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Avoidance of eye gaze by adults who stutter

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ABSTRACT

Purpose: Adults who stutter are at significant risk of developing social phobia. Cognitive theorists argue that a critical factor maintaining social anxiety is avoidance of social information. This avoidance may impair access to positive feedback from social encounters that could disconfirm fears and negative beliefs. Adults who stutter are known to engage in avoidance behaviours, and may neglect positive social information. This study investigated the gaze behaviour of adults who stutter whilst giving a speech.
Method: 16 adults who stutter and 16 matched controls delivered a 3-min speech to a television display of a pre-recorded lecture theatre audience. Participants were told the audience was watching them live from another room. Audience members were trained to display positive, negative and neutral expressions. Participant eye movement was recorded with an eye-tracker.
Results: There was a significant difference between the stuttering and control participants for fixation duration and fixation count towards an audience display. In particular, the stuttering participants, compared to controls, looked for shorter time at positive audience members than at negative and neutral audience members and the background.
Conclusions: Adults who stutter may neglect positive social cues within social situations that could serve to disconfirm negative beliefs and fears.

Educational objectives: The reader will be able to: (a) describe the nature of anxiety experienced by adults who stutter; (b) identify the most common anxiety condition among adults who stutter; (c) understand how information processing biases and the use of safety behaviours contribute to the maintenance of social anxiety; (d) describe how avoiding social information may contribute to the maintenance of social anxiety in people who stutter; and (e) describe the clinical implications of avoidance of social information in people who stutter.

1. Introduction

Stuttering is a speech motor disorder that involves disruptions to the free flow of speech production. The condition is understood to be the result of neural processing deficits, impairing the initiation of speech motor programmes for

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the production of syllables (Packman, Code, & Onslow, 2007). Those who stutter are at risk of experiencing significant negative consequences throughout life, including negative listener reactions, teasing, bullying, social rejection, stereotyping, educational underachievement, discrimination in the workforce and reduced occupational opportunities (Blood & Blood, 2004; Cooper & Cooper, 1985, 1996; Craig & Calvert, 1991; Crichton-Smith, 2002; Gabel, Blood, Tellis, & Althouse, 2004; Hayhow, Cray, & Enderby, 2002; Hugh-Jones & Smith, 1999; Langevin, Bortnick, Hammer, & Wiebe, 1998; Silverman & Paynter, 1990). Negative social reactions can result in a fear of social situations and the belief that social encounters are fraught with danger (Clark & Wells, 1995). It is not surprising then, that some people who stutter experience anxiety in speaking and social situations.

It has become increasingly apparent that expectancies of social harm and fear of negative evaluation due to stuttering are central to the nature of the anxiety experienced by people who stutter. For example, Messenger, Onslow, Packman, and Menzies (2004) found that those who stuttered scored significantly higher than controls on the Fear of Negative Evaluation (FNE; Watson & Friend, 1969) questionnaire and the Social Evaluation and New/Strange Situations subtests of the Endler Multidimensional Anxiety Scales—Trait (EMAS-T; Endler, Edwards, & Vitelli, 1991). Iverach, O'Brian, et al. (2009) confirmed these results with a large sample of 92 adults who stutter compared with matched controls. In yet another study (Bricker-Katz, Lincoln, & McCabe, 2009), with a group of older adults who stutter, scores on the FNE and EMAS-T for social evaluative anxiety and anxiety related to physical danger were significantly higher than those of controls. Moreover, although the stuttering participant's scores on the EMAS-T were in the average range, scores on FNE were in the social phobia range (Bricker-Katz et al., 2009). Most recently, Blumgart, Tran, and Craig (2010) reported that a group of 200 adults who stutter scored significantly higher than controls on the FNE.

Fear or expectancy of negative evaluation in situations that involve social participation is a significant factor used to define social anxiety (Beck, Emery, & Greenberg, 1985). There is increasing evidence that social anxiety disorder (social phobia) is the most common anxiety condition among people who stutter, with between 45% and 60% of adult treatment seekers meeting criteria for this diagnosis (Blumgart et al., 2010; Menzies et al., 2008; Stein, Baird, & Walker, 1996). Further, Iverach, O'Brian, et al. (2009) found that adults seeking treatment for stuttering had 16–34-fold increased odds of meeting criteria for a diagnosis of social phobia compared to matched controls. These findings are not surprising given that early negative social experiences appear to be implicated in the development of social anxiety (Hackmann, Clark, & McManus, 2000) and salient learning experiences such as teasing, bullying and social rejection are common among people who stutter.

In a recent report, Iverach, Jones, et al. (2009) reported that a comorbid diagnosis of an anxiety or mood disorder was associated with impaired long-term speech treatment outcomes. This finding is consistent with that of Craig and Hancock (1995), who reported that participants who had relapsed following speech treatment were three times more likely to experience high anxiety levels. It would seem important then to determine the factors that may maintain anxiety in those who stutter. Such information could be used to improve speech restructuring treatment programmes to (1) maximize the benefits of using a speech technique and (2) address the long-standing problem that for many people who stutter speech treatment gains are not maintained in the long-term (Andrews & Craig, 1988; Block, Onslow, Packman, & Dacakis, 2006; Craig, 1998; Craig & Calvert, 1991; Craig & Hancock, 1995; Martin, 1981). Further, interventions that have proved to be beneficial to those with social anxiety could be considered in the treatment of anxiety in those who stutter (Mahr & Torosian, 1999).

According to contemporary cognitive theorists Clark and Wells (1995), information processing biases and the use of safety behaviours play a role in maintaining anxiety in people with high levels of social anxiety. Biases in attentional processing occur when one focuses excessive attention towards threatening material, stimuli or unhelpful thoughts and feelings. For instance, when a person with significant levels of social anxiety enters a feared social situation, internal anxiety symptoms are activated. Attention is drawn away from external social information towards internal negative thoughts and the physiological arousal associated with anxiety (Clark & Wells). As a result potential positive feedback from the social interaction that could disconfirm negative thoughts, feelings and beliefs may not be processed. Much research has explored information processing and attention in people with social anxiety using computer-based tasks, eye tracking procedures and within real-life social interactions. Consistent with cognitive theories, those with social anxiety have displayed attentional neglect for positive social cues and a bias to attend towards threat stimuli. For instance, those with social anxiety have demonstrated (1) avoidance of positive facial stimuli and attention towards threatening facial stimuli (Pishyar, Harris, & Menzies, 2004, 2008), (2) attention towards internal information and away from external information (Mansell, Clark, & Ehlers, 2003), (3) higher accuracy in detecting negative social information than positive social information (Veljaca & Rapee, 1998), (4) discrimination of negative social information compared to low socially anxious participants, who discriminated positive social information (Perowne & Mansell, 2002), (5) slower recognition of positive social stimuli compared to low anxious participants (Silvia, Allan, Beauchamp, Maschauer, & Workman, 2006), and (6) hyperscanning of emotional social stimuli (Horley, Williams, Gonsalvez, & Gordon, 2003, 2004).

Safety behaviours are those behaviours or actions performed by a person who feels anxious, in order to relieve anxiety and minimize the risk of the feared outcome occurring (Salkovskis, 1991). Avoiding eye contact is a typical safety behaviour used by people who experience social anxiety (Clark & Wells, 1995; Horley et al., 2004; Huppert & Foa, 2004; Mansell, Clark, Ehlers, & Chen, 1999; Marks, 1969; Ohman, 1986; Wells et al., 1995). This avoidance of eye contact may be used to reduce opportunities to be included in social interactions, to continue conversations, to take part in turn taking or to observe possible negative reactions from others. Whilst this avoidance may reduce anxiety during the moment, it does not allow extinction of fear over time. The use of some safety behaviours, such as avoiding eye gaze, may even cause the feared outcome to occur. For example, someone who avoids looking at communication partners may be perceived by others as

reticent to engage in the interaction, uninterested, or bored. This may result in others being less friendly, which can lead to negatively perceived communicative encounters, further contributing to social anxiety. A significant problem associated with using safety behaviours is that fears are not challenged and anxiety is likely to persist (Clark & Wells, 1995; Salkovskis, 1991).

Avoidance is a common reaction reported by those who stutter, and this can include avoiding eye contact, specific situations, conversational topics and specific words in order to cope with the anticipation and occurrence of stuttering (Corcoran & Stewart, 1998; Crichton-Smith, 2002; Hayhow et al., 2002; Jensen, Markel, & Beverung, 1986; Luper & Mulder, 1964; Mahr & Torosian, 1999; Plexico, Manning, & DiLollo, 2005; Vanryckeghem, Brutten, Uddin, & Van Borsel, 2004). Some early treatment programmes even incorporated training to establish and maintain eye contact with stuttering clients (Luper & Mulder, 1964; Sheehan, 1970).

Yet although those who stutter anecdotally report that they avoid looking at communication partners, there appear to be no direct investigations of eye gaze in adults who stutter within naturalistic speaking situations. Further, social attentional biases have not been explored in people who stutter. This is surprising given the potential for anxiety-related health conditions to impair the maintenance of speech treatment outcomes. In light of this, it is clear that exploration of information processing biases in people who stutter is warranted. Avoiding attention to social information, and in particular to positive social cues, could be problematic for a person who stutters because social fears would not be challenged by reality. This could result in the persistence of anxiety. In addition, people who stutter who avoid social information would not have the opportunity to test the real cost of potential negative reactions from others within social situations. It is possible, that this bias to avoid social information may be typical of those who stutter, and this may be most likely to emerge when placed in situations of social evaluation.

In this study then, we aimed to assess attention within a stressful social interaction—an impromptu speaking task—using a pre-recorded audience and eye tracking technology, to observe eye gaze in adults who stutter. The audience members were trained to display positive, negative and neutral expressions. We hypothesized that those who stutter would show an attentional bias for social information; that they would fixate less towards the audience, and in particular would show greater neglect of positive audience members and greater attention to negative audience members compared to control participants. Moreover, if such attentional biases are implicated in the maintenance of social anxiety it was predicted that time spent focusing on positive audience members would correlate negatively with self-reported anxiety and self-rated performance during the speaking task. It was additionally predicted that the stuttering participants would exhibit hyperscanning, indexed by increased scanpath length at the audience display, in comparison to controls. Following the procedure a recognition task was presented to the participants. It was hypothesized that if the stuttering participants displayed a bias to gaze less towards the audience, their recall of audience members would be impaired compared to that of the controls.

2. Method

2.1. Participants

Participants were 16 adults who stutter and 16 normally fluent control participants matched for gender, age and level of education. There were 13 men and three women in each group. The stuttering participants were recruited from treatment waiting lists at the Australian Stuttering Research Centre, the University of Sydney (44%) and local stuttering support groups (56%). Control participants were invited to participate from the University of Sydney general staff, students and visitors via email notices and flyers describing the study. All participants were assessed prior to entry into the study. For the participants who stuttered, stuttering was confirmed by a qualified speech pathologist during the assessment. No control participants reported a history of stuttering or were observed to stutter during the assessment or experimental procedure. The research ethics committee of the University of Sydney approved this study. All participants read the information statement and gave written consent before participating in the study.

2.2. Questionnaires

Participants completed the following battery of measures.

2.3. Social Phobia and Anxiety Inventory (SPAI)

The SPAI (Turner, Beidel, & Dancu, 1996) is a 45-item self-report measure that assesses the severity of somatic, cognitive and behavioural aspects of social phobia. A number of studies have been published providing support for the reliability and validity of the instrument with clinical and nonclinical populations (Ries et al., 1998; Rodebaugh, Chambless, Terrill, Floyd, & Uhde, 2000). The SPAI provides two scores. The maximum score is the total score for both the social phobia and agoraphobia subscales. The difference score is calculated by subtracting the agoraphobia sub-score from the social phobia sub-score. The difference score is reported to provide a more accurate measure of social phobia (Turner, Stanley, Beidel, & Bond, 1989) and this value was used in the current analyses.

2.4. Fear of Negative Evaluation (FNE)

The FNE (Watson & Friend, 1969) is a 30-item self-report questionnaire that asks respondents to respond "true" or "false" to statements referring to the expectation and fear of negative evaluation from others. True and false scores are coded and scored 1 or 0. Higher scores on the FNE indicate a greater fear of negative evaluation. The psychometric properties of the FNE have been evaluated, showing high internal consistency (Oei, Kenna, & Evans, 1991) and validity (Watson & Friend, 1969). Its use has extended to the assessment of social anxiety in clinical (Turner, McCanna, & Beidel, 1987) and non-clinical populations (Stopa & Clark, 2001).

2.5. Performance Rating Questionnaire (PRQ)

The PRQ (Rapee & Lim, 1992) was developed to assess a person's self-evaluation of public speaking performance. The questionnaire involves 12 specific items related to individual performance (e.g., fidgeted, stuttered) and five global items representing evaluations of overall performance (e.g., made a good impression). Participants rate items on a 5-point scale from (0) "not at all to" (4) "very much". Higher scores indicate poorer performance. The PRQ has shown moderate to strong internal consistency (Rapee & Lim, 1992).

2.6. Subjective Units of Distress Scale (SUDS)

Participants completed a self-report measure of anxiety where "0" = "no anxiety" and "100" = "the worst anxiety imaginable." Participants were asked to rate how much anxiety they experienced prior to the speaking task (see below). Following the procedure the participants were asked to rate the average and most amount of anxiety they experienced during the task.

3. Materials and apparatus

3.1. Eye tracker

Each participant's eye movements were recorded using the Tobii ×120 eye tracker and Tobii Studio 1.7 software application package (Tobii Technology, 2008). The Tobii Studio 1.7 software was operated on a Dell Inspiron 530 with a quad core processor. The video stimuli were presented on a LG 60 in. widescreen (16 × 9) plasma screen with a resolution of 1280 × 768 pixels.

The Tobii ×120 standalone eye tracker recorded the binocular gaze of participants. Using the non-intrusive Pupil Centre Corneal Reflection technique, infrared diodes generated reflections from the corneas of participants. Image sensors collected and stored the reflection patterns from each participant's eye movements. Data were recorded at a rate of 120 Hz with 0.5° angle accuracy. The Tobii ×120 eye tracker allows for freedom of head movement for a width of 30 cm, height of 22 cm and depth of 30 cm, enabling participants to move naturally during the experimental procedure. It also automatically accommodates for head movements slower than 35 cm/s. A five-point calibration procedure was conducted with each participant prior to the speaking task.

The eye tracker was positioned on a lectern between the participant and a wall mounted television screen, which displayed a video of an audience. Participants stood at a distance of 70 cm from the eye tracker and the television screen was positioned 180 cm behind the eye tracker.

3.2. Stimulus materials

An audience was pre-recorded for the purposes of this study. The audience consisted of eight men and eight women drawn from students and staff of the University of Sydney. No audience member was known to any of the participants. Audience members were trained to display negative, positive or neutral expressions and behaviours. Negative behaviours consisted of yawning, rolling eyes, head shaking, looking away and frowning. Positive behaviours included leaning forward, smiling and nodding. Neutral behaviours consisted of looking ahead without smiling, nodding, frowning, or movement towards or away from the speaker.

The audience was filmed in a tiered lecture theatre with four people sitting in each of four rows facing towards the video camera. The valence assigned to each audience member was balanced for gender and across positions. Two video-recordings were created. For the first recording, audience members were filmed displaying positive, negative or neutral expressions. For the second recording, the previously positive audience members were then trained to display negative expressions and vice versa for the negative audience members. The neutral audience members remained neutral throughout both recordings. Each recording followed the same sequence in which all audience members were neutral for 50 s. On a visual cue, each 30 s thereafter, the audience members were signalled to display their respective negative or positive expressions and behaviours. The audience members who were trained to display neutral expressions remained neutral for the duration of the 3 min. The recording presentation was counterbalanced across participants.

To confirm that the three categories of positive, negative and neutral behaviours were rated as different, 20 independent raters, naive to the purpose of the video and hypotheses of the study, rated the valence of each audience member from the

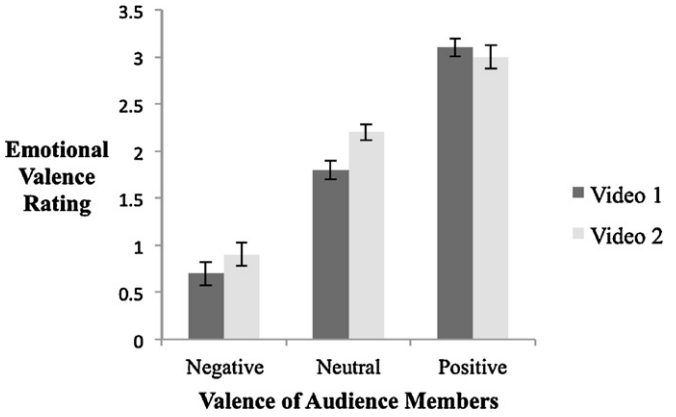

Fig. 1. Emotional valence ratings of audience members for videos 1 and 2.

video on the following scale: −2 (extremely negative), −1 (negative), 0 (neutral), +1 (positive), and +2 (extremely positive). All scores were converted to a positive value by adding two points to each rating. For both videos independently, each of the positive, negative and neutral audience members scores were pooled according to the emotional valence they displayed during the video recording. Fig. 1 shows the mean scores for the three valences from each video.

3.3. Recognition task

The recognition task was presented on a computer using E-Prime software (Schneider, Eschman, & Zuccolotto, 2002). Photographs were taken of each audience member. These represented "old" faces (previously seen in the audience). As well, 16 photos were taken of people who were not part of the audience, thus representing "new" faces not seen before. All photos used in the recognition task depicted a neutral expression. The photographs of old and new faces were matched according to gender. The photos were displayed as bitmap files of 240 × 334 pixels and were presented in a random order to each participant. Participants used a modified keyboard to indicate whether they remembered seeing the face in the audience by pressing "Y" ("I remember seeing the face in the audience") or "N" ("I don't remember seeing the face in the audience").

3.4. Procedure

Participants were individually tested with the experimenter present in the room. Before commencing the speaking task, participants completed the SPAI, FNE and SUDS and were then briefed with the following instructions:

> In a short while I will ask you to make a 3 minute speech on a neutral topic. You will have a few moments to prepare the speech. There will be a video camera projecting you to an audience who are sitting in a room in another building on the campus. There is a camera filming the audience and you will be able to see them projected on a screen in front of you. The reason for giving a speech via this video link is that the equipment we are using cannot be moved as this will alter the settings and calibration procedures. It is also necessary for the equipment to remain in a constantly monitored air conditioned environment to avoid overheating. You should note there are no microphones in the room where the audience is sitting so you will not be able to hear anything they are saying but they will be able to hear you.

The neutral topic of "driving" was provided to all participants. It was suggested that they talk about their experiences driving and their opinions on driving laws and penalties. Participants had up to 3 min to prepare their talk. Participants could write notes on paper, but they were advised that they could not take the notes with them into the experimental procedure. The experimenter used the notes to prompt the participant if required. When participants had prepared their speeches, they were asked to stand in front of the lectern on which the eye tracker was positioned. Participants were advised that the telecast to the audience would commence and they should speak to the audience, which would be displayed on the television screen. The experimenter introduced the participant to the audience and instructed them to commence their speech. All speeches were video recorded.

Following the speaking task, participants completed the recognition task, as described above. Finally, the participants completed the PRQ and SUDS. Following completion of all post-task questionnaires, each participant was invited to provide feedback about the task. In particular, they were prompted to provide any comments they had regarding the audience and whether they believed that the audience was "live". Each participant was then de-briefed and informed that the audience had been pre-recorded for the purposes of standardizing the presentation of audience behaviours to each participant.

3.5. Data preparation

The data analysis was based on 2 min 30 s of speaking time. Sixteen regions of interest were created over the audience members from a still picture of the video recording. The regions of interest encompassed the whole head area for each audience member. Analyses were based on the frequency and time participants looked at each audience member. A fixation count was defined as the number of fixations within each area of interest. Fixation duration was defined as the length of fixations in seconds within each area of interest. A minimum fixation length filter of 200 ms with a 1° spatial radius was applied to the data prior to analysis (Horley et al., 2004; Moukheiber et al., 2010; Noton & Stark, 1971; Tobii Technology, 2008).

4. Results

Paired *t*-tests confirmed there were no significant differences between the groups for age and years in education (Table 1). Comparisons of social anxiety measures showed that participants in the stuttering group scored significantly higher than controls on the SPAI. There were no significant differences between the groups for scores on the FNE and the PRQ. For self-rated anxiety before and after the speech task there were no significant differences between the groups. Two participants, one from each group, had total fixation duration scores that were more than three standard deviations from the mean of all scores and thus were excluded from all analyses.

Participants stated whether or not they believed the audience was live following the speaking task. One participant who stuttered and two controls stated they did not believe the audience was live. The very high rate of belief that the audience was "live" among participants was somewhat surprising and therefore the data should be interpreted with caution. However, most importantly there was no significant difference between the groups for whether the participants believed the audience was live during the procedure (Fisher's Exact $p = 0.60$).

All stuttering participants stuttered during the speaking task. The percentage of syllables stuttered (%SS) was measured for each participant from their video recording by one of the researchers. Stutter count measures ranged from 0.1%SS to 19.6%SS (mean = 7.6%SS, SD = 7.2). Reliability of these scores was established by presenting 5 recordings (30%) to another speech language pathologist (SLP) experienced in the treatment of stuttering but independent of this study. There was no difference between the %SS scores for the two SLPs [$t(8) = 0.56$, $p = 0.59$].

4.1. Eye movement data

4.1.1. Fixation duration

The main analysis determined whether the groups differed in the amount of time they looked towards any area of the screen, which included attention to positive, negative, and neutral audience members and the background in comparison to control participants. A mixed-design ANOVA was used with a between-subjects factor of group (stuttering, control) and within-subjects factor of region of interest (attention to the background, positive, neutral and negative audience members). For all ANOVAs where Mauchly's test of sphericity was violated, Greenhouse-Geisser corrections were applied.

For fixation duration there was a significant main effect for group [$F(1, 28) = 7.35$, $p = 0.01$]. The stuttering participants looked significantly less at the screen containing an audience display than did the control participants. There was also a significant main effect of valence [$F(2.14, 59.79) = 7.37$, $p = 0.001$]. This effect was characterized by increased fixation duration to positive audience members relative to all other regions on the screen [$F(1, 28) = 10.50$, $p = 0.003$]. Importantly a significant valence by group interaction was found [$F(2.34, 59.79) = 5.46$, $p = 0.006$]. Follow-up planned contrasts were conducted to clarify the interaction effect. Compared to controls, the stuttering participants spent less time looking at positive audience members relative to all other areas of interest on the screen, including negative and neutral audience members and the background [$F(1, 28) = 6.45$, $p = 0.02$]. Further, compared to controls, the stuttering participants spent less time looking at

Table 1
Characteristics of stuttering and control participants. Mean (*M*) and standard deviation (SD).

Variable	Group				Statistic	
	Stuttering		Control		*t*	*p*
	M	SD	*M*	SD		
Age	36.7	13.0	38.2	13.5	0.30	0.78
Education (years)	15.9	2.3	16.0	1.8	0.08	0.94
SPAI	69.5	26.6	49.4	24.0	2.83	0.01
FNE	13.5	7.8	12.9	6.2	0.19	0.85
Anxiety pre-task	40.3	24.8	46.0	17.2	0.78	0.45
Anxiety post-task: average	46.7	24.7	51.3	19.2	0.68	0.51
Anxiety post-task: most	57.3	26.0	62.0	21.8	0.54	0.60
PRQ	35.5	10.2	32.5	10.3	0.76	0.46

Note: SPAI = Social Phobia and Anxiety Inventory; FNE = Fear of Negative Evaluation; PRQ = Performance Rating Questionnaire.

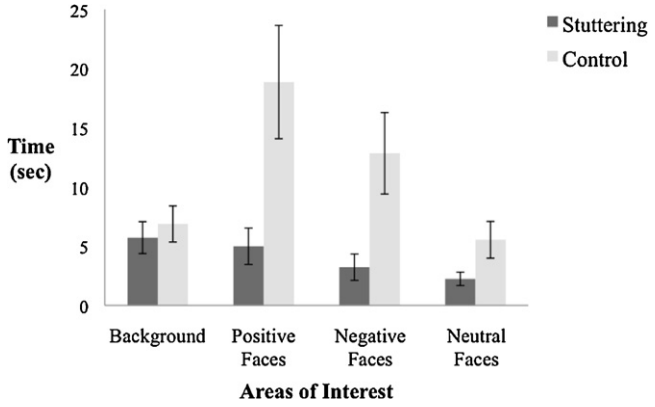

Fig. 2. Time spent gazing towards each area of interest on the screen during the speaking task for stuttering and control participants.

any audience member relative to the background [$F(1, 28) = 6.72$, $p = 0.02$]. When the groups were compared for attention towards negative audience members relative to all other areas of the screen no differences were observed [$F(1, 28) = 1.55$, $p = 0.24$]. Fig. 2 shows the mean fixation duration for each emotional valence and the background.

4.1.2. Fixation count

The former analysis for fixation duration was repeated for the fixation count data to determine if there were differences between the groups for the number of times participants looked towards any area of the screen including positive, negative and neutral audience members and the background. The results for the fixation count data mirrored those for fixation duration, showing there was a significant main effect of group [$F(1, 28) = 7.54$, $p = 0.01$]. The stuttering participants looked significantly less often at the screen containing an audience display than did the control participants. There was also a significant main effect of valence [$F(2.20, 61.60) = 6.39$, $p = 0.002$]. This effect was characterized by increased fixation count to positive audience members relative to all other areas of interest on the screen [$F(1, 28) = 8.50$, $p = 0.007$]. The effect of valence was accounted for by a significant valence by group interaction [$F(2.20, 61.60) = 3.99$, $p = 0.02$]. The outcomes from the follow-up planned contrasts showed that compared to controls the stuttering participants looked less frequently at all audience members relative to the background [$F(1, 28) = 4.77$, $p = 0.04$]. A trend indicated that compared to the control participants, the stuttering participants tended to look less often at positive audience members relative to all other areas on the screen [$F(1, 28) = 3.93$, $p = 0.06$]. There were no significant differences between the groups for fixation count for negative audience members relative to all other areas on the screen [$F(1, 28) = 2.34$, $p = 0.14$]. Fig. 3 shows the mean fixation count for each emotional valence and the background.

4.2. Correlations

Correlation analyses were conducted between the total amount of time spent fixating towards each emotional expression and the background and scores on anxiety reactivity and scores on the PRQ during the speech task. The results displayed in Table 2 show that for the stuttering participants, reduced fixation duration towards positive and neutral audience members was associated with more negative cognitions regarding speech performance. Reduced fixation duration towards positive

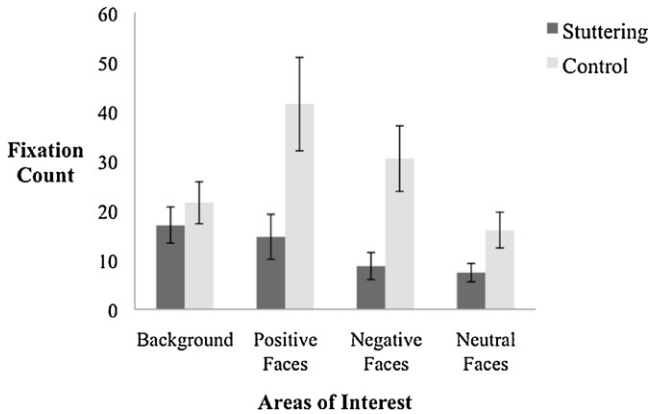

Fig. 3. Number of fixations towards each area of interest on the screen during the speech task for stuttering and control participants.

Table 2
Associations between fixation duration towards areas of interest on the screen and anxiety reactivity and self-appraisals of performance.

	Performance Rating Questionnaire		Average anxiety		Most anxiety	
	Stuttering	Control	Stuttering	Control	Stuttering	Control
Positive audience members	−0.53*	−0.01	−0.52*	0.19	−0.52*	0.38
Negative audience members	−0.37	−0.27	−0.21	−0.03	−0.26	0.03
Neutral audience members	−0.55*	−0.26	−0.30	−0.16	−0.30	0.00
Background	−0.47	−0.40	−0.20	0.07	−0.02	0.10

* $p < 0.05$.

Table 3
Percentage of raw correct responses for 'old' positive, negative and neutral audience members and 'new' faces. Mean (SD).

	Positive audience members	Negative audience members	Neutral audience members	New remember (false alarm rate)
Stuttering	45 (27.1)	41.7 (22.5)	36.5 (27.6)	10.4 (12)
Control	46.7 (20.8)	53.3 (29.7)	25.8 (22.4)	9.2 (11.3)

audience members was also associated with higher average anxiety and most anxiety experienced during the speech task. These results suggest that as the participants who stuttered looked less at positive and neutral audience members their self-ratings of performance were poorer, and avoidance of positive audience members was associated with increased anxiety. There were no significant correlations for the control participants (Table 2).

4.3. Scanpath length analysis

A one way ANOVA comparing groups on scanpath length revealed no differences for the distance the participants eyes moved relative to the display during the speaking task [$F(1, 29) = 2.25$, $p = 0.15$]. Mean and standard deviations (in parentheses) were 22.37 (12.33) and 29.50 (13.65) (meters) for the stuttering and controls respectively.

4.4. Recognition task

Raw scores for the recognition task are presented in Table 3. The raw scores were transformed to provide a measure of independent recall for "old" audience members (independent recall = hit rate – false alarm rate) (Guastella, Mitchell, & Mathews, 2008). The transformed data was subjected to a 2 (stuttering, control) × 3 (emotional expression: positive, negative and neutral) repeated measures ANOVA. There were no group differences [$F(1, 28) = 0.14$, $p = 0.72$] or interactions of group and emotional valence [$F(1, 28) = 2.11$, $p = 0.13$].

5. Discussion

This is the first study to explore attentional biases in people who stutter within a naturalistic social encounter. In this study we observed the eye gaze behaviour of adults who stutter towards a pre-recorded audience whilst giving a speech. The results demonstrated that compared to the control participants, the stuttering participants looked for less time and less often towards an audience display on a television screen. In particular, the stuttering participants looked for less time towards audience members displaying positive expressions relative to negative and neutral expressions and the background compared to the controls. This attentional bias to avoid positive audience members was associated with poorer self-perceptions of performance and an increase in anxiety. Further, the stuttering participants compared to the controls looked less frequently and for less time towards all audience members relative to the background. These preliminary findings suggest that some people who stutter appear to display the same information processing bias to avoid social information as has been found for those high in social anxiety. A bias to avoid social stimuli and in particular positive social cues may be an attempt to avoid engagement within the social interaction. Moreover, avoiding social information could contribute to the maintenance of social anxiety in those who stutter. Research is now needed to determine whether these effects are the result of social anxiety or a characteristic of people who stutter in general.

No difference was observed between the groups for attention towards negative audience members relative to all other areas on the screen. This indicates that the participants who stuttered did not display an attentional preference to attend towards negative social cues as has been demonstrated in those with social anxiety. Interestingly, several studies have found a correlation between severity of social anxiety and gaze behaviour (Moukheiber et al., 2010; Mühlberger, Wieser, & Pauli, 2008). A failure to find a difference between the groups in the present study for attention towards negative audience members may be due to participant selection criteria. Inclusion of participants who stutter with a diagnosis of social anxiety and without social anxiety in future studies may provide further information on attentional processing in adults who stutter. There was a trend, though not significant, for the stuttering participants to look less frequently at positive audience members relative to all other information on the television screen compared to the controls. One explanation might be, relative

to controls those who stuttered upon observing positive expressions may have disengaged their gaze towards these audience members, relative to controls. It is possible though that fixation duration may be a more sensitive measure to assess attentional biases to threatening stimuli than fixation count. This will require further investigation. Further, there were no differences between the groups for total scanpath length, which is inconsistent with previous anxiety-linked hyperscanning findings (Horley et al., 2003, 2004). It is possible that hyperscanning may be a gaze behaviour specific to social anxiety disorder and not to stuttering. As suggested above, participant selection criteria will need to be considered in future studies exploring attentional processing in adults who stutter. Finally, the hypothesis that the groups would differ on the recognition task following the procedure was not supported. In keeping with previous findings, both groups displayed limited recognition of faces post-task (Chen, Ehlers, Clark, & Mansell, 2002).

Individuals who stutter, relative to controls, showed reduced total fixation duration and fixation count towards the audience display. Such a finding is arguably reflective of attentional avoidance of social stimuli. Alternatively, it is possible that the nature of the stuttering moment and associated secondary behaviours such as blinking and eye twitching may lead to reduced total fixation duration and count. Nonetheless, the fact that the stuttering group, in comparison to controls, exhibited reduced fixation time towards positive audience members relative to all other areas of the screen remains a critical finding. That is, individuals who stutter appear to display an attentional bias away from positive social stimuli.

Overall the participants who stuttered scored higher than the controls on the SPAI suggesting they exhibited higher levels of social anxiety. There are several ways that an avoidance of social cues might contribute to the maintenance of social anxiety in people who stutter. First, cognitive theories of social phobia suggest that attentional biases limit access to accurate information from the social encounter which could serve to disconfirm fears and negative, unhelpful beliefs (Clark & Wells, 1995; Hartman, 1983). For example, those who stutter may believe that their social performance is impaired because of their stuttering. Avoiding social information may result in limited feedback being obtained from the social encounter that could serve to disconfirm beliefs of poor performance. Self-evaluations of performance are then based on very little information received from the social encounter. The only information from which to evaluate performance then would be obtained from attending towards their internal physiological arousal and negative thoughts. Self-focused attention has clearly been shown to lead to negative beliefs and poorer self-evaluations of performance in social anxiety (Mansell & Clark, 1999; Mellings & Alden, 2000; Wells & Papageorgiou, 2001). Secondly, avoidance of eye gaze can lead to the feared consequence of negative evaluation from others occurring (Atkins, 1988; Tatchell, van den Berg, & Lerman, 1983). In social phobia, self-focused attention has been shown to enhance the likelihood that anxiety symptoms will be more visible, and has been associated with poorer ratings of performance by others (Hirsch, Clark, Mathews, & Williams, 2003; Hirsch, Meynen, & Clark, 2004). Negative consequences of listening to stuttered speech include listener discomfort (Guntupalli, Everhart, Kalinowski, Nanjundeswaran, & Saltuklaroglu, 2007) and reduced eye contact from others (Bowers, Crawcour, Saltuklaroglu, & Kalinowski, 2009; Rosenberg & Curtiss, 1954). Avoiding eye gaze by those who stutter can impair the quality of communicative interactions and further contribute to negative listener reactions.

The findings from the present study have critical clinical implications. These results may begin to explain why long-term speech treatment gains are impaired in those with anxiety related mental health conditions. SLPs can provide clients with evidence that self-focused attention and avoidance of social stimuli may play a role in maintaining anxiety. Further, this information may alert SLPs to clients who would benefit from psychological interventions such as cognitive behaviour therapy (CBT). CBT is designed to reduce self-focused attention and increase the processing of disconfirmatory information from the external environment (Mattick, Peters, & Clarke, 1989). Recently, Menzies et al. (2008) showed that the addition of a CBT programme for adults who stutter, compared to receiving speech restructuring alone, produced greater engagement in everyday social tasks, reduced avoidance, improved global functioning and eliminated all social phobia diagnoses. More recently, participants who stuttered who completed an online computerized CBT programme also had their diagnoses of social phobia eliminated (Helgadottir, Menzies, Onslow, Packman, & O'Brian, 2009).

Although the stuttering participants scored higher on the SPAI than the controls, the groups did not differ with respect to scores on the FNE, which is in contrast to previous studies. One explanation may be that over half the stuttering participants were drawn from waiting lists for post-treatment refresher programmes. It may be that following formal speech treatment, fear of negative evaluation is reduced, however this requires exploration. It was also of interest that the stuttering participants and controls did not differ on self-reported anxiety experienced during the speech task. It is possible that the experimental speech task was particularly anxiety inducing, raising the state anxiety of both the stuttering and control participants to comparable levels.

The stuttering participants in the present study were not selected according to whether they met the criteria for a diagnosis of social phobia. Future research would now benefit from including a group of adults who stutter and meet diagnostic criteria for social phobia. Additionally, including adults who stutter with no social phobia diagnosis would allow a comparison between these groups to determine whether attentional biases are characteristic of a general population of adults who stutter or specific to those who are socially anxious. Finally, future research should explore whether stuttering severity has an impact on attentional processing within social encounters.

The results from this preliminary study have shown that, compared to fluent controls, a group of adults who stutter looked significantly less at an audience display on a television screen whilst giving a speech, and in particular looked less at positive audience members. Attentional biases to avoid social information may contribute to the maintenance of social anxiety in people who stutter. This is particularly important, given that those who are socially anxious are thought to interpret social situations as more threatening than non-socially anxious (Clark & Wells, 1995) and further, those who are

socially anxious have been shown to demonstrate a negative response bias (Winton, Clark, & Edelmann, 1995). Reduced eye gaze to positive social stimuli would further impact accurate information processing in people who stutter. It will be important for future research to explore the effect of such attentional biases in those who stutter. The findings from this study may begin to provide an explanation for the impaired maintenance of long-term speech treatment outcomes in those with anxiety-related mental health conditions. Future research is now needed to determine if such attentional biases are characteristic of people who stutter or whether these biases are attributable to social anxiety.

CONTINUING EDUCATION

Avoidance of eye gaze by adults who stutter

QUESTIONS

1. The anxiety experienced by adults who stutter is considered to be due to:
   a. being teased and bullied early in life
   b. fear of negative social evaluation from others
   c. fear of stuttering
   d. fear of social situations and the belief that social encounters are fraught with danger
2. Information processing biases may contribute to the maintenance of social anxiety through:
   a. excessive attention being directed towards threatening information
   b. excessive attention being directed towards internal physiological arousal
   c. limited information being obtained from the social encounter that could disconfirm negative thoughts, feelings and beliefs
   d. all of the above
3. Adults who stuttered, compared to controls looked less at:
   a. positive audience members relative to all other areas of interest on the television display
   b. positive audience members relative to the negative audience members
   c. positive audience members relative to the neutral audience members
   d. all audience members relative to the background information
4. Adults who stuttered, compared to controls had significantly less fixation duration towards:
   a. negative audience members relative to the positive audience members
   b. background information relative to the audience members
   c. positive audience members relative to all other information on the television screen
   d. positive audience members relative to the negative and neutral audience members
5. Reduced eye gaze towards positive social cues within social interactions may contribute to the maintenance of anxiety in people who stutter by:
   a. limiting access to positive feedback from others that can disconfirm fears
   b. impairing positive self-evaluations of performance
   c. leading to the feared consequences occurring
   d. all of the above

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