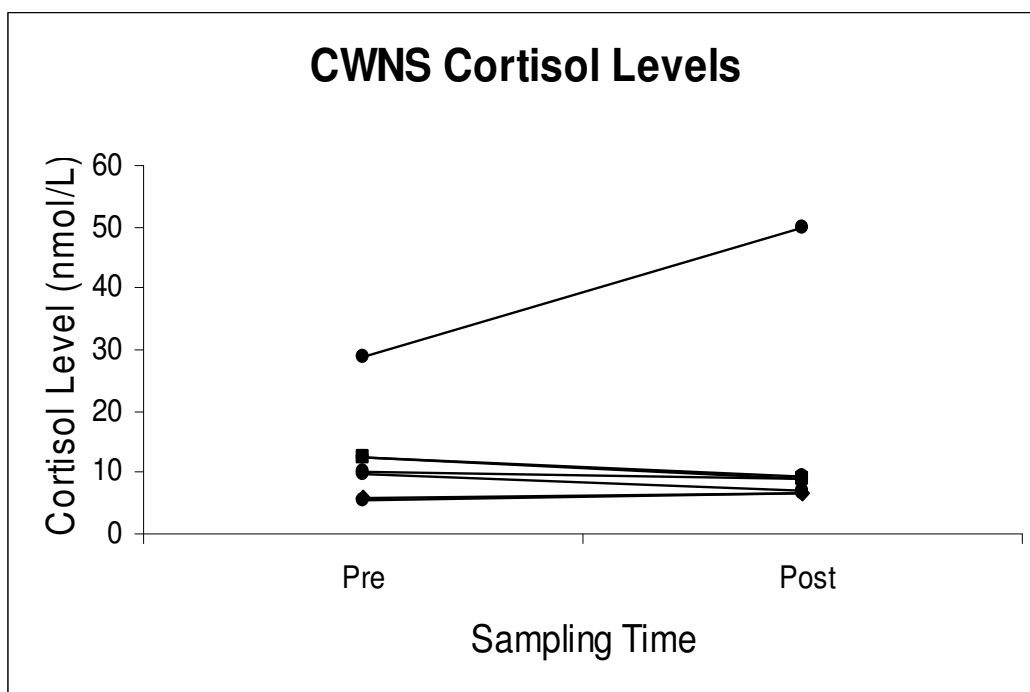
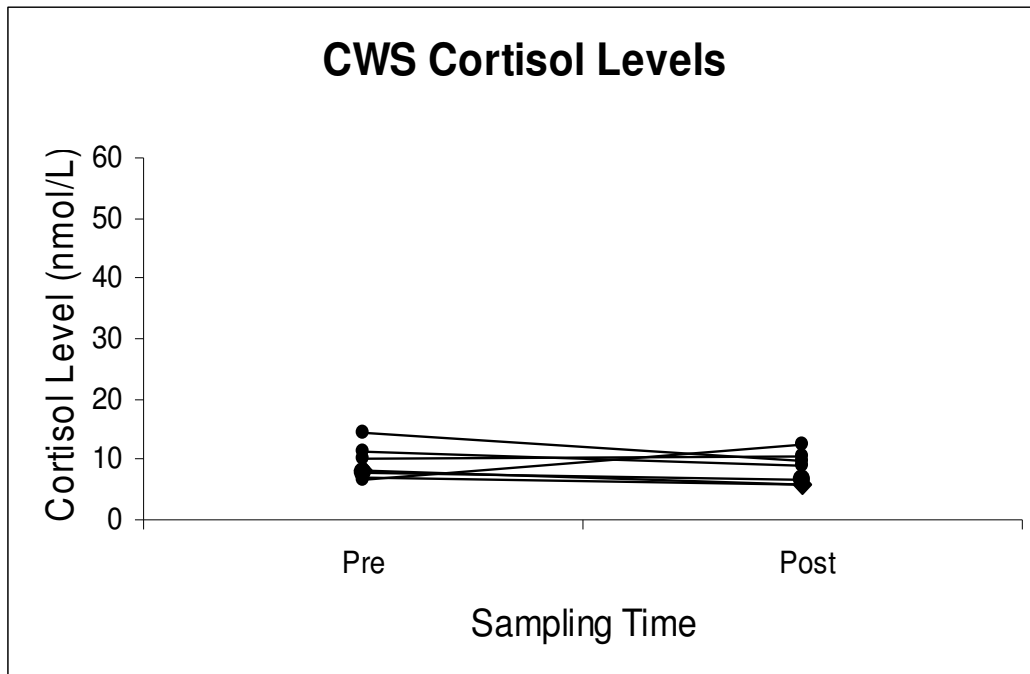


Figure 4. Salivary cortisol levels collected for individual children who stutter (CWS) and children who do not stutter (CWNS) at Pre- and Post-conversation sampling points.

Mean Cortisol Levels

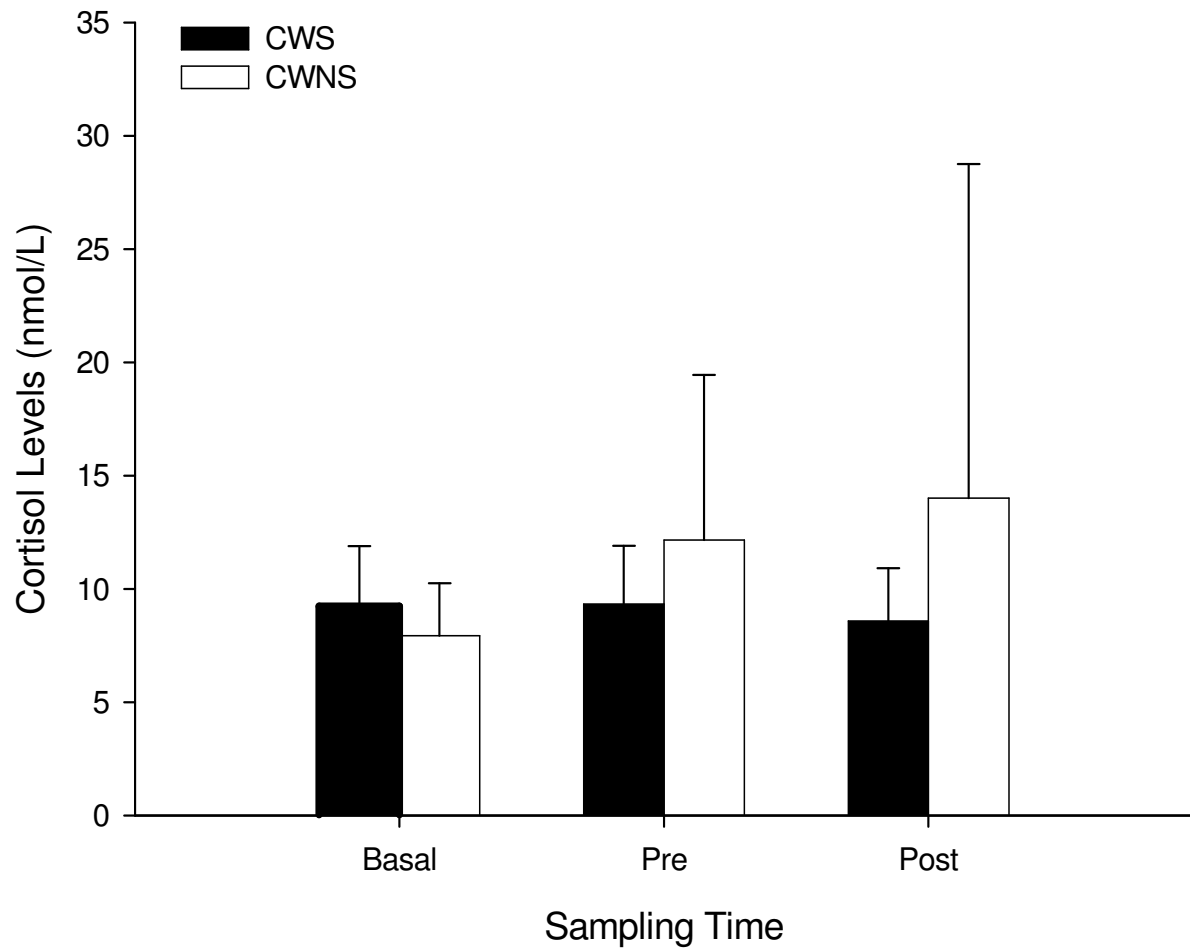


Figure 5. Mean cortisol levels for the group of children who stutter (CWS) and children who do not stutter (CWNS) at Basal, Pre- and Post-conversation sampling points. Standard deviations for each of the three sampling times are also indicated.

Communication Apprehension Measures

The results related to the KiddyCAT are found in Table 5. Among the CWS, KiddyCAT scores ranged from 0 to 6 with an average score of 2.14. Among the CWNS, KiddyCAT scores ranged from 0 to 6, also with an average score of 2.14. To determine whether communication attitudes differed significantly between the two groups, a two-tailed *t*-test was performed. The test was not significant [$t(1,12) = 0.000, p < 1.00$], indicating comparable communication attitudes among the CWS and CWNS groups.

Group	CWS	CWNS
Participant	KiddyCAT	KiddyCAT
1	0	1
2	2	1
3	3	6
4	0	4
5	0	2
6	4	1
7	6	0
Mean	2.14	2.14
SD	2.34	2.12

Table 5. KiddyCAT scores for the individual children who stutter (CWS) and children who do not stutter (CWNS). Data include the corresponding group means and standard deviations (SD).

Correlational Analyses

A series of Pearson Product-Moment correlational analyses were performed to determine whether the various language, anxiety, and communication apprehension variables were related within each group. The results for the CWS group are reported as a correlation matrix in Table 6. Significant correlations were found between age and Pre-conversation cortisol measures ($r = 0.706, p < 0.03$), TSO and PAS total score ($r = -0.726, p < 0.03$), TSO and Social Phobia subscale score ($r = -0.692, p < 0.04$), PAS total score and Social Phobia subscale score ($r = 0.753, p < 0.02$), PAS total score and Generalized Anxiety Disorder subscale score ($r = 0.717, p < 0.03$), PAS Total score and KiddyCAT score ($r = 0.837, p < 0.009$), and KiddyCAT score and Generalized Anxiety Disorder subscale score ($r = 0.963, p < 0.0002$). The correlations between TSO and PAS Total score, TSO and Social Phobia subscale score, and PAS Total score and the KiddyCAT score for the CWS participants are displayed in Figures 6, 7, and 8 respectively.

Results of correlations calculated for the CWNS group are reported as a correlation matrix in Table 7. Significant correlations were found between the Pre- and Post-conversation cortisol measures ($r = 0.954, p < 0.0004$), Post-conversation cortisol measures and Social Phobia subscale score ($r = 0.733, p < 0.03$), Post-conversation cortisol measures and Generalized Anxiety Disorder subscale score ($r = 0.685, p < 0.04$), PAS total score and Social Phobia subscale score ($r = 0.973, p < 0.0001$), PAS total score and Generalized Anxiety Disorder subscale score ($r = 0.967, p < 0.0001$), and Social Phobia subscale score and Generalized Anxiety Disorder subscale score ($r = 0.989, p < 0.00001$).

CWS

Age	1.0										
% WS	0.032	1.0									
TSO	0.629	-0.319	1.0								
Basal	0.280	-0.071	0.029	1.0							
Pre	0.706	0.399	-0.052	0.432	1.0						
Post	-0.162	0.383	-0.495	0.580	0.259	1.0					
Total PAS	-0.319	0.138	-0.726	0.383	0.245	0.260	1.0				
SP	-0.487	-0.020	-0.692	-0.264	-0.033	-0.225	0.753	1.0			
GA	0.111	0.488	-0.314	0.625	0.505	0.330	0.717	0.219	1.0		
KiddyCAT	-0.024	0.420	-0.428	0.479	0.401	0.191	0.837	0.452	0.963	1.0	
	Age	% WS	TSO	Basal	Pre	Post	Total PAS	SP	GAD	KiddyCAT	

Table 6. Correlation matrix for the group of children who stutter (CWS). Correlations are calculated for age, percentage of words stuttered (% WS), time since stuttering onset (TSO), cortisol levels at Basal, Pre-, and Post-conversation sampling times, total score (Total PAS), Social Phobia subscale score (SP), and Generalized Anxiety Disorder subscale score (GAD) of the Preschool Anxiety Scale (PAS), and KiddyCAT scores. Correlations in boldface were significant at the $p < 0.05$ level.

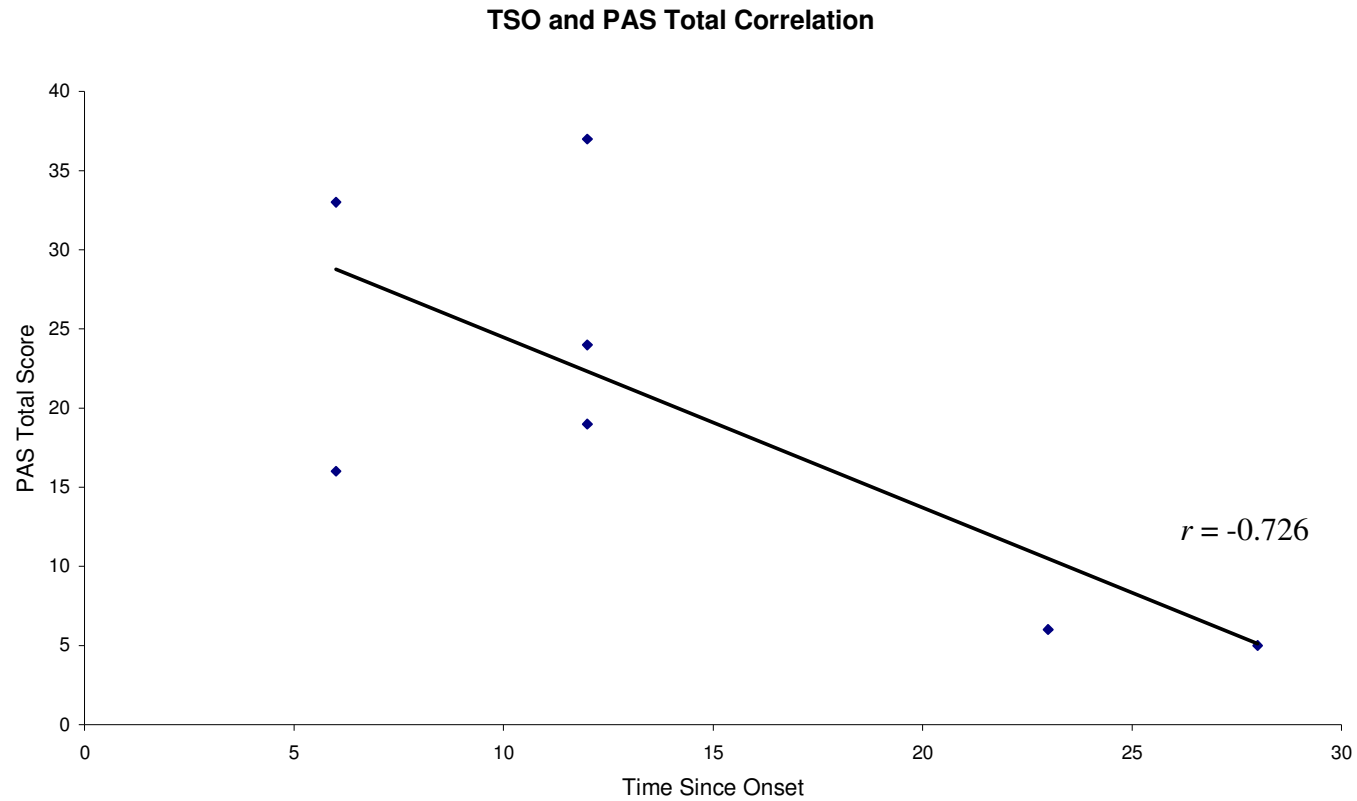


Figure 6. Scatter plot of the relationship between time since stuttering onset (TSO) and Preschool Anxiety Scale (PAS) total score for the children who stutter (CWS). The corresponding Pearson Product-Moment correlation coefficient is displayed. A line of best fit is superimposed on the data.

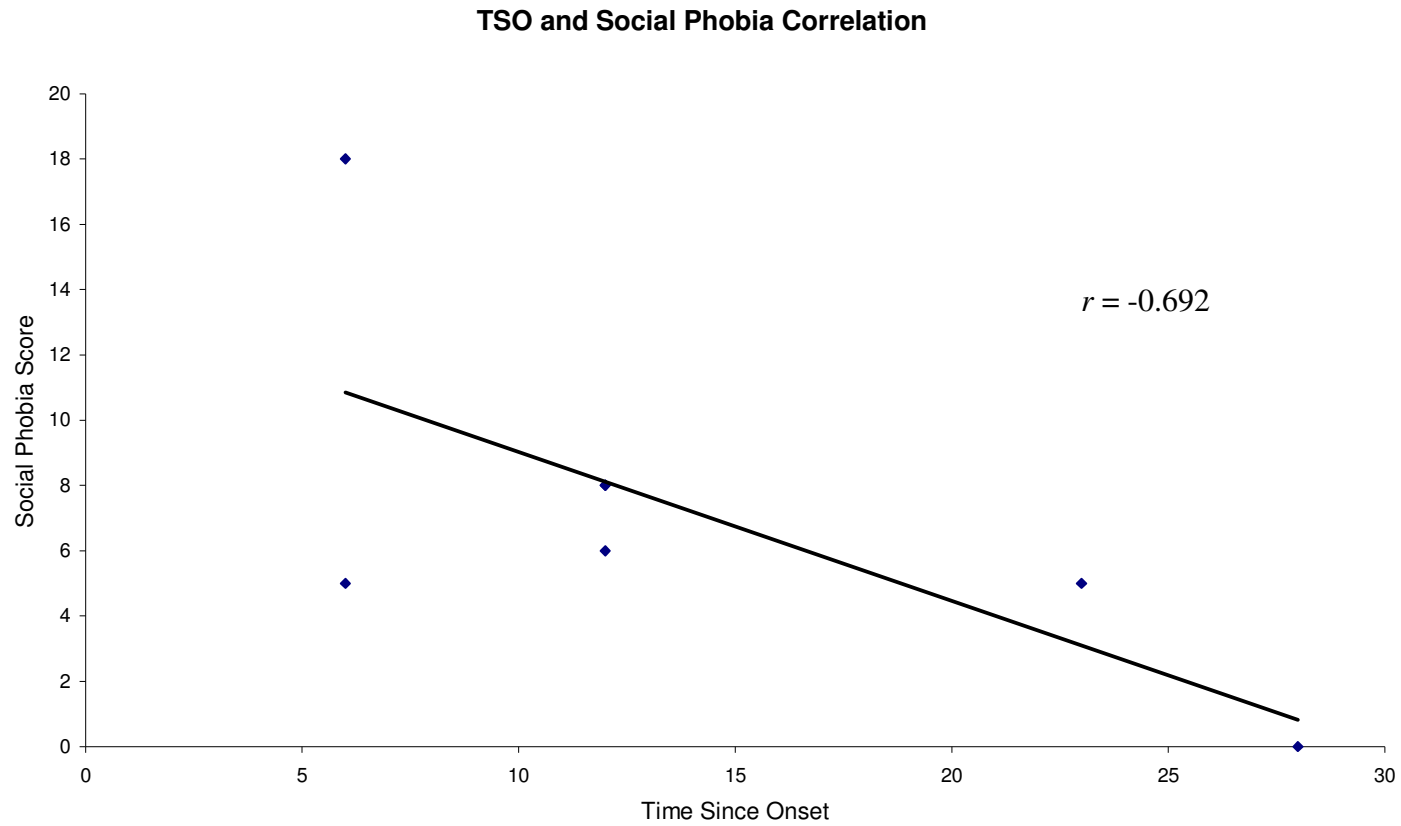


Figure 7. Scatter plot of the relationship between time since stuttering onset (TSO) and Social Phobia subscale score of the Preschool Anxiety Scale (PAS) for the children who stutter (CWS). The corresponding Pearson Product-Moment correlation coefficient is displayed. A line of best fit is superimposed on the data.

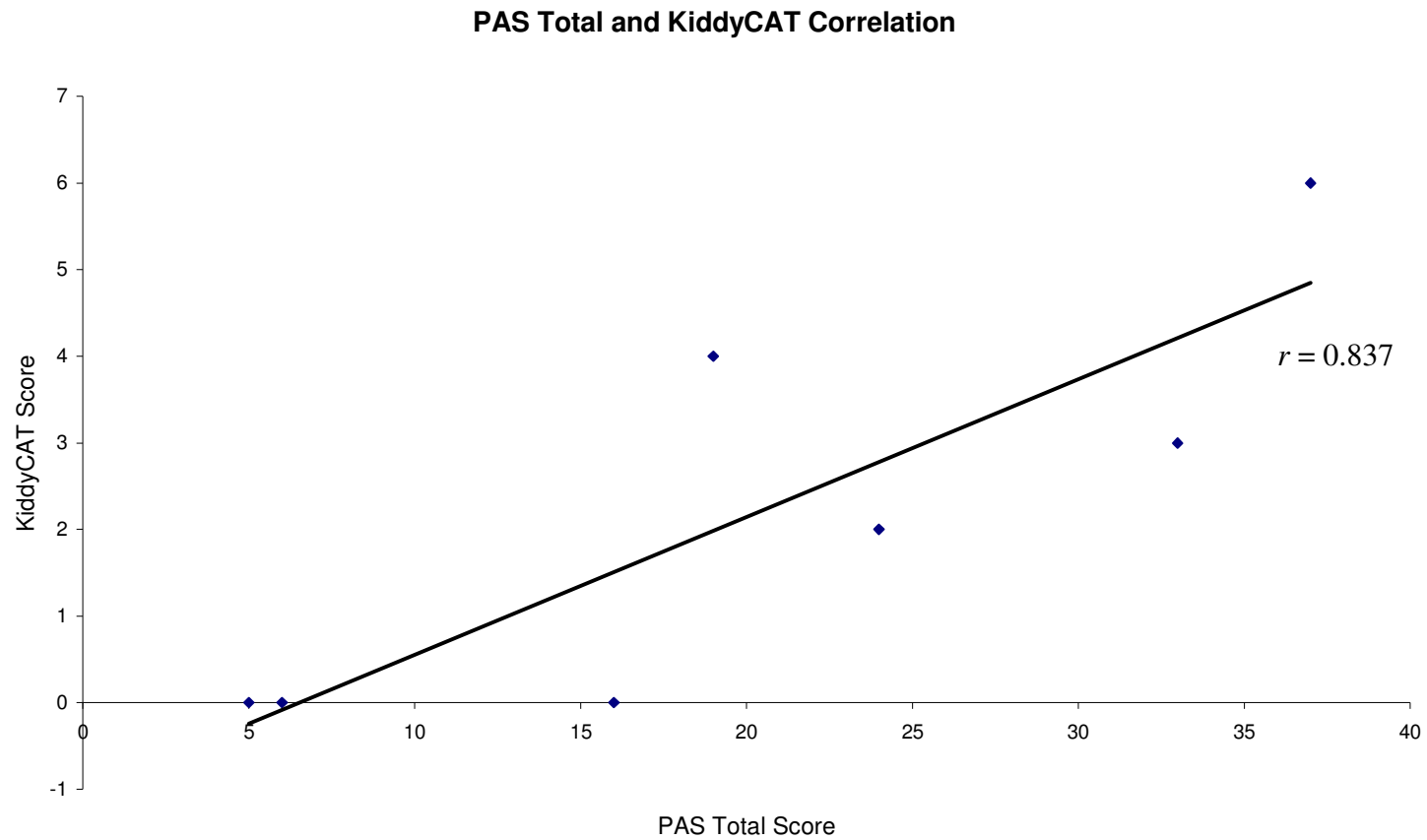


Figure 8. Scatter plot of the relationship between Preschool Anxiety Scale (PAS) total score and KiddyCAT score for the children who stutter (CWS). The corresponding Pearson Product-Moment correlation coefficient is displayed. A line of best fit is superimposed on the data.

CWNS

Age	1.0							
Basal	0.360	1.0						
Pre	0.182	0.401	1.0					
Post	0.005	0.355	0.954	1.0				
Total PAS	-0.270	0.437	0.482	0.648	1.0			
SP	-0.362	0.403	0.587	0.733	0.973	1.0		
GA	-0.405	0.390	0.518	0.685	0.967	0.989	1.0	
KiddyCAT	-0.373	0.131	-0.600	-0.491	0.323	0.223	0.281	1.0
	Age	Basal	Pre	Post	Total PAS	SP	GAD	KiddyCAT

Table 7. Correlation matrix for the group of children who do not stutter (CWNS). Correlations are calculated for age, cortisol levels at Basal, Pre-, and Post-conversation sampling times, total score (Total PAS), Social Phobia subscale score (SP), and Generalized Anxiety Disorder subscale score (GAD) of the Preschool Anxiety Scale (PAS), and KiddyCAT scores. Correlations in boldface were significant at the $p < 0.05$ level.

Summary

In summary, major findings of the present study are as follows:

- 1) There was no significant difference between CWS and CWNS as measured by the PAS (Spence & Rapee, 1999).
- 2) There was no significant difference between CWS and CWNS as measured by the KiddyCAT (Vanryckeghem & Brutton, 2007).
- 3) There was no significant difference between CWS and CWNS as measured by salivary cortisol.
- 4) There were no significant relationships between the percentage of words stuttered and either the PAS, the KiddyCAT, or cortisol levels.

DISCUSSION

Four hypotheses were posed in the present study. They were: (1) CWS will not differ significantly from CWNS on measures of generalized anxiety, (2) CWS will differ significantly from CWNS on measures of communication apprehension, (3) There will be no significant relationship between measures of generalized anxiety and stuttering severity, and (4) There will be a significant relationship between communication apprehension and stuttering severity. Results are discussed in reference to each of these hypotheses.

Hypothesis One

Evidence of higher generalized anxiety among the CWS group could have been provided in two ways. First, based on parent report, the total score and the Generalized Anxiety Disorder subscale score of the PAS (Spence and Rapee, 1999) provided an estimate of overall generalized anxiety. Second, elevated cortisol levels rendered at Basal, Pre-, and Post-conversation sampling points would have been indicators of a non-specific, generalized anxiety condition. Results revealed no significant differences between CWS and CWNS on measures of generalized anxiety. This was confirmed by the PAS total and Generalized Anxiety Disorder subscale scores respectively, as well as the Basal, Pre-, and Post-conversation cortisol measures. The collective results from these various measures provide support for Hypothesis 1. Surprisingly, the parent report for the CWNS as a group revealed a larger range of PAS scores than the parent report for the CWS group, although the difference between the groups was not significant. The higher variability among the CWNS was most likely due to an outlier (Participant 7), whose total score and scores

on three of the five subscales (including the Generalized Anxiety Disorder subscale) of the PAS were markedly higher than what parents of the remaining CWNS participants reported (see Table 3). A similar pattern was found for the Pre- and Post-conversation cortisol measures. As a group, the CWNS revealed a larger range of scores and a higher average than the CWS. The likely reason for the higher variability in cortisol results among the CWNS can also be attributed to Participant 7, whose cortisol measures were markedly higher than the remaining CWNS participants.

Previous research with adult PWS has resulted in conflicting evidence regarding the Generalized Anxiety Concept (Craig, 1990; Craig et al., 2003; Fitzgerald et al., 1992; Miller & Watson, 1992). For example, Craig (1990) found that in addition to experiencing anxiety specific to speaking situations, PWS also had higher levels of trait anxiety than PWNS. Fitzgerald et al. (1992) concluded that generalized anxiety was related to stuttering. Conversely, Blood et al. (1994) reported specifically that PWS did not demonstrate any more generalized anxiety than PWNS. In addition, Miller and Watson (1992) reported that PWS did not differ significantly from PWNS on any measures of anxiety, but only with regard to communication apprehension. Andrews and Harris (1964) also did not find a significant difference between groups of CWS and CWNS on a generalized anxiety measure. Similarly, research using the STAIC (Spielberger et al., 1970) found state and trait anxiety scores of the CWS to be within normal limits (Craig & Hancock, 1996).

There are two possible explanations for the lack of difference between preschool CWS and CWNS in the present study on measures of generalized anxiety. Firstly, research has found that abundant expression of parental warmth and positivity towards children is linked with lower levels of generalized anxiety in childhood

(Dadds, Barrett, Rapee, & Ryan, 1996; Dumas, LaFreniere, & Serketich, 1995). In contrast, positive associations have been found between generalized anxiety levels in children and parents who exercised greater constraint, rejection, and criticism, coupled with less encouragement of independence (Dumas et al., 1995; Hudson & Rapee, 2001, 2002; McClure, Brennan, Hammen, & Le Brocque, 2001; Siqueland et al., 1996). Perhaps both the CWS and CWNS involved in this study were being reared in environments rich in emotional warmth and positive regard, thus rendering them no different from each other in terms of generalized anxiety. However, it is interesting to consider the results for Participant 7 of the CWNS group. While it remains to be determined whether aspects of child-rearing contribute to the child's elevated anxiety level, it is clear that the child had a high anxiety level and this was accurately evaluated by her parents.

A second explanation to account for supporting this hypothesis concerns the involvement of the majority of the CWS participants in a treatment program. Four of the seven CWS participants in the present study were currently in treatment at the time of data collection, and a further two were awaiting treatment. Craig (1990) found that trait anxiety levels in adult PWS decreased to within normal limits following intensive treatment for stuttering. The simple act of receiving treatment for stuttering may have an additional benefit of reducing any associated anxiety. Perhaps the effects of treatment played a role in maintaining the present group of CWS participants' low generalized anxiety levels at levels comparable to that of the CWNS participants.

Hypothesis Two

Evidence of a significant difference between CWS and CWNS in regard to communication apprehension could have been provided by three sources. First, the results of the Social Phobia subscale of the PAS provided an estimate of state anxiety specific to social situations. Second, each child's performance on the KiddyCAT (Vanryckeghem & Brutton, 2007) provided a direct estimate of communication attitudes. In addition, elevated cortisol levels at the Post-conversation sampling point compared to the Pre-conversation sampling period would have been indicative of heightened state anxiety specific to communication. No significant differences were found between the CWS and CWNS participants on the various measures of communication apprehension. The Social Phobia measure, taken from the PAS, indicated that the parent report for the CWNS as a group revealed a larger range of scores than for the CWS. Similar to the results for generalized anxiety, the larger range among the CWNS group on the basis of parent report was likely due to Participant 7's outlying score on the Social Phobia subscale. However, both groups had the same mean, suggesting that parents across both groups judged their children to have low social phobia. Results from the KiddyCAT indicated that both groups had an identical mean and range of scores. This similarity was taken to confirm that both groups were highly similar in communication attitude, regardless of differences in fluency. Furthermore, cortisol levels at Pre- and Post-conversation sampling periods provided additional support to indicate that there were no significant differences in state anxiety specific to communication situations between CWS and CWNS. In general, cortisol levels of the CWS and CWNS group changed little from the Pre- to Post-conversation sampling periods. The overall results serve to reject Hypothesis 2.

The findings of the present study appear to contrast with the literature, which has indicated that PWS experience significantly more negative attitudes towards communication than PWNS (Andrews & Cutler, 1974; De Nil & Brutten, 1991; Guitar, 1976; Vanryckeghem, 1995). In Miller and Watson's study (1992), the correlation between negative communication attitudes and state anxiety was higher for PWS than PWNS, suggesting that for PWS, state anxiety increases due to the belief that speech is erratic and threatening. People who judge their own stuttering to be severe tend to have the poorest communication attitudes (Miller & Watson, 1992). Blood et al. (1997) found heightened cortisol levels for participants identified as having high communication apprehension, regardless of whether they were PWS or PWNS. Messenger, Onslow, Packman, and Menzies (2004) reported that adult PWS experience increased levels of state anxiety compared to PWNS, particularly in social situations. Stein et al. (1996) found that up to 44% of PWS seeking treatment for their stuttering also experienced a concurrent diagnosed social phobia. In addition, heightened state anxiety levels specific to communication situations have been associated with persistent stuttering (Davis et al., 2007). Vanryckeghem et al. (2005) revealed clear evidence of more negative communication attitudes towards speaking situations in CWS compared to CWNS at the onset of stuttering (i.e., 3 or 4 years of age).

There are two main explanations for the lack of difference between CWS and CWNS on measures of communication apprehension. Firstly, there is evidence to suggest that children may not provide attitudinal responses to assessments of communication attitude, but rather report on the overall quality and stuttering severity of their speech in specific situations (Ulliana & Ingham, 1984; Ingham, 1997). Should this be true, it would seem that CWS undertake a subjective evaluation of their

speaking ability when completing a communication attitude assessment (such as the KiddyCAT), rather than judging their attitudes to speaking in specific communication situations. Hence, it may be that CWS and CWNS do not judge their speaking abilities differently at the onset of stuttering, when speech disfluencies are common among both CWS and CWNS.

A second possibility to consider is the fact that CWS simply have not had sufficient experiences of frustration with stuttering in social situations in order to have developed communication apprehension. Perkins (1986) found that negative communication attitudes arise from continuous experiences of speech disfluencies in communicative situations. Craig and Hancock (1996) suggested that CWS may not experience anxiety associated with their stuttering to the same degree as adult PWS because they have not experienced the “long-term effects of an extensive history of negative speech-related experiences” (p. 35) (e.g., dating, job interviews, and work-related social demands). Although it has been found that both preschool CWS and CWNS are aware of the differences between fluent and stuttered speech at the onset of stuttering (Ambrose & Yairi, 1994; Ezrati et al., 2001), it is likely that CWS have not been exposed to the same degree of negative reactions that adult PWS associate with speaking situations. Accordingly, young CWS may not yet be conditioned to have negative attitudes towards communication or an ensuing social anxiety. In examining anxiety levels in CWNS aged 8 to 12 years, Spence (1998) found that in comparison to other CWNS age groups, symptoms of social phobia were most frequent between 9 and 11 years of age. Assuming state anxiety is likely to naturally occur later in child development, it is probable that aspects of state anxiety (namely communication apprehension) are likely to appear in the later stages of stuttering development. At present, research comparing preschool CWS and CWNS has not

demonstrated significant differences in communication apprehension. Perhaps, as Craig and Hancock (1996) concluded, anxiety is simply less prevalent in CWS compared to adult PWS, but develops gradually with age.

Hypothesis Three

Evidence for a relationship between generalized anxiety and stuttering severity could have been provided by a series of relationships between scores on the various anxiety measures for the CWS participants and the percentage of words stuttered. First, a correlation between results from either the total scores or the Generalized Anxiety Disorder subscale scores of the PAS and percentage of words stuttered would have revealed a relationship between generalized anxiety and stuttering severity. Second, correlations between the Basal, Pre-, and Post-conversation cortisol measures with percentage words stuttered would have revealed a relationship between generalized anxiety and stuttering severity. However, no relationships between these measures of anxiety and stuttering severity were found. Accordingly, Hypothesis 3 is accepted.

Stuttering severity is associated with emotions such as embarrassment, frustration, and apprehension of negative social evaluation (Craig et al., 2003). As such, greater anxiety levels should be associated with a higher frequency of stuttering. However, there is conflicting evidence in the literature regarding the presence of a relationship between generalized anxiety and stuttering severity in PWS. Craig et al. (2003) discovered significantly higher generalized anxiety levels in PWS who stuttered more severely than in PWNS. However, Ezrati-Vinacour and Levin (2004) found no differences in generalized anxiety levels of individual PWS as a function of stuttering severity. Blood et al. (1994) also found no associations between stuttering

severity and generalized anxiety as measured by cortisol levels and the STAI (Spielberger et al., 1970) in adult PWS. In addition, Craig and Hancock (1996) found no relationship between stuttering severity and trait or state anxiety in CWS aged 9 to 14 years.

In the present study, CWS did not differ significantly from CWNS on various measures of anxiety. Therefore, it was unlikely that a relationship between generalized anxiety and stuttering severity would be found. The present results for CWS seem to support past research for PWS showing no strong relationship between generalized anxiety and stuttering severity. However, it is important to note that the present group of CWS was small and there was no specific analysis in regard to type of disfluency (e.g., repetition, prolongation, block). Therefore, the resulting correlations between generalized anxiety and stuttering severity were low. Furthermore, stuttering severity appears to be dependent on factors such as communication partner status or the number of addressees, novelty, formality, and familiarity with the speaking situation, and feelings of conspicuousness (Buss, 1980; Porter, 1939; Siegel & Haugen, 1964). Because these factors were not isolated in the present analysis, their relationship to generalized anxiety remains to be determined.

Hypothesis Four

Evidence in support of this hypothesis could have been provided by a series of relationships between measures of communication apprehension for the CWS participants and percentage of words stuttered. First, a correlation between the KiddyCAT scores and percentage of words stuttered would have provided a direct relationship between communication attitudes and stuttering severity. Second, a correlation between the Social Phobia subscale scores of the PAS and percentage of

words stuttered would have indicated a relationship between state anxiety specific to communication situations and stuttering severity. Finally, a correlation between each of the Pre- and Post-conversation cortisol measures and percentage words stuttered would have indicated a relationship between communication apprehension and stuttering severity. No significant correlations were found between any of the measures of communication apprehension and stuttering severity. Accordingly, Hypothesis 4 is rejected.

The present results contrast with previous research relating communication apprehension and stuttering severity. For example, Miller and Watson (1992) reported that communication attitudes of PWS appeared to deteriorate with worsening self-ratings of stuttering severity. Ezrati-Vinacour and Levin (2004) found a difference in state anxiety levels as a function of stuttering severity. Craig et al. (2003) suggested that state anxiety should be greater for PWS than PWNS in social situations because stuttering severity is associated with an apprehension of negative social evaluation. More specifically, CWS as young as 3 and 4 years were found to experience more negative or mal-attitudes towards speech than CWNS, which appeared to worsen with age and stuttering severity (De Nil & Brutton, 1990, 1991; Vanryckeghem, 1995; Vanryckeghem & Brutton, 1996, 1997; Vanryckeghem et al., 2001, 2005).

A possible explanation for the lack of relationship between communication apprehension and stuttering severity in the present study is that young CWS simply do not show increased negative communication attitudes or state anxiety compared to CWNS at the onset of stuttering. Therefore it is unlikely that measures of communication apprehension are related to stuttering severity at such an early age. It is interesting to note that the KiddyCAT did not differentiate CWS from CWNS in the

present study, despite evidence to support its validity and reliability for children at preschool age (Vanryckeghem & Brutten, 2007). Perhaps it is not an ideal measure of communication apprehension for children at the onset of stuttering.

In addition, a small sample and a tight spread in stuttering severity may have impacted on the lack of relationship between communication apprehension and stuttering severity. The Iowa Scale for Rating Severity of Stuttering (Johnson, Darley, & Spriestersbach, 1952; Williams, 1978) classifies stuttering on 12% to 25% of words as severe. According to this scale, six out of the seven CWS participants in the present study did not stutter severely (see Table 1). In the present study, stuttering severity was measured in percentage of words stuttered, but perhaps measuring it as percentage of syllables stuttered would have altered the spread of severity among the CWS participants. It is interesting to consider that TSO may be a more sensitive variable to compare with communication apprehension, rather than stuttering severity. A negative correlation was found between TSO and Social Phobia subscale scores of the PAS, indicating that the greater the length of time children had been stuttering, the lower their state anxiety specific to communication situations. Upon close examination of the descriptive data for the CWS participants, it was revealed that those who had been stuttering for the greatest length of time were all in treatment. Thus, as TSO continues to accumulate, the effects of treatment appear to cause a decrease in state anxiety specific to social situations. Craig (1994) reported that state and trait anxiety levels, including communication apprehension could be reduced through completion of even moderately successful treatments for stuttering. Furthermore, it may be that at the earliest periods of stuttering onset, communication apprehension is simply not related to stuttering severity.

Clinical Implications

Although the present study did not directly examine the effects of treatment for stuttering on anxiety, research with adult PWS has clearly shown that elevated anxiety is a characteristic of stuttering which tends to decrease as a result of participation in a treatment programme (Craig, 1990; Fitzgerald et al., 1992; Messenger, et al., 2004; Miller & Watson, 1992). Thus, by providing early intervention to CWS with an effective treatment programme, such as the Lidcombe Program of Early Stuttering Intervention (Onslow, Packman, & Harrison, 2003), the disfluent speech characteristics of stuttering can be overcome, and the cycle of developing communication apprehension prevented. The Lidcombe Program is a behavioural treatment that directly targets the behavioural characteristics of stuttering, with the goal of eliminating stuttering. It was specifically designed for children younger than 6 years of age and is administered by parents. The programme has also undergone a randomized controlled trial as evidence of its effectiveness in eliminating stuttering (Harris, Onslow, Packman, Harrison, & Menzies, 2002). The relationship found in the present study between TSO and state anxiety would also support early involvement in treatment in order to reduce communication apprehension. Direct treatment for childhood anxiety (associated with stuttering) may not be necessary. The current group of CWS who had been in treatment the longest, showed the lowest anxiety, suggesting that reduced anxiety may be a residual effect of stuttering treatment.

Cortisol and Stuttering

The current study is possibly the first to examine cortisol levels in young CWS. The results obtained using this approach indicated there were no differences in

cortisol levels between preschool CWS and CWNS. Past cortisol studies have focused on adult PWS (Blood et al., 1994; 1997). The measurable cortisol levels obtained in past studies of adult PWS were similar to the present results obtained for children. However, the present and past studies differ in regard to their interpretation of the cortisol levels. In the present study, no significant differences were found between preschool CWS and CWNS for cortisol levels or communication apprehension. Conversely, Blood et al. (1994) found a significant difference in cortisol response between PWS and PWNS under a high stress condition with no apparent link to communication apprehension. Yet, Blood et al. (1997) found no significant differences in cortisol response between PWS and PWNS following a laboratory stressor, although a link was shown between communication apprehension and cortisol levels. Therefore, it is important to consider whether examining cortisol levels in people who stutter is a useful endeavour. Based on the present and past results, it seems as though cortisol yields little insight into the role of anxiety in PWS. That is, the physiologically measurable level of anxiety that appears to separate PWS from PWNS seems negligible.

Limitations

Although the results of the present study appear to indicate no differences in generalized anxiety or communication apprehension between preschool CWS and CWNS, there are some limitations to this study. For example, the small participant sample size contributes to low statistical power, thereby limiting the applicability of results to the broader population of preschool CWS (Jones, Gebiski, Onslow, & Packman, 2002). Further research using a larger sample of participants would be necessary to confirm this finding and support its applicability to the general

population. The low sample size also prevented analysis of sex differences on the various anxiety measures, although neither Spence et al. (2001), nor Vanryckeghem and Brutton (2007) found any sex differences on generalized anxiety and communication attitude measures, respectively. In terms of the PAS, the present study did not control for whether mothers or fathers of the participants completed the questionnaire. One father in each of the CWS and CWNS groups completed the questionnaire, which may have affected the spread of data. Spence et al. (2001) reported that mothers' responses to the questionnaire illustrated a clearer distinction between the anxiety subscales, whereas fathers' responses were more generalized across the subscales and revealed a trend of lower scores overall than mothers' responses. Hence, controlling for which parent completed the questionnaire may have yielded different results. The method of cortisol sampling may also have affected the past results. The cortisol samples were collected at 11:00 am for all participants for both the Basal and Pre-conversation sampling periods. Research has found that cortisol levels tend to remain stable between 11:00 am and 12:00 pm (Kirschbaum & Hellhammer, 1989), however they tend to remain stable during other periods of the day as well. Perhaps collecting the cortisol measures at a different time of day, while still remaining consistent across participants, would have altered the results. Further, the present study did not control for the presence or absence of stuttering treatment, or the type of treatment being administered. These uncontrolled variations in treatment may likewise have influenced the present results.

Finally, it is necessary to note that temperament was not considered as a possible variable affecting the relationship between anxiety and stuttering in the present study. CWS in general are thought to be more susceptible to sensitive temperaments than their fluent peers (Anderson, Pellowski, Conture, & Kelly, 2003).

Temperamental characteristics include negative emotionality, difficultness, adaptability to novel situations and people, activity level, self-regulation, reactivity, and sociability-positive emotionality (Anderson et al., 2003). Various researchers have examined the role of temperament in childhood stuttering (Anderson et al., 2003; Karrass et al. 2006). For example, Andrews et al. (2003) found preschool CWS to be slow to adapt to novel situations and changes of routine, less distractible, and more erratic in their physiological functions than sex and age-matched CWNS. The authors concluded that perhaps slow adaptation to new situations could account for increased fluency in familiar situations and a corresponding increased disfluency in unfamiliar situations. In addition, Karrass et al. (2006) found preschool CWS to be more impulsive and less able to regulate their emotions and attention, and suggested that these inherent characteristics may contribute to their difficulties establishing fluent speech. Thus, it appears that temperament is associated with stuttering. In the present study, it may have been a confounding variable in the relationship between both state and trait anxiety and stuttering for preschool children.

Future Research

No differences between the CWS and CWNS groups in state and trait anxiety or communication apprehension were found in the present study. This would indicate that even if a difference was found in a similar study completed with a larger sample size, it would probably be a very small difference. Across all the assessments completed, mean scores between the CWS and CWNS groups were very similar. Thus, taking into account greater individual variation that could result from a larger sample size, group means would still not likely be significantly different. This notion warrants further research. In addition, while the present study indicated that treatment

for stuttering appeared to be effective in reducing communication apprehension, it did not control for treatment type. Treatments using prolonged speech or fluency shaping techniques could either have similar or different effects on the characteristics of stuttering. It would thus be of interest to perform a controlled study examining the effect of TSO and treatment type on communication apprehension in CWS.

Furthermore, a longitudinal study examining generalized anxiety and communication apprehension in CWS with and without treatment from the onset of stuttering into adulthood would be of interest in determining the development of the relationship between anxiety and stuttering.

Conclusion

In the present study, no significant differences were found in generalized anxiety or communication apprehension between preschool CWS and CWNS. Further, there were no strong relationships between stuttering severity and generalized anxiety or communication apprehension for the CWS group. Therefore, it appears that at the onset of stuttering, CWS are not affected by the negative psychological characteristics associated with the disorder, which are found to occur in older PWS. However, past research indicates that these characteristics are likely to develop over time (Alm, 2004; De Nil & Brutton, 1990, 1991). Thus, it is concluded that generalized anxiety and communication apprehension are not associated with early childhood stuttering. Any changes in anxiety levels are likely to occur with increased chronological age and stuttering chronicity. The provision of effective early treatment for stuttering may be beneficial in preventing the potential development of anxiety and negative communication attitudes in CWS.

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APPENDIX A

HEC Approval

Participant Information

Participant Consent Form



HEC Ref: 2007/42

24 May 2007

Bianca Phaal
Communication Disorders
UNIVERSITY OF CANTERBURY

Dear Bianca

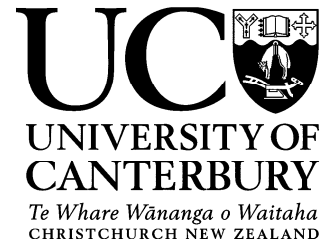
The Human Ethics Committee advises that your research proposal “An Examination of Anxiety and Communication Apprehension in Preschool Children who Stutter” has been considered and approved. However this approval is subject to the amendments you outlined in your email of 22 May 2007.

Yours sincerely

Dr Michael Grimshaw
Chair, Human Ethics Committee

Department of Communication Disorders

Bianca Phaal
Speech-Language Therapist
Master of Speech and Language Therapy Research Project



Project Information

Your child is invited to participate in the research project, “*An Examination of Anxiety and Communication Apprehension in Preschool Children who Stutter*”.

The aim of this project is to investigate whether preschool children who stutter have different attitudes towards speaking situations than their peers who do not stutter. Previous research has suggested that attitudes towards speaking situations in adults who stutter may influence treatment outcomes.

Your child’s involvement in this project will include the collection of a conversational speech sample to determine the severity of their stuttering and to provide a general indication of their spoken language development. In addition, your child will be administered the Peabody Picture Vocabulary Test as a measure of their understanding of spoken words, and the Communication Attitude Test to investigate their attitudes towards speaking situations. Your child will also be asked to provide three saliva samples as a measure of anxiety. The samples will be collected by chewing on a cotton swab for approximately 30-60 seconds. You will also be asked to complete the Preschool Anxiety Scale (Parent Report) as an indicator of your child’s general anxiety level. Results will be analysed to determine your child’s overall anxiety level as well as their attitude towards speaking situations.

The results of the project may be published, however your child will be assured of the complete confidentiality of data gathered in this investigation; the identity of participants will not be made public without their consent. To ensure anonymity and confidentiality, the information gathered will be assigned a number and all identifiable information removed. Data will be kept in a locked filing cabinet within a lockable room in the Department of Communication Disorders and will be destroyed on completion of the research. The researcher and her supervisor will be the only authorised persons to have access to the data.

The project is being carried out as a requirement for a Master of Speech and Language Therapy by Bianca Phaal, under the supervision of Professor Michael Robb, who can be contacted at the University of Canterbury on 364-2401. They will be pleased to discuss any concerns you may have about participation in the project.

The project has been reviewed *and approved* by the University of Canterbury Human Ethics Committee.

Department of Communication Disorders



*Bianca Phaal
 Speech-Language Therapist
 Master of Speech and Language Therapy Research Project*

Consent Form

“An Examination of Anxiety and Communication Apprehension in Preschool Children who Stutter”

I have read and understood the description of the above-named project. On this basis, I agree to my child’s participation in the project, and I consent to publication of the results of the project with the understanding that anonymity will be preserved.

I understand that my child may withdraw from the project at any time, including withdrawal of any information my child or I have provided.

CHILD’S NAME (please print):

PARENT’S NAME:

Signature:

Date:

APPENDIX B

Procedures for the Analysis and Determination of Cortisol.

Prior to performing the cortisol analyses, the salivettes were thawed and centrifuged for 10 minutes at 3000 rpm to recover the saliva. Samples from a particular participant were always analysed in the same batch to avoid between-assay variation. Saliva cortisol was measured in 96 well microtitre plates by enzyme-linked immunosorbent assay (ELISA) using a monoclonal antibody (Lewis et al., 1992). These ELISA plates (Falcon 3912 microtest III) were coated overnight at 4C with 100 μ L of cortisol-thyroglobulin conjugate/well (1 μ g/mL) in 6M aqueous guanidine hydrochloride. The following day the plates were washed four times with a solution of phosphate-buffered saline (PBS), 0.05 M NaH_2PO_4 , 0.15 M NaCl adjusted to pH 7.4 with 5M NaOH, containing 0.1% Tween 20 (v/v). To prevent further adsorption of protein, the plates were then “blocked” with assay buffer, PBS containing 0.1% Tween 20 (v/v) and 0.1% gelatine (w/v) for 1 hour at room temperature. After emptying the plates by inversion they were blotted dry and duplicate portions of standards or reconstituted saliva extracts were added (50 μ L/well) followed by 50 μ L of a pre-formed complex of cortisol monoclonal antibody (1:35) and antimouse Ig-peroxidase (1:500) in assay buffer for 30 minutes at room temperature (Lewis & Elder, 2000). The plates were then washed four times and 100 μ L/well of substrate added. Substrate was prepared by the addition of 600 mL aqueous solution containing 8.2 g anhydrous sodium acetate and 3.6 g citric acid to 400 mL of methanol containing 270 mg of tetramethyl benzidine. Five hundred μ L of 30% H_2O_2 was finally added and the substrate stored in a dark bottle at room temperature. Colour development was terminated by the addition of 100 μ L of 0.9 M HCl per well, the absorbance read at 450 nm on a BMG Fluostar Galaxy (BMG, Technologies GmbH, Germany), and unknowns interpolated on the standard curve. To avoid evaporation

losses, the plates were covered during all the steps preceding the addition of substrate. Saliva (250 μ L) was extracted with 1 mL of dichloromethane and 500 μ L dried in glass tubes. The dried extract was reconstituted with 25 μ L of assay buffer and duplicate 50 μ L portions used for ELISA. A series of 7 authentic cortisol standards were prepared in assay buffer, 0, 3.5, 7.0, 14.0, 28.0, 56.0 and 280 nmol/L from a stock standard of 1 mg/mL in ethanol.