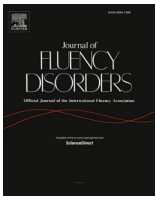
Journal of Fluency Disorders 70 (2021) 105880

Contents lists available at ScienceDirect

Journal of Fluency Disorders

journal homepage: www.elsevier.com/locate/jfludis



Does stammering act as a barrier to exercise and sport in Irish adults who stammer?

Siobhán O'Connor [a,*], Kieran A. Moran [a,b], Enda F. Whyte [a], Aisling C. Lacey [a,b]

[a] Centre for Injury Prevention and Performance, Athletic Therapy and Training, School of Health and Human Performance, Dublin City University, Dublin, Ireland
[b] Insight SFI Research Centre for Data Analytics, Dublin City University, Dublin, Ireland

ARTICLE INFO

Keywords:
Stammer
Stuttering
Physical activity

ABSTRACT

Purpose: Exercise and sport participation lead to many physical and psychosocial benefits. However, barriers to exercise and sporting participation exist. This study aims to examine if stammering acts as a barrier to exercise and sporting participation in adults.
Methods: One hundred and six adults who stammer (male n = 74, female n = 32; 33.83 ± 14.5 years) completed an anonymous questionnaire which evaluated their stammering history, exercise and sporting participation, views on why they exercise, whether stammering prevented or negatively influenced their participation in exercise or sport. Descriptive statistics were then calculated.
Results: The majority (90.6 %) of participants take part in some form of exercise/sport. However, their stammer prevented them from taking part in a specific exercise/sport at least once (49.1 %), due to being too nervous to introduce themselves, nervous or fear of stammering or being judged. Their stammer also negatively impacted their involvement when participating at least once (42.4 %), with not feeling part of the team and fear of speaking reported. Self-disclosure of their stammer and improving awareness of stammering were identified as common facilitators for taking part in exercise/sport.
Conclusion: Stammering was not found to impact general participation in exercise and sport but was identified as a barrier to partaking in specific exercise and sport and their enjoyment thereof. Encouraging those who stammer to inform those involved in sport and exercise (e.g. fellow players, coaches) about their stammer and improving stammer awareness across the general and sporting population may encourage further participation in exercise and sport in those who stammer.

1. Introduction

There are a multitude of benefits associated with exercise and sport participation, including improved cardiovascular and respiratory function (Fuertes et al., 2018; Nystoriak & Bhatnagar, 2018), enhanced psychological well-being and quality of life (Martin et al., 2009; Zubala et al., 2017) and reduced risk of chronic non-communicable diseases (Ding et al., 2016). Despite these benefits, 27.5 % of the global population remains physically inactive (Guthold et al., 2018), with physical inactivity being the fourth leading cause of death worldwide (Kohl et al., 2012). In addition, the total economic burden of physical inactivity is very significant (Ding

* Corresponding author at: A144B, School of Health and Human Performance, Dublin City University, Glasnevin, Dublin 9, Ireland.
E-mail address: siobhan.oconnor@dcu.ie (S. O'Connor).

https://doi.org/10.1016/j.jfludis.2021.105880
Received 29 April 2021; Received in revised form 27 July 2021; Accepted 8 September 2021
Available online 15 September 2021

et al., 2016). Sport is defined by the European Sports Chapter in 2001 as "all forms of physical activity which, through casual or organised participation, aim at expressing or improving physical fitness and mental wellbeing, forming social relationships or obtaining results in competition at all levels". Exercise on the other hand is defined as planned, structured and repetitive bodily movements that are performed repeatedly over an extended period of time, with the intent to improve or maintain physical fitness, performance or health (Bouchard et al., 2012). It is typically described in terms of mode, intensity, duration and frequency (Bouchard et al., 2012). Various barriers to partaking in exercise and sport have been reported, including financial pressure and lack of energy, motivation, support, time and resources (Awadalla et al., 2014; Gómez-López et al., 2010; Reichert et al., 2007). Injury, disease and disorders may also further limit exercise and sport participation, and anxiety-related disorders, such as social anxiety, have been highlighted as one such potential barrier (Herdt et al., 2013; Mason et al., 2019).

There are high levels of social anxiety associated with stammering (Blood & Blood, 2016; Blumgart et al., 2010b), and as anxiety related disorders have been highlighted as a barrier to exercise and sport (Mason et al., 2019), it can be theorised that individuals who stammer may be discouraged from participation due to their speech. Previous research has found that those who stammer may avoid participating in activities that involve social communicative and/or anxiety-provoking situations (Blumgart et al., 2010a; Craig et al., 2009; Craig & Tran, 2006; Iverach & Rapee, 2014; Messenger et al., 2004). Stammering is a disruption in the fluency of verbal expression characterised by involuntary, audible or silent repetitions, prolongations or complete blocks of sounds, syllables or words (Büchel & Sommer, 2004; Nicolosi et al., 2004; Wingate, 1964). It has a worldwide prevalence of 5–8 % (Yairi & Ambrose, 2013). However, 80 % of children recover by adolescence, leaving a 1 % global incidence rate of stammering into adulthood, and a male/female ratio of 4:1 (Yairi & Ambrose, 2005). Stammering can present as either overt or covert (Murphy et al., 2007). Overt stammering occurs when the person is physically seen to struggle to articulate their speech, often displaying facial distortions/ticks (Constantino et al., 2017). Covert stammering is when the person tries to conceal their dysfluency, often with avoidance behaviour, both with words and situations, in the attempt to be perceived as a non-stammering individual (Douglass et al., 2018). Fear of being evaluated (Blumgart et al., 2010a; Mulcahy et al., 2008), communication fears (Craig & Tran, 2006) and avoidance behaviour (Bailey et al., 2015; Vanryckeghem et al., 2004) are evident in those who stammer, which may also consequentially negatively impact exercise or sporting participation. In contrast, exercise and sport has been shown to reduce anxiety in those with an anxiety-related disorder (Jayakody et al., 2014). Exercise and sport can expose those who stammer to various social settings and provide speaking opportunities, which may also lead to a reduction in avoidance behaviour and social anxiety (Fava et al., 2001). However, to the authors' knowledge no previous research has examined if stammering is a barrier to exercise and sporting participation in individuals that stammer. Addressing this as a potential barrier is critical to ensure that those who stammer can avail of, and benefit from, the many benefits imparted by a physically active lifestyle. Thus, the primary aim of this study was to examine if stammering acts as a barrier to exercise and sport in adults who stammer.

2. Materials and methods

2.1. Participants

Similar to previous quantitative research in the stammer literature (Boyle, 2013; Plexico et al., 2009; Salvo & Seery, 2021), a cross-sectional study was implemented using an anonymous questionnaire to adults who stammer (n = 106). Ethical approval was granted by the local university's Research Ethics Committee. Participants provided informed consent prior to completing the questionnaire.

2.2. Instrumentation

An anonymous questionnaire, containing 22 questions in 5 sections, was developed (Supplementary Material 1). Questionnaire development took place over 3 months. Firstly, the authors met as a group to create a list of concepts that should be included in the questionnaire to address the aim of the study and these concepts were fleshed out into the subsections of the questionnaire (e.g. participant background information, history of treatment, stammering severity, participation in sport and exercise, barriers and facilitators to participation in sport and exercise etc). Following this, the lead authors (SOC and AL) searched the literature for available published instruments in this field that could be utilised. For topics where no instrument was previously published, or a previously published instrument was unsuitable due to the population in the study, the two lead authors developed questions and responses addressing each topic. The authors then reviewed each question independently and met as a group to decide on inclusion, exclusion or editions required in each question. Finally, once the individual questions were established the authors met again to decide on the structure of the questionnaire.

Section 1 examined the participants' personal demographics (age, gender). Section 2 examined their history of stammering, and their perceived stammering severity during 10 different scenarios on a scale of 0–10 (e.g. talking on the phone to a stranger, talking in a group of people they are close with, talking to an authority figure) which was adapted from O'Brian et al. (2011). Their previous engagement in treatment for their stammer was examined in Section 3. Section 4 evaluated participants' previous experiences with exercise and sport, including what form of exercise they partake in and whether they feel exercise impacts their quality of life. Their motivations for exercise were also examined using a scale published by Markland & Ingledew (1997). Finally, Section 5 examined participants' perceptions on whether their stammer influenced their involvement in exercise. In this section, participants were required to reflect on how their stammer may interfere with various scenarios that can occur while partaking in exercise or sport. They were asked whether exercise/sport positively influenced their stammer (e.g. anxiety, breathing patterns, stammering severity etc), and

if stammering ever prevented them from taking part in exercise/sport or negatively impacted their involvement. Further questions on whether they stammer while exercising or are conscious of their stammering while exercising were queried. In addition, participants were asked whether they think exercise can improve their speech quality, if they were advised that exercise may help their stammer or if they actively take part in exercise to improve their stammer. Finally, participants were asked an open ended question on what would make their involvement in exercise or sport easier or more enjoyable regarding their speech, and if they had any additional comments.

Validity was established using a two-round modified Delphi review process (Hasson et al., 2000). Eight experts from associated fields of this study, speech and language therapy (n = 2), sports psychology (n = 2), physical activity (n = 2) and human behaviour (n = 1) were recruited along with an individual who stammers (n = 1). The inclusion, modification or removal of questions was suggested by experts and any question that received an approval rating of less than 70 % was removed. The questionnaire was then piloted on 10 people who stammer, and took 16.5 ± 6.5 min to complete.

2.3. Data collection

The questionnaire was available online via Google Forms for adults only, and hard-copies were available for adult participants. Data collection began in February 2020 for 8 weeks. A convenience sample of participants were recruited by contacting public (n = 8) and private (n = 4) speech therapy centres and stammering support groups and foundations (n = 8) to help distribute the questionnaire. Participants were also recruited from a weekend stammering treatment programme. Social media and word of mouth were utilised to advertise the questionnaire.

2.4. Data management and analysis

Data were downloaded from Google Forms in Google Sheets format and transferred into SPSS (version 26.0; IBM Corporation). Data were checked for missing or erroneous responses. For variables where missing data was present the overall proportions or descriptive statistics were generated from the total number of available valid responses. Frequencies and descriptive statistics were generated from the responses and open-ended questions were coded into prevailing themes. A stammering severity score was created by summating the participant's score on the related ten statements (maximum score of 100), with a higher score indicating greater severity of stammering. In addition, a total negative impact of stammering on sport and exercise participation score was also created. A mark of 1–5 was assigned to participant's responses, with 1 being given for those that reported "not at all" and 5 to "completely". Scores from all ten statements were summated to give a maximum score of 50. The higher the score the greater the negative impact of stammering. A Pearson's correlation was then completed to assess the relationship between stammering severity and total negative impact of stammering on sport and exercise participation score. Independent samples t-tests were conducted to compare total stammering severity score between 1) types of exercise they partook in (cardiovascular, resistance etc), 2) participants who played a team sport and those who didn't and 3) participants that reported their stammer prevented them from taking part in exercise or sport previously and those that didn't.

3. Results

3.1. Participant demographics and self-reported stammering severity

One hundred and six surveys were included in the analysis. Participants were primarily male (69.8 %, n = 74), with a mean age of 33.83 ± 14.5 (range: 18–73) years and the mean age that participants were diagnosed with a stammer was 5.77 ± 2.78 years (0–14 years). Participants primarily report greater severity of stammering during public speaking (6.71 ± 2.77), speaking to a group of people who they are not close with (6.34 ± 2.45) and speaking to an authority figure (6.25 ± 2.71) (Table 1). Over eighty percent (n = 85, 80.2 %) of participants reported that the severity of their stammering "often" increases when they are upset, anxious or stressed, with a further 10.4 % (n = 11) reporting "yes, but rarely". Most participants had engaged previously with speech therapy both through

Table 1
Self-reported stammering severity during speaking situations (n = 106).

Speaking situation	Mean ± Standard Deviation	Interquartile Range
Public speaking	6.71 ± 2.77	4
Speaking to a group of people you are not close with	6.34 ± 2.45	3
Speaking to an authority figure	6.25 ± 2.72	4
Speaking on the phone to someone you are not close with	5.91 ± 2.64	4
Speaking to a stranger	5.74 ± 2.71	5
Speaking to a person you know, but are not close with	4.74 ± 2.12	3
Speaking to a group of people you are close with	4.34 ± 2.15	3
Speaking on the phone to someone you are close with	4.10 ± 2.28	4
Speaking to a person you are close with	3.58 ± 2.09	3
Speaking to yourself	1.57 ± 1.67	1

Lower values imply lower stammering severity during that particular speaking situation. Interquartile range is a measure of variability of the results and indicates the middle 50 % of values when ordered from lowest to highest.

public (70.8 %, n = 75) and private (46.3 %, n = 49) systems.

3.2. Participants experience with exercise

Most participants took part in exercise or sport (n = 96, 90.6 %). Cardiovascular exercise was the most frequent type of exercise completed (77.9 %), followed by resistance training (50 %) (Table 2). Combining "very true for me" and "true for me" scores, revitalisation (66.0 %), positive health (63.2 %) and strength and endurance (60.4 %) were the leading motivators for exercise (Table 3). The majority of participants found exercise and sport had a positive effect on all measures of quality of life, with wellbeing (69.8 %), sense of achievement (60.4 %) and their physical (60.4 %) and emotional state (59.5 %) being most positively affected "completely" or "a lot" (Table 4). Table 5 details participants' thoughts on whether exercise positively affected their stammering. Over two-thirds of participants believed exercise or sport had a positive effect on severity of stammering. However, most participants reported exercise or sport had just "some" or "a little" effect (51.0 %). No significant differences between stammering severity was reported between those who take part in the differing types of exercise and those that did not ($p > 0.05$). In addition, stammer severity did not differ between those that play a team sport (51.6 ± 17.3) and those that don't (49.7 ± 2.1, $p > 0.05$).

3.3. Impact of stammering on exercise involvement

Participants reported that their stammer prevented them from taking part in some form of exercise or sport often (25.5 %, n = 27), and once (23.6 %, n = 25). Those who reported that exercise prevented them from taking part in exercise and sport previously (54.2 ± 20.5) displayed significantly higher self-reported stammering severity than those who did not (45.5 ± 2.2, $p = 0.02$) with a small effect size ($\eta^2 = 0.05$). Of the participants that provided reasons why stammering was a barrier to exercise (n = 37), being too nervous to introduce themselves, nervousness/fear of stammering or being judged was predominant (n = 33). Such responses included:

"Too nervous in case I would have to introduce myself"
"I avoid participating in events that involve a verbal registration process"
"I didn't want to stammer in front of new people, the fear was too intense"
"The fear of the unknown regarding introductions/strangers, and how I thought they'd react".

Stammering negatively affected participants' exercise involvement when participating often (22.6 %, n = 24) or once (19.8 %, n = 21), and the reasons provided (n = 27) were: not feeling part of the team (team sport) (n = 11), fear of speaking (n = 9), and bullying (n = 6). Responses included:

"I felt isolated and I didn't feel included since I couldn't actively be conversational with the rest of the group"
"Increased nervousness that people would judge on the stammer and not the physical ability"
"Negative reactions or laughter"

Taking on a leadership role (43.5 %, n = 46), booking appointments over the phone (46.2 %, n = 49), and answering questions about oneself (e.g. name, address, date of birth) when joining a new team (42.5 %, n = 45), were frequently identified as aspects of exercise impacted "completely" and "a lot" by stammering (Table 6). Most (62.3 %, n = 67) participants found that individual exercise was "not at all" affected by stammering, however a much lower number of participants (31.4 %, n = 33) reported group exercise was "not at all" affected (Table 6). A significant strong relationship between total negative impact of stammering on sport and exercise participation and stammer severity was observed ($r = 0.62$, $p < 0.0001$). When asked if anything could make exercise participation easier, participants (n = 49) reported that disclosing to teammates/staff would help reduce associated anxiety (63.3 %, n = 31), as well as increased awareness amongst the general public, teammates, and staff regarding stammering (32.7 %, n = 16).

Participants reported stammering while exercising often (22.6 %, n = 24) or rarely (27.4 %, n = 29), with 22.6 % (n = 24) never stammering while exercising and 27.4 % (n = 29) were unsure. Participants were often (23.6 %, n = 25) or rarely (27.4 %, n = 29) conscious of their stammer while exercising, but 38.7 % (n = 41) were never conscious of it and 10.4 % (n = 11) were unsure. While just 8.5 % (n = 9) were advised to take part in exercise to help their stammering, most participants believe exercise improves the quality of their speech indirectly (39.6 %, n = 42), directly (13.2 %, n = 14) and somewhat (17.9 %, n = 19). The reasons provided (n =

Table 2
Type of exercise and sport completed (n = 104).

Type of exercise	Complete % (n)
Cardiovascular exercise (e.g. running, swimming, cycling, brisk walking)	77.9 (81)
Resistance training (e.g. weight training, resistance bands, body weight exercises)	50.0 (52)
Flexibility training (e.g. stretching, yoga)	30.8 (32)
Team sport training (e.g. GAA, rugby, soccer, basketball)	17.3 (18)
Individual sport training (e.g. athletics, tennis, boxing, golf)	13.5 (14)
Group fitness class (e.g. spinning)	11.5(12)
Balance training (e.g. Tai Chi)	6.7 (7)
Other	6.7 (7)
Pilates	3.8 (4)

Percentage (%) and number (n) of participants that completed the specific type of exercise.

Table 3
Motivations for participation in exercise and sport (n = 106).

Motivation	Very True/True for me % (n)	Somewhat true for me % (n)	Very Untrue/Untrue for me % (n)
Revitalisation	66.0 (70)	25.5 (27)	8.5 (9)
Positive Health	63.2 (67)	26.4 (28)	10.3 (11)
Strength/Endurance	60.4 (64)	25.5 (27)	14.1 (15)
Enjoyment	59.4 (63)	27.3 (29)	13.2 (14)
Challenge	54.7 (58)	34.9 (37)	10.4 (11)
Stress Management	53.8 (57)	29.2 (31)	16.9 (18)
Appearance	50.9 (54)	30.2 (32)	18.8 (20)
Personality	45.3 (48)	34.0 (36)	20.8 (22)
Weight Management	45.3 (48)	28.3 (30)	26.4 (28)
Nimbleness	37.8 (40)	37.8 (40)	24.5 (26)
Ill Health Avoidance	36.8 (39)	37.7 (40)	43.4 (46)
Competition	33.1 (35)	32.1 (34)	34.9 (37)
Affiliation	23.6 (25)	26.4 (38)	40.6 (43)
Health Pressure	20.9 (22)	29.5 (31)	49.5 (52)
Social Recognition	18.9 (20)	37.7 (40)	43.4 (46)

Percentage (%) and number (n) of participants that reported their levels of agreement for different motivations for participation in exercise and sport.

Table 4
Positive effect of exercise and sport on quality of life (n = 106).

	Completely % (n)	A lot % (n)	Some % (n)	A little % (n)	Not at all % (n)
Well being	24.5 (26)	45.3 (48)	18.9 (20)	9.4 (10)	1.9 (2)
Sense of achievement	21.7 (23)	38.7 (41)	25.5 (27)	14.2 (9)	5.7 (6)
Physical state (e.g., tiredness)	17.9 (19)	42.5 (45)	28.3 (30)	7.5 (8)	3.8 (4)
Emotional state (e.g., mood)	17.0 (18)	42.5 (45)	25.5 (27)	7.5 (8)	7.5 (8)
Satisfaction with life	16.0 (17)	36.8 (39)	29.2 (31)	12.3 (13)	5.7 (6)
Sense of control	15.1 (16)	33.0 (35)	34.0 (36)	13.2 (14)	4.7 (5)
Sense of worth	14.2 (15)	40.6 (43)	25.5 (27)	13.2 (14)	6.6 (7)
Self confidence	12.3 (13)	37.7 (40	34.0 (36)	13.2 (14)	2.8 (3)
Anxiety	11.3 (12)	37.7 (40)	16.0 (17)	26.4 (28)	8.5 (9)

Percentage (%) and number (n) of participants that reported their levels of agreement for varying positive effects of exercise and sport on quality of life.

Table 5
Positive effect of exercise and sport on stammering and speech (n = 106).

	Completely % (n)	A lot % (n)	Some % (n)	A little % (n)	Not at all % (n)
Stress	14.2 (15)	31.1 (33)	28.3 (30)	11.3 (12)	15.1 (16)
Emotional state (e.g. mood)	13.2 (14)	32.1 (34)	26.4 (28)	15.1 (16)	13.2 (14)
Anxiety relating to speech	12.3 (13)	22.6 (24)	32.1 (34)	15.1 (16)	17.9 (19)
Self confidence	10.4 (11)	37.7 (40)	25.5 (27)	13.2 (14)	13.2 (14)
Physical state (e.g. tiredness)	9.4 (10)	38.7 (41)	26.4 (28)	13.2 (14)	12.3 (13)
Breathing patterns	8.5 (9)	17.0 (18)	25.5 (27)	30.2 (32)	18.9 (20)
Stammering severity	6.6 (7)	9.4 (10)	18.9 (20)	32.1 (34)	33.0 (35)

Percentage (%) and number (n) of participants that reported their levels of agreement for different positive effects of exercise and sport on their stammer and speech.

41) for improvements in speech quality were reduced stress and anxiety (31.7 %, n = 13), improved confidence (29.3 %, n = 12), feeling better (22.0 %, n = 9), and improved breathing patterns (9.76 %, n = 4). However, most participants do not actively take part in exercise to aid their stammering (80.8 %, n = 84), with just 8.7 % (n = 9) and 10.6 % (n = 11) doing this often or rarely, respectively.

4. Discussion

The vast majority of the individuals who stammer surveyed in the current study are physically active and take part in a variety of exercise and sporting activities. This is important as taking part in physical activity has a host of physical and psychosocial benefits and promotes healthy longevity (Vina et al., 2012). However, almost half of participants reported that their stammer prevented them from taking part in exercise or sport at least once. In addition, those that reported their stammer had prevented them from partaking in exercise or sport reported a great stammering severity. While no previous studies appear to have examined the relationship between

Table 6
Negative impact of stammering relating to aspects of involvement in exercise and sport (n = 106).

	Completely % (n)	A lot % (n)	Some % (n)	A little % (n)	Not at all % (n)
Leadership role (e.g. captaincy)	24.5 (26)	18.9 (20)	15.1 (16)	20.8 (22)	20.8 (22)
Booking appointment over phone	16.0 (17)	30.2 (32)	18.9 (20)	17.9 (19)	17.0 (18)
Answering questions about yourself	12.3 (13)	30.2 (32)	19.8 (21)	26.4 (28)	11.3 (12)
Making friends	11.3 (12)	17.9 (19)	29.2 (31)	20.8 (22)	20.8 (22)
Asking for assistance	10.4 (11)	20.8 (22)	15.1 (16)	27.4 (29)	26.4 (28)
Social events (e.g. team bonding)	9.4 (10)	22.6 (24)	20.8 (22)	19.8 (21)	27.4 (29)
Booking appointment in person	8.5 (9)	18.9 (20)	28.3 (30)	18.9 (20)	25.5 (27)
Communicating during exercise	5.7 (6)	17.9 (19)	26.4 (28)	29.2 (31)	20.8 (22)
Group exercise	5.7 (6)	16.2 (17)	25.7 (27)	21.0 (22)	31.4 (33)
Individual exercise	3.8 (4)	5.7 (6)	8.5 (9)	18.9 (20)	63.2 (67)

Percentage (%) and number (n) of participants that reported their levels of agreement for different negative impacts of stammering related to exercise and sport participation.

stammering and participation in sport and exercise, verbal communication can be an important component of exercise and sport and previous research has found that communication acts as a barrier to recreational activities in deaf-blind youths (Lieberman & Mac Vicar, 2003), and adults with aphasia (Blonski et al., 2014). Simple tasks that occur regularly during exercise and sport and are integral to these activities may require verbal communication and therefore place an individual in a situation where their stammer may occur. Similar to previous research in the stammer literature (Crichton-Smith, 2002; Plexico et al., 2009), participants in the current study reported that taking on a leadership role, booking appointments over the phone and answering questions about themselves when joining a new team were the most frequently identified tasks during exercise and sport impacted by their stammer. In addition, being too nervous to introduce themselves, nervousness or fear of stammering or perceived judgement due to their stammer were identified as the main barriers to taking part in exercise and sport in this study. Fear of negative evaluation (Blood & Blood, 2016; Bricker-Katz et al., 2009) has been previously reported in those that stammer, but also is a common barrier experienced in other populations. For example, females with obesity have reported that while they would like to take part in physical activity, the risk of experiencing ridicule and negative comments is too high and mentally draining (Myre et al., 2020). Thus, with the covert tendencies associated with stammering (Constantino et al., 2017), and willingness to avoid judgement and negative experiences, individuals who stammer may utilise a self-protection technique and so avoid taking part in exercise and sport (Crichton-Smith, 2002; Jackson et al., 2015; Plexico et al., 2009).

Stammering also negatively impacted 42.4 % of the sample's experiences when partaking in exercise or sport. In fact, approximately 1 in 5 reported these negative experiences occurred often (19.8 %). It is a concern that the enjoyment of these activities can impact the individual's motivation to continue taking part (Nielsen et al., 2014). Social inclusion is often recognised as a core component of sport, with sport often suggested to be an inclusive environment for all (Schaillée et al., 2019). However, participants in the current study reported not feeling part of the team and experiencing bullying. Negative social attitudes have also been reported as the largest barrier to exercise in those with a hearing impairment, with participants reporting fear of prejudice and lacking social confidence as driving factors in their avoidance of exercise (Tsai & Fung, 2005). Bullying is more common in those that stammer (Blood & Blood, 2004, 2007; Blood et al., 2011), and this can affect them later in life, as adults who had been bullied in childhood, presented with poorer psychosocial scale scores, regardless of whether they had a stammer or not (Blood & Blood, 2016). In fact, adolescent males and females who have been bullied have a higher odds of being physically inactive (Henriksen et al., 2016). Sport will experience the same social issues as society at large (Vveinhardt et al., 2019). Thus, all sporting organisations should have a social inclusion and anti-bullying policy and clearly detail how any issues are reported and handled (Stefaniuk & Bridel, 2018). In addition, social inclusion is paramount and those taking part in sport and exercise should be encouraged to exhibit empathy, respect and compassion to all fellow teammates (Short, 2013).

Similar to previous research (Klompas & Ross, 2004), the majority of participants reported that their stammer severity is increased when they are upset, anxious or stressed. While 70.7 % of participants reported that regular exercise improved the quality of their speech either directly, indirectly or somewhat, most of those surveyed (80.8 %) do not actively partake in exercise or sport to aid their stammering. Exercise or sporting participation may play a useful role, as an encouraged activity, by speech and language therapists, due to its ability to improve their health and wellbeing (Vina et al., 2012) but also potentially reducing anxiety (Jayakody et al., 2014). In fact, previous research has found that in social situations, individuals with a stammer experience significantly higher levels of emotional tension and engage in significantly less social interactions (Kraaimaat et al., 2002). Therefore, addressing the identified barriers and incorporating facilitators to taking part in exercise and sport is important to encourage lifelong physical activity participation.

Participants identified two main factors that would improve their enjoyment and make their involvement in exercise and sport easier. Firstly, disclosure of their stammer to those involved in exercise and sport, such as their fellow teammates, staff and coaches, was highlighted by participants as an important facilitator to partaking in exercise and sport. Disclosure can put the individual with the stammer and the person listening at ease (Crichton-Smith, 2002) and reduce the anxiety or worry the individual has about hiding the stammer from the listener (Healey et al., 2007). It can also help improve their acceptance of their stammer and early disclosure can lead to positive reactions from the listener (Collins & Blood, 1990; Healey et al., 2007). Secondly, increased awareness of stammering

amongst the general public, teammates and staff was also highlighted by participants as a way of making exercise and sporting participation easier. Negative reactions of others when stammering occurs can have a substantial impact on those who stammer and how they cope and deal with their stammer (Plexico et al., 2009). There is a broad view that there is not only a lack of awareness and knowledge in the general public about the topic and the impact stammering can have on those who stammer, but negative stereotyping also can occur (Berquez et al., 2011). Thus, more educational programmes targeting those involved in sport and exercise, that aim to enhance awareness and knowledge of stammering and how they can support those who stammer within the exercise and sporting context are required. Further qualitative research should be conducted to delve deeper into the facilitators to exercise and sport participation. This, along with further examination of potential barriers in a qualitative manner, is essential to inform the design of evidence-based interventions that will have the best chance of successfully enhancing exercise and sporting participation.

4.1. Limitations

The convenience sampling method utilised in this study facilitated participants choosing to complete the questionnaire on a self-selected basis. This may have led to participation bias, with those who have a greater interest in exercise and sport completing the questionnaire. A relatively small sample size of 110 Irish individuals who stammer were recruited, thus limiting the generalizability of the results. A much greater proportion of males completed the questionnaire than females (69.8 % *vs* 30.2 %). However, more males than females typically experience a stammer (Yairi & Ambrose, 2005) and so this is somewhat representative of the population who stammer. We examined the percentage of participants that took part in some form of exercise and sport and did not identify whether they met the minimum requirements of physical activity. This limited our ability to compare participant rates to other populations. In addition, we did not ask participants how long they had in engaged in any exercise or sport that they currently took part in. Future research should request participants to provide more detailed information on how long they took part in any reported activities and whether they meet the weekly minimum guidelines for physical activity.

5. Conclusions

Most of the individuals who stammer surveyed took part in some form of exercise or sport. However, stammering was still identified by many as a barrier. It prevented almost half of participants from taking part in some form of exercise or sport at least once, and just over two in five participants in exercise and sport were negatively impacted at least once while participating. Based on participant feedback, in order to encourage lifelong participation in exercise and sport for those who stammer, we recommend encouraging self-disclosure of their stammer to those involved when taking part in exercise or sport and facilitating education on stammering in the sporting population.

Financial disclosure

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Declaration of Competing Interest

The authors have no conflicts of interest to disclose.

Acknowledgements

The authors would like to thank the experts that contributed to the validation of the questionnaire; Dr. Mary O'Dwyer, Mrs. Joan Brophy, Dr. Anna Donnla O'Hagan, Dr. Ciara Lotsy, Dr. Mika Manninen, Dr. Noel McCaffery, Ms. Róisín Lacey, and Mr. Joe O'Donnell. The authors would also like to thank those who facilitated participant recruitment and all of those who participated in this research.

Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:https://doi.org/10.1016/j.jfludis.2021.105880.

References

Awadalla, N. J., Aboelyazed, A. E., Hassanein, M. A., Khalil, S. N., Aftab, R., Gaballa, I. I., & Mahfouz, A. A. (2014). Assessment of physical inactivity and perceived barriers to physical activity among health college students, south-western Saudi Arabia. *Eastern Mediterranean Health Journal, 20*(10), 596–604.

Bailey, K., Harris, S. J., & Simpson, S. (2015). Stammering and the social model of disability: Challenge and opportunity. *Procedia - Social and Behavioral Sciences, 193*, 13–24. https://doi.org/10.1016/j.sbspro.2015.03.240.

Berquez, A. E., Cook, F. M., Millard, S. K., & Jarvis, E. (2011). The stammering information programme: A Delphi study. *Journal of Fluency Disorders, 36*(3), 206–221. https://doi.org/10.1016/j.jfludis.2011.02.007.

Blonski, D. C., Covert, M., Gauthier, R., Monas, A., Murray, D., O'Brien, K. K., Mendelson, A. D., & Huijbregts, M. (2014). Barriers to and facilitators of access and participation in community-based exercise programmes from the perspective of adults with post-stroke aphasia. *Physiotherapy Canada, 66*(4), 367–375. https://doi.org/10.3138/ptc.2013-70.

Blood, G. W., & Blood, I. M. (2004). Bullying in adolescents who stutter: Communicative competence and self-esteem. *Contemporary Issues in Communication Science and Disorders, 31*(Spring), 69–79. https://doi.org/10.1044/cicsd_31_S_69.

Blood, G. W., & Blood, I. M. (2007). Preliminary study of self-reported experience of physical aggression and bullying of boys who stutter: Relation to increased anxiety. *Perceptual and Motor Skills, 104*(3_suppl), 1060–1066. https://doi.org/10.2466/pms.104.4.1060-1066.

Blood, G. W., & Blood, I. M. (2016). Long-term consequences of childhood bullying in adults who stutter: Social anxiety, fear of negative evaluation, self-esteem, and satisfaction with life. *Journal of Fluency Disorders, 50*, 72–84. https://doi.org/10.1016/j.jfludis.2016.10.002.

Blood, G. W., Blood, I. M., Tramontana, G. M., Sylvia, A. J., Boyle, M. P., & Motzko, G. R. (2011). Self-reported experience of bullying of students who stutter: Relations with life satisfaction, life orientation, and self-esteem. *Perceptual and Motor Skills, 113*(2), 353–364. https://doi.org/10.2466/07.10.15.17.PMS.113.5.353-364.

Blumgart, E., Tran, Y., & Craig, A. (2010a). Social anxiety disorder in adults who stutter. *Depression and Anxiety, 27*(7), 687–692. https://doi.org/10.1002/da.20657.

Blumgart, E., Tran, Y., & Craig, A. (2010b). An investigation into the personal financial costs associated with stuttering. *Journal of Fluency Disorders, 35*(3), 203–215. https://doi.org/10.1016/j.jfludis.2010.03.002.

Bouchard, C., Blair, S., & Haskell, W. (2012). *Physical activity and health*. Human Kinetics.

Boyle, M. P. (2013). Psychological characteristics and perceptions of stuttering of adults who stutter with and without support group experience. *Journal of Fluency Disorders, 38*(4), 368–381. https://doi.org/10.1016/j.jfludis.2013.09.001.

Bricker-Katz, G., Lincoln, M., & McCabe, P. (2009). A life-time of stuttering: How emotional reactions to stuttering impact activities and participation in older people. *Disability and Rehabilitation, 31*(21), 1742–1752. https://doi.org/10.1080/09638280902738672.

Büchel, C., & Sommer, M. (2004). What Causes Stuttering? *PLoS Biology, 2*(2), e46. https://doi.org/10.1371/journal.pbio.0020046.

Collins, C., & Blood, G. (1990). Acknowledgment and severity of stuttering as factors influencing nonstutterers' perceptions of stutterers. *Journal of Speech and Hearing Disorders, 55*(1), 75–81. https://doi.org/10.1044/jshd.5501.75.

Constantino, C. D., Manning, W. H., & Nordstrom, S. N. (2017). Rethinking covert stuttering. *Journal of Fluency Disorders, 53*, 26–40. https://doi.org/10.1016/j.jfludis.2017.06.001.

Craig, A., & Tran, Y. (2006). Fear of speaking: Chronic anxiety and stammering. *Advances in Psychiatric Treatment, 12*(1), 63–68. https://doi.org/10.1192/apt.12.1.63.

Craig, A., Blumgart, E., & Tran, Y. (2009). The impact of stuttering on the quality of life in adults who stutter. *Journal of Fluency Disorders, 34*(2), 61–71. https://doi.org/10.1016/j.jfludis.2009.05.002.

Crichton-Smith, I. (2002). Communicating in the real world: Accounts from people who stammer. *Journal of Fluency Disorders, 27*(4), 333–352. https://doi.org/10.1016/S0094-730X(02)00161-4.

Ding, D., Lawson, K. D., Kolbe-Alexander, T. L., Finkelstein, E. A., Katzmarzyk, P. T., van Mechelen, W., & Pratt, M. (2016). The economic burden of physical inactivity: A global analysis of major non-communicable diseases. *The Lancet, 388*(10051), 1311–1324. https://doi.org/10.1016/S0140-6736(16)30383-X.

Douglass, J. E., Schwab, M., & Alvarado, J. (2018). Covert stuttering: Investigation of the paradigm shift from covertly stuttering to overtly stuttering. *American Journal of Speech-Language Pathology, 27*(3S), 1235–1243. https://doi.org/10.1044/2018_AJSLP-ODC11-17-0190.

Fava, G. A., Grandi, S., Rafanelli, C., Ruini, C., Conti, S., & Belluardo, P. (2001). Long-term outcome of social phobia treated by exposure. *Psychological Medicine, 31*(5), 899–905. https://doi.org/10.1017/S0033291701004020.

Fuertes, E., Carsin, A.-E., Antó, J. M., Bono, R., Corsico, A. G., Demoly, P., Gislason, T., Gullón, J.-A., Janson, C., Jarvis, D., Heinrich, J., Holm, M., Leynaert, B., Marcon, A., Martinez-Moratalla, J., Nowak, D., Erquicia, S. P., Probst-Hensch, N. M., Raherison, C., … Aymerich, J. G. (2018). Leisure-time vigorous physical activity is associated with better lung function: The prospective ECRHS study. *Thorax, 73*(4), 376–384. https://doi.org/10.1136/thoraxjnl-2017-210947.

Gómez-López, M., Gallegos, A. G., & Extremera, A. B. (2010). Perceived barriers by university students in the practice of physical activities. *Journal of Sports Science & Medicine, 9*(3), 374–381.

Guthold, R., Stevens, G. A., Riley, L. M., & Bull, F. C. (2018). Worldwide trends in insufficient physical activity from 2001 to 2016: A pooled analysis of 358 population-based surveys with 1·9 million participants. *The Lancet Global Health, 6*(10), e1077–e1086. https://doi.org/10.1016/S2214-109X(18)30357-7.

Hasson, F., Keeney, S., & McKenna, H. (2000). Research guidelines for the Delphi survey technique. *Journal of Advanced Nursing, 32*(4), 1008–1015. https://doi.org/10.1046/j.1365-2648.2000.t01-1-01567.x.

Healey, E. C., Gabel, R. M., Daniels, D. E., & Kawai, N. (2007). The effects of self-disclosure and non self-disclosure of stuttering on listeners' perceptions of a person who stutters. *Journal of Fluency Disorders, 32*(1), 51–69. https://doi.org/10.1016/j.jfludis.2006.12.003.

Henriksen, P. W., Rayce, S. B., Melkevik, O., Due, P., & Holstein, B. E. (2016). Social background, bullying, and physical inactivity: National study of 11- to 15-year-olds. *Scandinavian Journal of Medicine & Science in Sports, 26*(10), 1249–1255. https://doi.org/10.1111/sms.12574.

Herdt, A. D., Knapen, J., Vancampfort, D., Hert, M. D., Brunner, E., & Probst, M. (2013). Social anxiety in physical activity participation in patients with mental illness: A cross-sectional multicenter study. *Depression and Anxiety, 30*(8), 757–762. https://doi.org/10.1002/da.22059.

Iverach, L., & Rapee, R. M. (2014). Social anxiety disorder and stuttering: Current status and future directions. *Journal of Fluency Disorders, 40*, 69–82. https://doi.org/10.1016/j.jfludis.2013.08.003.

Jackson, E. S., Yaruss, J. S., Quesal, R. W., Terranova, V., & Whalen, D. H. (2015). Responses of adults who stutter to the anticipation of stuttering. *Journal of Fluency Disorders, 45*, 38–51. https://doi.org/10.1016/j.jfludis.2015.05.002.

Jayakody, K., Gunadasa, S., & Hosker, C. (2014). Exercise for anxiety disorders: Systematic review. *British Journal of Sports Medicine, 48*(3), 187–196. https://doi.org/10.1136/bjsports-2012-091287.

Klompas, M., & Ross, E. (2004). Life experiences of people who stutter, and the perceived impact of stuttering on quality of life: Personal accounts of South African individuals. *Journal of Fluency Disorders, 29*(4), 275–305. https://doi.org/10.1016/j.jfludis.2004.10.001.

Kohl, H. W., Craig, C. L., Lambert, E. V., Inoue, S., Alkandari, J. R., Leetongin, G., & Kahlmeier, S. (2012). The pandemic of physical inactivity: Global action for public health. *The Lancet, 380*(9838), 294–305. https://doi.org/10.1016/S0140-6736(12)60898-8.

Kraaimaat, F. W., Vanryckeghem, M., & Van Dam-Baggen, R. (2002). Stuttering and social anxiety. *Journal of Fluency Disorders, 27*(4), 319–331. https://doi.org/10.1016/S0094-730X(02)00160-2.

Lieberman, L. J., & Mac Vicar, J. M. (2003). Play and recreational habits of youths who are deaf-blind. *Journal of Visual Impairment & Blindness, 97*(12), 755–768. https://doi.org/10.1177/0145482X0309701203.

Markland, D., & Ingledew, D. K. (1997). The measurement of exercise motives: Factorial validity and invariance across gender of a revised Exercise Motivations Inventory. *British Journal of Health Psychology, 2*(4), 361–376. https://doi.org/10.1111/j.2044-8287.1997.tb00549.x.

Martin, C. K., Church, T. S., Thompson, A. M., Earnest, C. P., & Blair, S. N. (2009). Exercise dose and quality of life: A randomized controlled trial. *Archives of Internal Medicine, 169*(3), 269–278. https://doi.org/10.1001/archinternmed.2008.545.

Mason, J. E., Faller, Y. N., LeBouthillier, D. M., & Asmundson, G. J. G. (2019). Exercise anxiety: A qualitative analysis of the barriers, facilitators, and psychological processes underlying exercise participation for people with anxiety-related disorders. *Mental Health and Physical Activity, 16*, 128–139. https://doi.org/10.1016/j.mhpa.2018.11.003.

Messenger, M., Onslow, M., Packman, A., & Menzies, R. (2004). Social anxiety in stuttering: Measuring negative social expectancies. *Journal of Fluency Disorders, 29*(3), 201–212. https://doi.org/10.1016/j.jfludis.2004.06.002.

Mulcahy, K., Hennessey, N., Beilby, J., & Byrnes, M. (2008). Social anxiety and the severity and typography of stuttering in adolescents. *Journal of Fluency Disorders, 33*(4), 306–319. https://doi.org/10.1016/j.jfludis.2008.12.002.

Murphy, B., Quesal, R. W., & Gulker, H. (2007). Covert stuttering. *Perspectives on Fluency and Fluency Disorders, 17*(2), 4–9. https://doi.org/10.1044/ffd17.2.4.

Myre, M., Glenn, N. M., & Berry, T. R. (2020). Exploring the impact of physical activity-related weight stigma among women with self-identified obesity. *Qualitative Research in Sport, Exercise and Health*, 1–18. https://doi.org/10.1080/2159676X.2020.1751690.

Nicolosi, L., Harryman, E., & Kresheck, J. (2004). *Terminology of communication disorders: Speech-language-hearing*. Lippincott Williams & Wilkins.
Nielsen, G., Wikman, J. M., Jensen, C. J., Schmidt, J. F., Gliemann, L., & Andersen, T. R. (2014). Health promotion: The impact of beliefs of health benefits, social relations and enjoyment on exercise continuation. *Scandinavian Journal of Medicine & Science in Sports, 24*(S1), 66–75. https://doi.org/10.1111/sms.12275.
Nystoriak, M. A., & Bhatnagar, A. (2018). Cardiovascular effects and benefits of exercise. *Frontiers in Cardiovascular Medicine, 5*. https://doi.org/10.3389/fcvm.2018.00135.
O'Brian, S., Jones, M., Packman, A., Menzies, R., & Onslow, M. (2011). Stuttering severity and educational attainment. *Journal of Fluency Disorders, 36*(2), 86–92. https://doi.org/10.1016/j.jfludis.2011.02.006.
Plexico, L. W., Manning, W. H., & Levitt, H. (2009). Coping responses by adults who stutter: Part I. Protecting the self and others. *Journal of Fluency Disorders, 34*(2), 87–107. https://doi.org/10.1016/j.jfludis.2009.06.001.
Reichert, F. F., Barros, A. J. D., Domingues, M. R., & Hallal, P. C. (2007). The role of perceived personal barriers to engagement in leisure-time physical activity. *American Journal of Public Health, 97*(3), 515–519. https://doi.org/10.2105/AJPH.2005.070144.
Salvo, H. D., & Seery, C. H. (2021). Perspectives of stuttering treatment: Children, adolescents, and parents. *Journal of Fluency Disorders, 69*, Article 105863. https://doi.org/10.1016/j.jfludis.2021.105863.
Schaillée, H., Haudenhuyse, R., & Bradt, L. (2019). Community sport and social inclusion: International perspectives. *Sport in Society, 22*(6), 885–896. https://doi.org/10.1080/17430437.2019.1565380.
Short, D. (2013). *Don't be so gay!: Queers, bullying, and making schools safe*. UBC Press.
Stefaniuk, L., & Bridel, W. (2018). Anti-bullying policies in Canadian sport: An absent presence. *Journal of Park & Recreation Administration, 36*(2), 160–176. https://doi.org/10.18666/JPRA-2018-V36-I2-8439.
Tsai, E., & Fung, L. (2005). Perceived constraints to leisure time physical activity participation of students with hearing impairment. *Therapeutic Recreation Journal, 39*(3), 192–206.
Vanryckeghem, M., Brutten, G. J., Uddin, N., & Borsel, J. V. (2004). A comparative investigation of the speech-associated coping responses reported by adults who do and do not stutter. *Journal of Fluency Disorders, 29*(3), 237–250. https://doi.org/10.1016/j.jfludis.2004.07.001.
Vina, J., Sanchis-Gomar, F., Martinez-Bello, V., & Gomez-Cabrera, M. C. (2012). Exercise acts as a drug; the pharmacological benefits of exercise. *British Journal of Pharmacology, 167*(1), 1–12. https://doi.org/10.1111/j.1476-5381.2012.01970.x.
Vveinhardt, J., Fominiene, V. B., & Andriukaitiene, R. (2019). Encounter with bullying in sport and its consequences for youth: Amateur athletes' approach. *International Journal of Environmental Research and Public Health, 16*(23), 4685. https://doi.org/10.3390/ijerph16234685.
Wingate, M. E. (1964). A standard definition of stuttering. *Journal of Speech and Hearing Disorders, 29*(4), 484–489. https://doi.org/10.1044/jshd.2904.484.
Yairi, E., & Ambrose, N. (2013). Epidemiology of stuttering: 21st century advances. *Journal of Fluency Disorders, 38*(2), 66–87. https://doi.org/10.1016/j.jfludis.2012.11.002.
Yairi, E., & Ambrose, N. C. (2005). *Early childhood stuttering: For clinicians by clinicians* (Vol. 521).
Zubala, A., MacGillivray, S., Frost, H., Kroll, T., Skelton, D. A., Gavine, A., Gray, N. M., Toma, M., & Morris, J. (2017). Promotion of physical activity interventions for community dwelling older adults: A systematic review of reviews. *PLoS One, 12*(7), Article e0180902. https://doi.org/10.1371/journal.pone.0180902.

Dr. Siobhán O'Connor is an Associate Professor in the School of Health and Human Performance in Dublin City University. She is a Certified Athletic Therapist and is primarily an injury surveillance and injury prevention researcher. She conducts multi-disciplinary research with the ultimate aim of encouraging lifelong participation in sport and exercise.

Professor Kieran Moran is a Professor of Biomechanics in the School of Health and Human Performance and Insight SFI research centre for data analytics in Dublin City University. He is interested in the barriers to physical activity and sport, and in particular how sensed data and technology can be used to increase participation.

Dr. Enda Whyte is an Assistant Professor in the School of Health and Human Performance and the Centre for Injury Prevention and Performance in Dublin City University. He is primarily interested in the investigation of barriers and the development of interventions to optimise participation in physical activity and sport.

Ms. Aisling Lacey is a Certified Athletic Therapist who is currently conducting a PhD in running related injuries in conjunction with the School of Health and Human Performance in Dublin City University and Insight SFI research centre for data analytics. Aisling is a person who stammers, and therefore is interested in the relationship between exercise and sport participation and stammering.