Construction and Validation of a Short Version of the Impact Scale for Assessment of Cluttering and Stuttering (ISACS)

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1 Introduction

Though the term “fluency” in the general sense means “forward flow of speech”, it can be interpreted in various ways (Wingate, 2002). It might mean fluency of language, content or thought. Further, it would be a dynamic variable, changing constantly based on the circumstances in which an interaction occurs. Broadly, fluency disorders can be classified as stuttering or cluttering. In a person with stuttering, the interruption in the forward flow of speech is manifested as excessive pauses, stress and effort – both mental and physical (Peters & Guitar, 1991). In a person with cluttering, on the other hand, there is a lack of pauses or effort, resulting in excessive repetitions, clustering of syllables, and a characteristic unawareness of the disorder (Daly & Burnett, 1999).

Since communication is central to human existence, stuttering and cluttering the impact of fluency disorders is not limited to speech but percolates to all areas of life (Van Riper, 1982; Daly & Burnett, 1999; Yaruss, 2010). The mosaic of factors related to the fluency disorder would not only differ from person to person, but also change depending on the situation, speech content and communicative partners, for the same individual (Bloodstein, 1995). It would therefore be beneficial to have a tool to quantify various environmental, cognitive and personal variables while assessing a person with a fluency disorder.

Most tools used for assessment of persons with fluency disorders document severity and/or attitudinal variables (Brutten& Dunham, 1989; Langevin, 2009), but not all the variables that would directly or indirectly influence the disorder. This is changing with the advent of the ICF (WHO, 2001). The ICF aims at providing a unified and standard language and framework for the description of health and health-related states. It has two parts, each with two components:

Part I: Functioning and Disability

Part II: Contextual factors

The first part is further divided into two components: Body Functions and Structures; and Activities and Participation. Similarly contextual factors are further classified as Environmental factors and Personal factors. Each component in turn consists of various domains and each domain contains several categories. A person's health related state can be described in detail using a combination of category codes. Each category code is followed by a qualifier, which might be positive or negative, denoting the extent of functioning or disability in that category. In this manner, combining the medical and social models of disability and functioning, the ICF provides a coherent view of biological, personal and social perspectives of health.

Person- environment transactions have been investigated in several studies in the field of fluency disorders (Denissen, Asendorf& Van Aken, 2008; Millard, Nicholas & Cook, 2008). Their face validity and efficiency would increase considerably if tools based on the ICF are used for measurement. While an increasing number of such tools are now being developed around the world (Yaruss&Quesal, 2006; St Louis et al., 2010), no such tool has yet been developed in India in the context of fluency disorders. Further, although these tools focus on stuttering, no standardized tool assesses the overall impact of cluttering.

The ICF emphasizes the contribution of the environment, which includes significant other persons in the life of a person with a fluency disorder. This is another aspect of fluency disorders that most current tools do not measure.

In answer to the need for an impact assessment instrument for fluency disorders that would be valid in India, an Impact Scale for Assessment of Cluttering and Stuttering (ISACS) (Kelkar&Mukundan, 2015) was constructed. An ICF based 100 item tool divided into four

subscales, the ISACS helps measure the impact of stuttering and cluttering from two perspectives- that of clients and their significant others.

1.1 Need for the study

A unique feature of the ISACS as opposed to other impact assessment tools is the simultaneous measurement of impact from two perspectives. As with other impact assessment tools, however, the ISACS consists of 100 statements in order to adequately represent codes in the ICF. A drawback of this is the time taken to respond to them. This not only reduces valuable session time, but the resultant fatigue or response burden (Ware, Kosinski& Keller, 1996) might also distort the accuracy of responses (Diehr, Chen, Patrick, Feld &Yasui, 2005; Synder et al., 2007; Galesik&Bosnjak, 2009), thus compromising on validity of the information obtained.

Previous studies have reported good replication of tests of empirical validity for shorter versions of scales (Ware, Kosinski& Keller, 1996). Use of a short version of an assessment instrument would be extremely beneficial in India where the clinician-client ratio is extremely poor (Mohan, Anjum&Rao, 2017).

2 Aims and Objectives

2.1 Aims

The aim of the present study was to construct an abridged version of the ISACS and to find out the equivalence, construct validity and explore the response trends of the shorter version across Persons with fluency disorders (PWFD), their family members (FM) and typical speakers (TS).

2.2 Key research questions

Is the short version of the ISACS equivalent to the original version?

Does the short version of the ISACS have high construct validity?

Does the short version of the ISACS yield similar response trends as the original version?

2.3 Hypotheses

The present study principally aimed at testing three research hypotheses:

1. There is no significant difference between the ISACS scores obtained using the original ISACS and a short version of the ISACS.
2. There is no significant difference between ISACS (A) and (B) scores obtained using the short version of the ISACS.
3. There is no significant difference between ISACS (A) scores of typical speakers and persons with fluency disorders obtained using the short version of the ISACS.

2.4 Objectives

Objective 1 Reducing the length of the ISACS based on factor analysis and assessing its equivalence to the original version

An exploratory factor analysis was conducted for the items of the original version of the ISACS (A). Items that did not load on the factors identified were removed. The equivalence of the short version to the original ISACS (A) was determined by a combination of subjective and objective assessments.

Objective 2 Administering the shortened version of the ISACS to 100 persons with fluency disorders and their significant others

The short version was administered to a purposive sample of 100 persons with fluency disorders (stuttering/ cluttering) and their significant other persons. Reliability was estimated on the basis of Cronbach's alpha. Split half reliability would also be calculated.

Objective 3 Administering the shortened version of the ISACS to 50 typical speakers, age and gender- matched to 50 of the persons with fluency disorders

The short version of ISACS (A) was administered to 50 typical speakers. This was done to ascertain whether the short version of the ISACS measures impact of fluency disorders.

3 Review of Literature

The impact of fluency disorders have been identified as an area of significance, even more so since the advent of the ICF model. Recent literature in this area has been focused on development of various tests that encompass all the areas of life that are affected due to fluency disorders. A brief summary of the exiting tools are listed below.

3.1 Tools to assess attitudes orimpact

A review of presently available impact and attitude assessment tools for fluency disordersreveals that they are limited to stuttering. Of these, most impact assessment instruments like the Overall Assessment of the Speaker's Experience of Stuttering (OASES) (Yaruss&Quesal, 2006) and the Assessment of the Child's Experience of Stuttering (ACES), (Coleman, Yaruss&Quesal, 2004) consist of over 50 statements in order to represent maximally the codes in the ICF.

A brief review of the tools and what they measure is mentioned below:

3.1.1 Perceptions of stuttering Inventory (PSI) – Woolf (1967)

This consists of 20 closed set (true/ false) questions that look into the dysfluencies in terms of the person with stuttering. The scores are classified ranging from Mild (below 7) to severe (16- 20 points).

3.1.2 Erikson's S- 24 scale(Andrews, & Cutler,1974)

The communication attitudes measured by the 39 item S- scale by Erikson were revised to form the aforementioned scale. It has simple one point- true/ false questions regarding feelings toward speech, fluency breakdown and socializing. They are scored to give a simple "stutterer's communication score".

3.1.3 The Wright and Ayre Stuttering Self- rating profile 'WASSP'- (Wright &Ayre, 2000)

Similar to OASES this questionnaire encapsulates various aspects of stuttering behaviours, the tripartite ABC's of stuttering and impact in social settings, through 26 questions. The answers are set on a 7- point likert scale.

3.1.4 Subjective severity of stuttering (SSS, Riley, Riley & Maguire, 2004)

This questionnaire attempts to probe into the self-rating of severity, Locus of control (internal or external) and avoidance behaviour. It consists of 8 questions with a 9- point likert scale. The scale gives a brief insight into the self- perception of persons with stuttering(PWS) with the help of a total score from the answers.

3.1.5 Assessment of the Child's Experience of Stuttering(Coleman, Yaruss&Quesal, 2004)

This tool consists of four sections that are aimed at providing an insight on the impact of stuttering in the younger demographic (7-18 years). They probe into: the self-perception and attitude towards stuttering, cognitive, behavioral and affective reactions, and social context based interferences of the disorder, and finally, the quality of life and life satisfaction related measures are looked into. The tool gives out overall impact score based on the above domains.

3.1.6 Peer Attitudes Toward Children who Stutter (PATCS) (Langevin&Hagler, 2004)

This scale helps shed light on the impact of stuttering in the school settings. The ABC (Affective, behavioural and cognitive) components and peer interaction were attempted to be measured by a set of 116 questions, which were later condensed to 40 questions. They have been grouped under the subscales of social distance, social pressure and Verbal Interaction – measured with a 5- point Likert scale.

3.1.7 Overall Assessment of the Speaker's Experience of Stuttering(Yaruss&Quesal, 2006)

It consists of 4 sections: The information obtained revolves around self-perception of speaking ability, self- reactions to the overt and covert aspects of stuttering, day to day communication in social situations, and quality of life measures. The scores are computed from the questions attempted. Since OASES has been administered to over 300 PWS till date, Yaruss&Quesal (2006) have given a classification based on the total impact scores thus computed. Impact based on the OASES may thus classified across five categories ranging from Mild (20- 29.9) to Severe (75- 100).

3.1.8 Speech situation checklist (SSC, Brutten, 1973; Brutten&Vanryckeghem,2003, 2007)

This checklist was initially a part of the Behavioural Assessment Battery (Brutten, 1973), and has been standardized as its potential as a separate entity to measure the covert ABC's of stuttering was realized. The checklist consists of two separate parts that measure the emotional response and speech disruption; the former pursues the negative psychological impact of the PWS and the latter gains perspective on the speech breakdown caused by it. The 38 question- checklist is answered employing a 5- point likert scale, and the scores range from 38- 190, depending on the impact.

3.1.9 Communication Attitude Test for Adults who Stutter (BigCAT) (Vanryckeghem& Muir, 2016)

This test probes into the communication attitudes of the PWS with 35 questions that are close ended. The responses with negative attitudes towards speech are scored as 1 and positive responses are scored as 0, thus the scoring ranges from '0- 35'. This test is seen to have high test- retest reliability.

3.1.10 Public Opinion Survey of Human Attributes—Stuttering *(*POSHA-S) (St. Louis, 2011

This questionnaire attempts to get insights into the public's attitudes and beliefs about stuttering. It attempts to compare a spectrum of positive- negative events with stuttering in order to gain the public's perspective.

Further, anxiety and negative correlates of stuttering maybe measured by using tools such as Unhelpful Thoughts and Beliefs About Stuttering (UTBAS, St. Clare et al, 2009), which measure a number of negative attitudes associated with stuttering.

However, other than the OASES- P (Beilby et al., 2013) which was not standardized, tools using the ICF do not account for other people's perception of impact of stuttering. Another limitation of the existing tools is that they exclude cluttering.

Tools for self-assessment of cluttering have been adapted from tools originally meant to assess stuttering. E.g. The Perceptions of Speech Communication inventory (Daly, 1993) was adapted from the Perceptions of Stuttering Inventory (Woolf, 1967) by substituting the words "speaking difficulty" for "stuttering". However, no scale has been developed specifically to assess impact of cluttering. Only one scale has been cited in literature, to measure other people's perception of cluttering. This tool, called the POSHA- Cl (Cluttering) (St Louis, et al., 2010) was adapted from the Public Opinion Survey of Human Attributes (POSHA-E) (St. Louis, Reichel, Yaruss&Lubker, 2009), originally designed to measure public attitudes towards stuttering. However, no subsequent study has been cited in literature using the POSHA-Cl.

The existing literature encompasses a few studies have also been probing into the aspects of life i.e., workplace, education, overall quality of life, etc. using qualitative

interviews and some of the above mentioned instruments. A brief summary of the studies relevant to the current topic, have been mentioned in this section.

McAllister, Collier & Shepstone (2012) on studying 217 PWFD, and 15,000 Typical Speakers (TS), through a survey, identified no significant effect of stuttering in the purview of education. But, presence of stuttering did indicate a higher chance of being bullied in school. Chances of being employed weren't shown to be reduced, but PWS were seen to have a lower status of job, when compared to others. This was reasoned out to be particularly due to their lack of confidence in speaking. This fell in line with prior studies in this direction (Klien&Hood, 2004; Rice &Kroll, 2004)whose results delineated that presence of a fluency disorder may interfere with promotion or job performance and may cause discrimination.

Quality of life is another popular theme that has been continually explored in PWFD. It has been explicitly reflected through numerous studies (Craig, Blumgart& Tran, 2009;Klompas& Ross, 2004) that stuttering plays a detrimental role in life, leaving a negative emotional impact. Numerous studies agree on the dismal impact in PWS, but, some studies list increased severity of stuttering as the reason for the impact. Meanwhile, on the opposite end of the spectrum, Andrade, Sassi, Juste&Ercolin, 2008, assert that all levels of severity would be equally impacted by fluency disorders.

Many studies have discussed the negative psychological impact of stuttering. Mcallister, Collier & Shepstone in 2013, proved that the link was decisive and highlighted the importance of therapeutic intervention in this regard. More evidence in this direction was gathered by Erickson & Block (2013) who probed into the self-perceived communication competence and stigma in adolescent PWS. The study found that there were long term negative effects of stuttering, and the PWS reported low perception of competence; higher chances of bullying was found, especially in families where the emotional support was strained. High perception of self- doubts, self- stigma in the professional environment has

also been highly reported in this population. (Bricker- Katz, Lincoln & Cumming 2013)Special attention has also been drawn towards severity of stuttering as being a factor in increased negative self- acceptance. (Swartz, Irani& Gabel, 2015; Adriaenses, Beyers&Struyf, 2015)

In general, there have been a few linksbetween the severity of stuttering and higher impact, but there is no evidence of correlation between age and gender of PWS with the impact of the disorder. (Freud, Kichin- Brin, Vinacour, Roznier& Amir, 2017) The self-perceptions of PWS have correctly been identified as an important factor in deciding the Impact of the disorder. However the perceptions of PWS have also been known to be influenced by perceptions of persons around them. (Lau, Beilby, Byrnes & Hennessey, 2012) Studying the way others perceive the impact of the fluency disorder can therefore add valuable information and insight into the person with the disorder.

The self-perceptions of a PWS might often be worse than others' perceptions of them. Lau et al. (2012) underlined the complex interaction between anxiety, environment and stuttering in a study where 16 adults with stuttering and 16 typical individuals matched for gender, age and education gave a 3 minute speech. The audience was a screen with a pre-recorded video of eight men and eight women, and the eye movements of the speakers were recorded. PWS looked significantly less at the screen than controls. Further, compared to the typical individuals, PWS looked significantly less at the audience members who gave positive reactions. Thus the authors concluded that attention biases to avoid social information may contribute to the maintenance of social anxiety in PWS. PWS probably tend to have a "set to observe stuttering".

Self-perceptions of impact of stuttering have been studied across gender (Craig, Blumgart& Tran, 2009), age (Scaler-Scott, 2013) and culture (Bernardini, Vanryckegham, Brutten, Cocco&Zmarich, 2009). Similarly, attitudes of others and other- perceived impact

has also been extensively investigated in the context of stuttering (St Louis, Le Masters &Poormohammad, 2013). The way stuttering is perceived by persons other than the PWS can often be incorrect and negatively biased. This has been labelled the "stuttering stereotype" (Mac Kinnon, Hall & Mac Intyre, 2007).

McKinnon et al. (2007) expanded upon work on the stuttering stereotype by testing a hypothesis called the 'anchor- adjustment' hypothesis, which explained the formation of the stuttering stereotype in two steps. Fluent speakers first use their own experiences of temporary dysfluencies as a starting point or "anchor" for their judgments about PWS. They then realize that dysfluencies and stuttering experiences are not necessarily one-and-the-same and accordingly make an adjustment to partially account for the high intensity of the emotional experience during moments of dysfluencies. A fear of confirming to the stereotype might then develop in the PWS. This phenomenon, called 'stereotype threat' (Steele & Aronson, 1995), may, in turn, contribute to a negative self-concept (Manning, 2010; Silverman, 1996) leading to poorer performance on various tasks, or even lack of involvement in therapy in PWS (Andrade et al., 2014)

3.2 Assessing impact from two perspectives

Stuttering and cluttering are both problems related to speech fluency, thereby occupying an important place in the functioning and quality of life of a person with a fluency disorder (PWFD). Delving into the impact of the disorder as perceived by the persons themselves thus becomes a necessity.

PWS have been seen to judge impact to be greater than their significant others perceive it (Lau et al., 2012). A study by Beilby, Byrnes, Meagher and Yaruss (2013) reaffirmed this.They compared the impact of stuttering as estimated by PWS and their partners. 10 PWS (9 males, 1 female) and their partners participated in the study. The spouses indicated strong and unfailing acceptance of their spouse and their stutter, and estimated the impact to be

lesser than the PWS perceived it. Further, studies investigating the impact on the spouses of PWS, such as those by Boberg&Boberg, 1990, indicated a strong positive impact with the help of spouse participation in awareness to the fluency disorder.

The attitude expressed towards the PWFD was subject to differences based on the sources investigated, in the existing influences. For example, on interviewing Speech Language Pathologists (SLP), employing POSHA-S in a semi- structured interview, and they were seen to have a majorly positive attitude towards PWFD. (Koutsodimitropoulos, Buultjens, Loius&Monfries, 2015; Crichton- Smith, Wright & Stackhouse, 2003)

Compared to the vast amount of research on the impact of stuttering, research on impact of cluttering is still in its incipient stages. In the words of Dewey (2005), "Cluttering is an undiscovered country of speech pathology". Reichel (2007) emphasized that persons with cluttering (PWC) represent a wide continuum of self-awareness and feelings. For example, frustration about their own deficits or other's deficits in understanding what they say, low self-esteem, feelings of incompetence, anxiety, anger, confusion lack of hope about successful treatment, and low motivation can all be experienced in different combinations by different persons with cluttering. Reichel (2007) also stated that though the thoughts and feelings of persons with cluttering may not be as profound as those with stuttering, they were definitely a part of the problem of cluttering.

A study comparing attitudes towards stuttering with those towards cluttering was carried out in four countries- USA, Russia, Turkey and Bulgaria, in their native languages (St Louis et al., 2007; St Louis et al., 2011). The findings revealed that cluttering was viewed as negatively as mental illness. People seemed to be slightly less tolerant and patient with a person with cluttering than with stuttering; and slightly more concerned if someone close to them had cluttering, than stuttering, though the differences were not significant. The mean ratings for good judgement, earning people's trust or being described as influential were

below neutral for cluttering, and significantly lower than for stuttering. Finally, the participants did not completely dismiss the possibility of cluttering being caused by viruses, or an act of God. These findings, according to the researchers, suggested the presence of a "cluttering stereotype".

3.3 Influence of culture on assessment instruments

The importance of culture specificity of a questionnaire cannot be overemphasized. Filgueiras, Archibald &Landeira-Fernandez (2013) stated that adequate assessment using a culture specific tool allows precise conclusions to be drawn.

Ndung'u and Kinyua (2009) underlined the importance of region and culture in assessment and subsequent management of speech and language disorders. They stated that in addition to paralinguistic aspects like rate of speech, intonation, etc. that might influence the speech disorder, regional and cultural belief systems, too, play a major role since speech is an integral part of socialization and interaction.

In spite of the above evidence, no ICF based fluency impact assessment toolhas yet been developed in the Indian context.

3.4 Reduction in length of assessment instruments

Galesik&Bosnjak (2009) manipulated the stated length as well as the position of questions in a web-based questionnaire. They hypothesized that the respondents' willingness to participate would reduce if expected questionnaire length increases from 10 through 20 to 30 minutes. A second hypothesis stated that questions asked later as compared to earlier would result in shorter response time per question, higher non-responses to items, less variability in responses and shorter responses to open ended questions. Both the hypotheses were accepted, thus strongly supporting the need for shorter versions of questionnaires.

Rolstad, Adler &Ryden (2011) conducted a meta-analysis of studies involving response rates and questionnaire length. Reports including direct (e.g. patient input) or

indirect (e.g. response rate) measures of response burden were considered acceptable for inclusion in the meta-analysis. Out of the 11 studies that involved a comparison of data quality in relation to questionnaire length, 7 found no difference in data quality, one found better data quality for the longer version while 3 found better data quality for the shorter version. While response rates reduced when longer questionnaires were administered, they also found that other factors like content contributed equally to response rate. This was in agreement with findings of a previous systematic review by Edwards et al. (2002) who reported that a response was more likely when shorter questionnaires were used.

Chlan (2004) compared responses of 200 patients receiving mechanical ventilator support to a 20-item anxiety measurement instrument and a 100 mm visual analog scale for measuring anxiety. While the 20-item scale received some non-responses, no missing data was reported on the visual analog scale, leading the researchers to conclude that there was less response burden for the shorter instrument, i.e, the visual analog scale.

Cunningham et al. (1999) measured the relationship between attrition rate and questionnaire length in a postal survey assessing alcohol consumption. 49 participants were randomly assigned to the group that would receive a shorter questionnaire, while 46 participants received the longer questionnaire. The response rate was 22% for the longer questionnaire and 51% for the shorter questionnaire, suggesting that participants preferred shorter postal surveys to longer ones.

Millard and Davis(2016) modified the Parent Rating Scale (Millard, Edwards & Cook, 2009) in order to make it quicker and easier to administer, score and interpret. The original 25- item scale estimated parents' perceptions of impact of their child's stuttering. The resultant 19-item Palin Parent Rating Scale assessed principally three components: impact of stuttering on the child, severity of stuttering and impact on the parent, and the parent's knowledge and confidence in managing the stuttering. The complexity in interpretation of the

Palin Parent Rating Scale was significantly reduced by an online version of the scale that allowed an easy analysis of the parents' ratings.

3.5 Impact assessment of fluency disorders: National status

Owing to the unavailability of culture specific instruments that encompass all the aspects of the ICF for both fluency disorders, there was an urgent need to develop a tool for assessing impact of stuttering and cluttering from two perspectives- that of the persons themselves and that of their significant others. Fulfilling these criteria, an Impact Scale for Assessment of Cluttering and Stuttering (ISACS) was recently constructed (Kelkar&Mukundan, 2015).

The Impact Scale for Assessment of Cluttering and Stuttering (ISACS) consists of 100 statements distributed unequally among four subscales. Subscale I is representative of the "body functions" section of the ICF. It has 12 statements describing the speech of the person being assessed. Subscale II has a total of 28 statements related to personal contextual factors. Subscale III deals with both, "activities" and "environmental factors". Subscale IV consists of 18 statements representing quality of life or "participation" in the ICF. The respondent opines on each statement using a five point Likert type scale. Overall, a rating of 'one' on the scale suggests a low impact and a rating of 'five' suggests a high impact. In this manner, a minimum total score of 100 and a maximum total score of 500 can be obtained on the ISACS.

The participant needs to be an adolescent or an adult to understand the scale. For some participants, especially adolescents, some statements might not be applicable. E.g. in Section IV, situations like 'College life', 'Intimate relationships', or 'Maintaining a job'. To make the total scores of all participants comparable (if required), the total ISACS scores can be converted to percent scores using the formula:

Percent score= [Total score/ (Number of statements attempted*5)]* 100

The ISACS has two identical forms- (A) and (B). Form (A) is to be filled by the PWFD and Form (B) is to be filled for them, by their SOP. Form (B) thus reflects the significant other's perception of the impact that the problem has, on the person with fluency disorder.

Apart from construction of the ISACS, Kelkar and Mukundan (2015) also tested its reliability and appropriateness through a pilot study of 30 individuals. They suggested building on this data to increase the size of the sample and statistically establish construct validity of the ISACS as a future research direction. A pan India project to establish the validity of the ISACS across different cultures and languages in India was suggested as a future direction.

However, the pilot study also revealed that the ISACS takes about 20 minutes to administer. A shorter version of the ISACS therefore would retain the positive aspects of the tool while simultaneously increasing the efficacy of assessment. A few sample items from the long version of the ISACS are shown in Appendix 1.

3.6 Translation

ISACS (A) and (B) were translated to Marathi and given to a professional translator for back-translation(Kelkar, Sanghi&Chaudhari, 2018). Words causing major differences in meaning were changed in the Marathi version based on inputs from a clinical psychologist (PhD) experienced in scale translation. To establish the equivalence of the English and Marathi ISACS, the ISACS (A) in both languages were administered (in random order) to a group of three typical speakers. The English and Marathi ISACS scores were then compared and found to be equivalent.

3.7 Importance of short versions of tools: Indian scenario

While assessment and its documentation is an essential part of evidence- based practice, its implementation in the Indian scenario has poor feasibility owing to a number of reasons like

a. Low doctor-patient ratio (Deo, 2013)
b. Poor public awareness resulting in low motivation for repeated assessments (TISA & Speak: Stammering Foundation, 2018)
c. A resultant reduction in data quality if lengthy measurement instruments are used (Rolstad et al., 2011).

Assessment of fluency disorders would be incomplete and lack face validity unless it includes quantification of impact. While the ISACS is certainly a step in this direction, its length might prove to be a drawback for its use in India. The present project would help overcome this barrier and make the ISACS a quicker tool to administer, this significantly increasing its utility in India.

3.8 Findings so far

The ISACS scores of typical speakers were found to be significantly lower than those of persons with fluency disorders suggesting high construct validity (Kelkar, Sanghi&Chaudhari, 2018). In fact, there was also a significant difference between ISACS (A) and (B) scores of the same speaker as seen on a paired t test, thus underlining the importance of assessing impact from two perspectives. Cronbach's alpha values were high (>0.8) across subscales II, III and IV. They were approximately 0.6 for Subscale I, an expected finding since it has descriptive and heterogeneous items, which are not directly reflective of impact.

External validity however was limited since the study was limited to Maharashtra. Carrying it out over a larger and culturally diverse population would make this scale the first impact scale for fluency disorders that India has to offer, and perhaps the first ever scale in the world that assesses impact of fluency disorders from two perspectives.

One factor that has proved to be a barrier in data collection with the ISACS has been its length. A short version of the ISACS would certainly benefit efficacy in assessment of impact of fluency disorders.

4 Methods

4.1 Study design

Standard Group Comparison was employed to study the sample. The samples were collected using: i. one- to- one interviews, and ii. Telephonic-conversations.

4.1.1 Phase 1:Construction of a short version of the ISACS

4.1.1.1 Participants.

The data for this phase of the study was made available from the participants who responded to the original version of the ISACS (n=100). For this, few more data points were added to an original data pool of 68 PWFD as the statistician had proposed. (n = 32)

4.1.1.2 Creation of the short version.

Exploratory factor analysis is a statistical procedure that is performed to assess actual, rather than theoretical correlation between items. (Field, 2005).Based on the responses to the items, a factor analysis was conducted to determine the principal components. Owing to some missing responses by five of the subjects, 95 data points out of 100 were included for the principal component analysis (PCA).A varimax rotation was used and components with Eigen values greater than 2 were included. The PCA yielded four principal components, with a total of 38 items loading on at least one of these components. Items with coefficients greater than 0.75 were included in this shortened version. These 38 items were then put through another factor analysis, which yielded 29 items, clustering on one of four components. Items that showed correlation coefficients of >0.60 were retained in this further shortened version of the scale. Section I and the behavioral subsection of Section II displayed least collinearity with the entire scale and were hence removed from the scale.

The new sections of the short version of the ISACS (ISACS-s) were rearranged based on appropriate sequence and the statistical loading, with the following order:

i. Combining Sections iii an iv

ii. Section ii

iii. Section iii (part i)

iv. Section iii (part ii)

Four itemswere eliminated owing to coefficients approaching but not exceeding 0.6. Other reasons for exclusion of these items were redundancy of statements (two of the four statements pertained to “neighbors”), influence of socio- economic status, and poor pragmatic generalizability(for example, the question: asking a bus conductor for a ticket). Thus, the short version of the ISACS-s had a total of 25 questions, following a sequence as mentioned below:

i. Activities

ii. Participation/ Quality of Life

iii. Environmental factors

iv. Personal contextual factors

Some sample items of the short version are given in Appendix 4.

4.1.1.3 Determining the equivalence of the original and shortversion

In addition to the above, Demographic details including- name, age, gender, education, occupation, and other indexical information were collected in addition to their latest SSI scores.

Following this, the equivalence of the two versions was ascertained using the following procedure:

1. Two experienced Speech Language Pathologists and two Persons with Stuttering were given the long version and Short version of ISACS, and were instructed to score them based on subjective perceptions of section-wise equivalence of the two tests. They

were asked to rate the tests on a scale of 1-5 where 1=not at all equivalent; 2= slightly equivalent; 3=somewhat equivalent; 4=highly equivalent; 5= very highly equivalent.

2. The long and the short versions of the test were administered to each of two TS and two PWFD in random order to avoid order effect. The mean-percent scores obtained from the long and short versions were compared. The order of presentation of the two tests was counterbalanced, and the time difference between the two tests for an individual was four days to a week. The individuals were comfortably seated in a quiet environment and were instructed that the questions were regarding their impact of speech in various situations, and were asked read all of the questions carefully and circle the responses of questions that were relevant to them, as appropriate. Each of the responses was scored by the investigator and a percentage score was assigned to each of the participants.

4.1.2 Phase 2: Determining reliability, construct validity and face validity of the short version (ISACS-s)

4.1.2.1 Participants

100 persons (98 PWS, 2 PWC, 91 males, 9 females) with fluency disorders within the age range of 13- 45 years (mean= 22.5 years), and 37 caretakers, who were willing to participate, were recruited in this phase of the study with their informed consent. The PWS were distributed based on severity as follows: 24 mild/ very mild, 49 moderate, 20 severe, and 4 very severe, classified according to their most recent SSI scores. Purposive sample was used since the participants would be recruited when they report to the speech clinic. There were no restrictions on the gender distribution of the sample, or the distribution in terms of the type of fluency disorder. This was done to ensure that the sample distribution approximately reflects the distribution by gender and fluency disorder in the population. A detailed account of demographic details of participants can be found in Appendix 2.

4.1.2.1.1 Inclusion criteria.

Stuttering

1. Males or females aged 13 years and above
2. Diagnosed as persons with mild to severe stuttering
3. Able to read, understand and speak English / Marathi at a middle school level

Cluttering

1. Males or females aged 13 years and above
2. Diagnosed as persons with cluttering as per the LCD definition (St Louis and Schulte) along with SSI 4 to rule out stuttering, and PCI score of 80 or more.
3. Able to read, understand and speak English/ Marathi at a middle school level

Stuttering- cluttering (mixed)

1. Males or females aged 13 years and above
2. Diagnosed as persons with stuttering-cluttering as per the LCD definition (St Louis and Schulte) along with SSI 4 to qualify stuttering, and PCI score of 80 or more.
3. Able to read, understand and speak English / Marathi at a middle school level

4.1.2.1.2 Exclusion criteria.

1. Persons with known concomitant neurological, cognitive, psychological and/ or hearing deficits
2. Persons with a known condition independent of their fluency disorder which could dominate the impact of the fluency disorder

4.1.2.2 Procedure

Each participant was given a short version of the ISACS-s (A) / (B) given to caregiver for cases where a caregiver was present.

The individuals were comfortably seated in a quiet environment and were instructed that the questions were regarding their impact of speech in various situations.

The steps taken to collect the data are enlisted below:

1. Taking informed consent from participant
2. Eliciting demographic details
3. Explaining the nature of the ISACS and going over the instructions in the forms[1]
4. Supervising as the participant responds to the statements in the short version of the ISACS(A)
5. Asking the participant to rate the utility of the tool on a scale from 1-5, where 1= Not at all useful; 5=Extremely useful
6. In case of any queries regarding the questions, they were instructed to ask for help from the tester.

The corresponding short version of the ISACS-s (B) was given to 37 significant other persons of the participants with fluency disorders, who were willing to participate, and the first three steps of the procedure were followed.

Reliability analysis was done with the responses to the ISACS-s (A). Usefulness ratings given by persons with fluency disorders would be a measure of face validity. Utility of the scale can

[1] The instructions in the forms read as follows: “This is a scale which will help us examine different aspects of speech and the effect it has on the way one goes about one’s daily life. Please read each statement carefully and circle the appropriate number. If a statement does not apply to you (e.g. “Advancing in your career” when you are not working yet), you may leave it and move on to the next statement. But try not to leave out any statement as far as possible. “

also be reaffirmed if a significant difference is found between ISACS-s (A) and (B) scores for the same individual.

4.1.3 Phase 3: Determining construct validity of the short version of the ISACS

4.1.3.1 Participants

Participants in this phase were 58 typical speakers (TS), (10 females, 48 males), between the age range of 18 years to 40 years. (Mean age = 25.5 years) age and gender matched to 58 of the persons with fluency disorders (PWFD). Case specific demographic details can be referred to in Appendix 3.

4.1.3.1.1 Inclusion criteria:

1. Individuals who read, understand, and speak English at a middle school level
2. Individuals with no presenting complaints related to content, clarity or fluency of speech

4.1.3.1.2 Exclusion criteria:

1. Persons with known neurological, cognitive, psychological and/ or hearing deficits
2. Persons with any other known condition which could affect their speech – These were verified by the investigator by conferring the same with the willing participants.

4.1.3.2 Procedure

The steps listed above in section 2.1.2.2., were followed for administering ISACS-s (A) with TS as well.

A significant difference between ISACS (A) scores of TS and PWFD could be an excellent indicator of good construct validity and robustness of the short version of the ISACS. The

scores of typical speakers alone could also serve as preliminary normative data using the short version of the ISACS.

4.2 Scoring

4.2.1 Scoring for the short version of ISACS

Each statement could be responded to in a five point Likert type scale. Overall, a rating of 'one' on the scale suggests a low impact and a rating of 'five' suggests a high impact. In this manner, a minimum total score of 25 and a maximum total score of 100 could be obtained on the ISACS.

The participants were encouraged to answer all the questions of the test, but for some participants, especially adolescents, some statements might not have been applicable. E.g. in Section I, situations like 'speaking to a crowd using a microphone', or 'Maintaining a job'. To make the total scores of all participants comparable the total ISACS scores were converted to percent scores using the same formulaas was used for score calculation with the long version:

Percent score= Total score/ (Number of statements attempted*5) * 100

All the participants' individual responses were coded, asLikert scale values (1-5) in Microsoft Excel- 2010, and subsequently in IBM-SPSSversion 21 to get the percentage scores calculated using the same software, automatically.

4.2.2 Coding for Severity of Stuttering

The coding for Severity was as follows: 0- Very Mild, 1 mild, 2 moderate, 3 Severe and 4 very severe.

4.3 Statistical analysis

The data was subjected to the following statistical procedures:

4.3.1 Creation of the short version:

i. Exploratory Factor Analysis was carried out to determine the essential questions to be retained for the shorter version

ii. Wilcoxon signed ranks test – to compare the scores from the longer and shorter version of the ISACS

4.3.2 Determining reliability, utility and face validity of the short version of the ISACS

i. Cronbach's alpha was employed to investigate the Internal consistency

ii. Spearman- Brown coefficient was employed to investigate split half reliability

4.3.3 Determining construct validity of the short version of the ISACS

i. Discriminant analysis, cross validation and a comparison of the short version ISACS (A) scores of TS and PWFD through an independent samples t-test was carried out to investigate the construct validity of the ISACS.

ii. ISACS-s (A) and (B) scores for the same individual were compared using a paired t-test.

4.3.4 Additional analyses

Trends in ISACS-s (A) scores across the degree of severity of stuttering (0=very mild; 4=very severe) were explored using one way ANOVA. Apart from this, trends across gender, education and occupation were analyzed using Mann Whitney U-test, independent samples t- test, and one way ANOVA, respectively.

5 Results

The present study was aimed at constructing and validating a short version of ISACS, from the existing longer version of the tool.

To recapitulate, the objectives of the study were:

1. Reducing the length of the ISACS employing factor analysis and assessing its equivalence to the original version
2. To assure equivalence of the short version to the original version by
    i. assessing the construct validity
    ii. assessing the reliability
3. To check the trends of responses given by the participants through ISACS-s A and B.

The Independent variables considered in the study for statistical analysis, were- groups of participants including- PWFD, family members (FM) of PWFD,Age, gender, and severity of stuttering, were also considered for further analysis. The dependent variable included the percentage test scores obtained by the participants.

In order to pursue the objectives of the study, data collectionwas carried out in three phases. The first phase included administering the long version an additional 32 participants, to add to the existing pool of data. The data collected from a total of 100 participants was used to perform factor analysis, to derive the short version of the test. Data was collected from 100 PWFD, 34 FM of PWFD, and 58 TS, by administering the short version. The scores obtained were changed to percentage scores, to scale them. The responses were coded in SPSS version 21 for statistical analysis. The analyses and their results with reference to each objective are given below:

5.1 Objective 1-

Reducing the length of the ISACS based on factor analysis and assessing its equivalence to the original version

5.1.1 Reduction in Length

The exploratory factor analysis and the procedure used to create the ISACS-s, has been briefly described in the methods section. The original ISACS had 100 items distributed among four subscales. Within subscale II and III, there were further subdivisions. Subscale II (Personal factors) was subdivided into Behavioral, Affective and Cognitive sections, and Subscale III into Activities and Environmental factors. Since each subscale or subdivision had about 12 to 28 items, the minimum sample size required for a factor analysis was 100 (number of items multiplied by four). Five of the subjects had not responded to some of the items. Owing to this the data from these five participants was discarded, and in consultation with the statistician, a sample size of 95 was considered appropriate for further analysis. These data points were put through a Principal Component Analysis (PCA). Considering eigen values greater than 2 and items with coefficients greater than 0.75, 38 items were found to be loading onto one of four components. All items from the Affective subsection of Subscale II items loaded on a single component. Subscale 3 items loaded on four components;

Component 1: items from Activities subsection of Subscale III

Component 2: Items from the second part of the Environmental factors subsection of subscale III (this probed how the PWFD perceived others' responses)

Component 3: Items from the first part of the Environmental factors subsection of subscale III (this probed others' responses/ attitudes towards the PWFD)

Component 4: This has an odd collection of items- 12, 14, 15- from the Activities subsection.

Items from subscale IV loaded on a single component.

This suggests that the scale is in keeping with the theoretical framework of the ICF. Items from within a section/ question set were all uniformly pointing to one component.

However this clarity was not seen for Subscale I. Another striking finding was that items from the behavioral or cognitive subparts of Subscale II are not a part of any of the components that surfaced from the PCA.

Cronbach's alpha value for this shortened version was 0.96. The statistical table displaying factor loading values for each of the 100 items of the long version of the ISACS is reproduced in Appendix 5.

In the next step this 38 item version was further put through an Exploratory Factor Analysis. As mentioned in the Method section, this yielded 29 items, clustering on one of four components. Items that showed correlation coefficients of >0.60 were retained in this further shortened version of the scale. The Cronbach's alpha value for this version was 0.94. The statistical table displaying factor loadings for each of the items in the 38 item version is displayed in Appendix 6. The distribution of these 29 items in terms of loading on tofactors was as follows:

Factor 1: Items from Subscale IV and items 12, 14, 15 and 28 from subscale III.

Factor 2: Items from the Affective subsection of Subscale II

Factor 3: Items from the Activities subsection of Subscale III

Factor 4: Items pertaining to the PWF's perception of others' reactions from the Environmental factors subsection of Subscale III.

It must be noted that the four items from Subscale III that load on Factor 1 are the same items that formed the additional fourth component in the first PCA. When the tool was scrutinized item-wise, these four items were found to be closely related to items in Subscale IV, and therefore, redundant. These were therefore removed to yield the final 25 item ISACS-s.

5.2.2 Assessing equivalence

1. The equivalence of the short version to the original ISACS (A) was determined by a combination of subjective and objective assessments. Two experienced speech

language pathologists and two PWFD were asked to rate the equivalence of the two tests after reading the questions in both the versions. Their Independent judgments about equivalence were seen to be 5 and 5, respectively, giving a collective score of 5.

2. In order to objectively test the equivalence, the ISACS and ISACS- s were administered on 2 PWFD, and 2 PWNF, and the percentage scores obtained were analyzed. The percentage scores were calculated for both the versions. The Wilcoxon signed-ranks Test was carried out to compare the scores of the two tests. The results revealed no significant differences (Median PWFD =63.75, TS= 22.08; Z= 0.000, p= 1.000) between long and short versions administered to the same individuals, suggesting that the two versions were equivalent.

   The statements thus finalized for the short version of the ISACS (A) were replicated in third person (e.g. 'this person speaks fast') to give the short version of the ISACS (B).

5.2 Objective 2

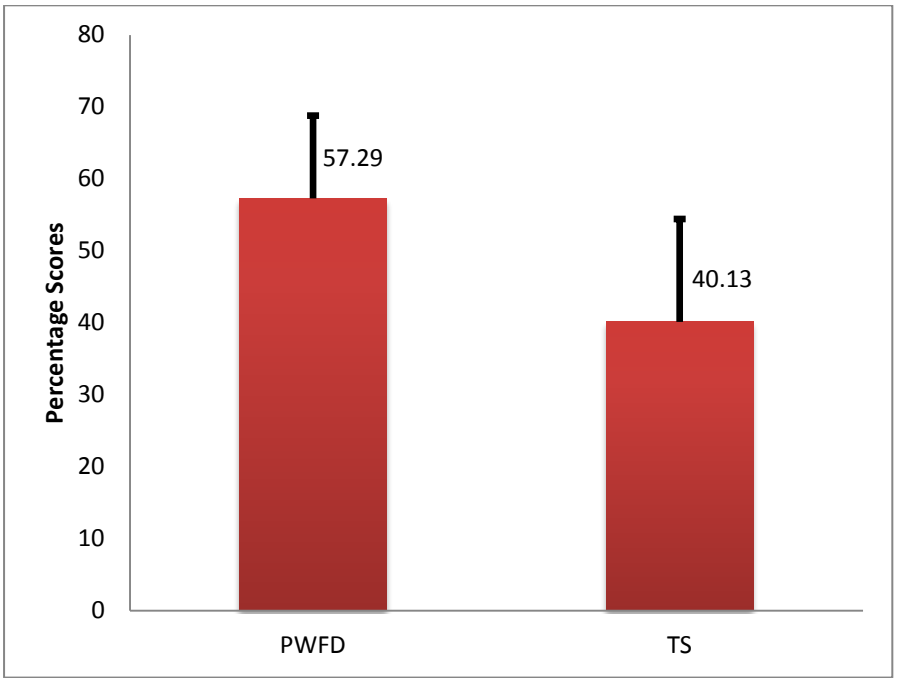
Administering the shortened version of the ISACS to 50 typical speaker (TS), age and gender-matched to 50 of the persons with fluency disorders (PWFD)

5.2.1 Comparison between PWFD and TS groups

In order to verify the construct validity, the PWFD and TS were compared in two ways:

In the first method, Independent samples t– test was performed on the two groups as a whole, where scores of 100 PWFD, and 58 TS, were compared. The inferential statistics, [t (156) = 8.077, (p= 0.000)], revealed that the two groups showed a highly statistically significant difference. The effect size was further conferred using Hedges' g, which showed a value of 1.33 indicating a large effect size (Schuele& Justice, 2006).

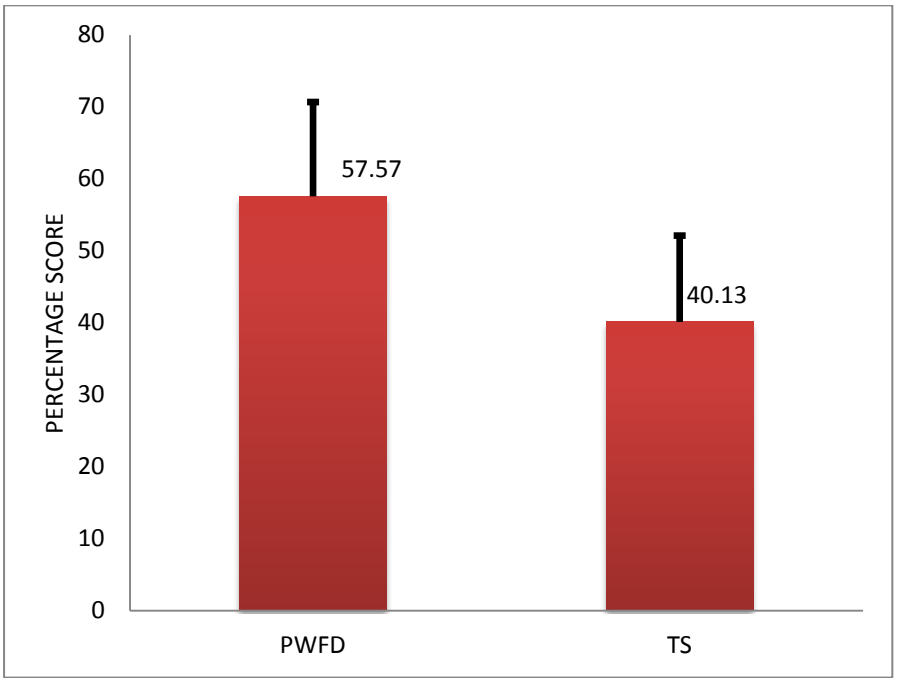
The descriptive statistics, inclusive of the mean and standard deviation of the two groups were seen to be dissimilar, as witnessed in Graph 2.



Graph 2 Comparison of mean scores and standard deviation of PWFD and TS groups

The second analysis was performed to avoid dilution of results by group wise comparison, as given by the above method. The sample size of PWFD was altered to 58 people, selected on a random basis, in order to contrast with 58 TS. The inferential statistics performed with independent samples t- test revealed yet again that there was a statistically significant difference [t (114) = 7.474, (p= 0.000)] between the two groups, conferring with the above result.The effect size was checked using Cohen's d, which showed a value of 1.388, indicative of a large effect size (Schuele& Justice, 2006).

The group scores of the mean and standard deviation of the two groups were seen to be different, as witnessed in Graph 3. This was in consonance with the first comparison.



Graph3 Comparison of Mean scores and Standard Deviation of sample size matched PWFD and TS groups

Thus, the ISACS-s can significantly distinguish between PWFD and TS, as inferred by the results. Thus, the null hypothesis for this objective that stated that there is no difference between the scores obtained for TS and PWFD obtained using the ISACS-s, is rejected.

5.2.2 Reliability scores

Cronbach's alpha and Spearman- Brown split half reliability coefficients for the PWFD group was- r=0.749; $r_{kk=}$ 0.778 and TS groups were- r=0.74; $r_{kk=}$ 0.779.

5.2.3 Item- analysis

Item- analysis was performed in order to verify the within group correlation. It revealed that 13 items within the group (items 3,5, 6,7,9,12,14,16,20,22,23,24,25) did not significantly correlate with the total score of ISACS-s, PWFD group. However, Cronbach's alpha revealed good internal reliability (PWFD- 0.749, TS- 0.74) for both the groups.

5.2.4 Discriminant Analysis

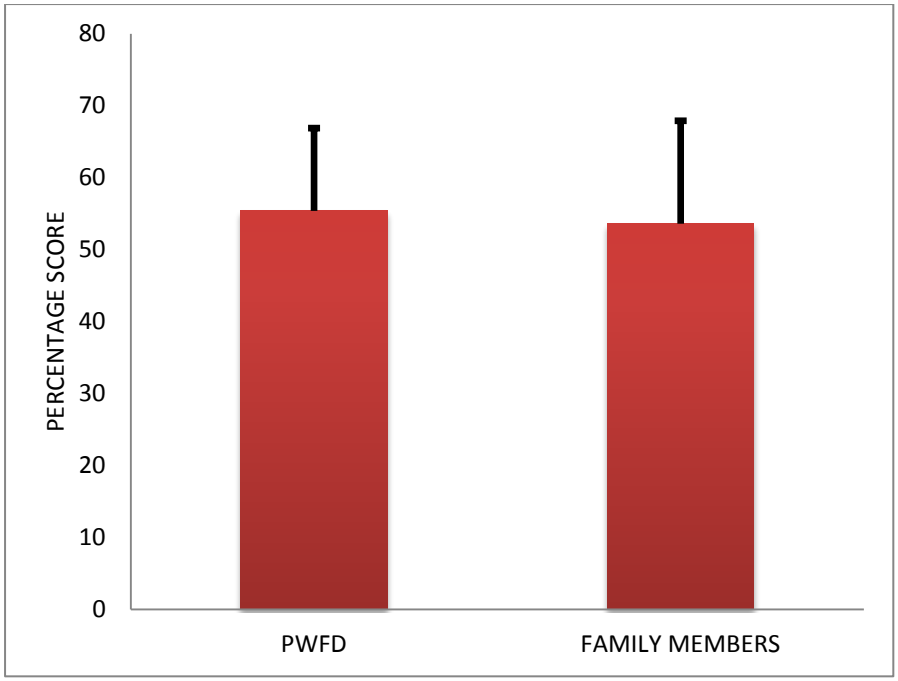
Discriminant analysis, and cross validation were carried out to ascertain the construct validity of the ISACS-s. Discriminant analysis revealed that the ISACS-s can successfully discriminate 97.9% of PWFD and 98.3% of TS. Overall, the discriminant analysis judged that ISACS- s correctly classified 98.1% of the sample. In addition to the above, cross validation of the groups correctly classified 92.9%. Further, the usefulness ratings given by the PWFD groups were also calculated. Mean usefulness rating for the ISACS-s was 3.89, indicative of high face validity.The combined scores given by the discriminant analysis, cross validation, and independent samples t- test comparing PWFD and TS groups, indicate high construct validity of ISACS-s.

5.3 Objective 3

Administering the shortened version of the ISACS to 100 persons with fluency disorders and their family members

5.3.1 Comparison of ISACS-s (A) and ISACS-s (B) score:

A group of 37 FM, whose mean age was 40 years(S.D. = 9.78 years, Range= 24- 59 years), included 13 males and 24 females. Their responses were obtained wand compared with the respective 37 PWFD, about whom they were interviewed. Independent samples t-test was employed to obtain inferential statistics in order to compare the percentage scores obtained from the PWFD and their FM. The comparison revealed that there was no statistically significant difference[$t(72) = 0.286$, $p= 0.776$] between the percentage scores of the two groups.



Graph 4 Comparison of Mean scores and Standard Deviationacross PWFD and FM

The descriptive statistics done prior to the inferential analysis, revealed minimal differences between the mean and standard deviation, as displayed in the graph (refer to Graph 4).

Thus, the null hypothesis for this objective stating that the scores obtained for ISACS-s A and ISACS-s B are different is rejected, as there is no statistically significant difference between the two groups, through the results of independent samples t- test.

This is a trend that is not seen in the previous, long version of ISACS. This will be further elucidated in the discussion section as being a possible short coming of the ISACS-s, in comparison to the original version.

5.4 Additional analyses

Apart from analyses with reference to the proposed primary objectives, some additional analyses were conducted on the available data in order to investigate any trends that might emerge. Trends in ISACS-s (A) scores were analyzed across the following factors- Severity of stuttering, Gender, Occupation, and Education.

5.4.1 Severity of stuttering

The severity groups were initially made of 5 groups (0- very mild, 1- mild, 3- moderate, 4- severe, 5- very severe). Due to the scarcity of data points across groups, groups- 0,1 and groups- 4,5, were combined for the analysis, to 3 groups (1= mild,2= moderate, 3=very severe) . A total of 98 peoples' scores were analyzed (group1- 24, group 2- 49, group 3- 25). 2 Persons included as a part of the sample, diagnosed as having cluttering were also excluded from this analysis. The three groups were explored using one way ANOVA.Although the mean impact scores did show an upward trend with an increase in stuttering severity, a one way- ANOVA revealed no statistically significant difference in impact scores across degree of severity [F (2, 95) =2.357, p =0.100]; a finding similar to that of Chun, Mendes, Yaruss&Quesal, 2010, suggesting that severity alone may not give a complete picture of the disorder. Thus, the impact was not dictated by the severity of stuttering.

Table 1 Descriptive data for levels of Severity

Severity Levels	Mean	S.D.
Mild	52.56	12.84
Moderate	59.02	12.35
Severe	59.06	13.54

5.4.2 Comparison based on Gender

Gender based comparison of the scores across PWFD group were performed. As the sample included 9 female PWFD, the ISACS-s scores of 9 male PWFD were selected on a random basis. A median-based, Mann Whitney U- test was employed to analyze the sample, due to the small sample size. The results, [Median= 57.6, Z (p) = -0.619 (0.536)] suggested that there was no statistically significant difference across the two groups.

Table 2 Descriptive data for comparison of Gender

Education Levels	Mean	S.D.
Male	60.08	16.74
Female	54.31	14.23

5.4.3 Comparison based on Education and Occupation

The education and occupational levels of the PWNF groups were categorized and compared. The education levels were classified as: 1- High School (17), 2- Under Graduation (82), 3- Post Graduation(nil); and the occupation levels were classified as: 1- Student (57), 2- Service (35), 3- Business(8). The descriptive statistics for educational and occupational levels are given in Table 3 and Table 4. The education and occupational levels were compared individually using independent samples t- test, and one way ANOVA, respectively, across the 100 PWFD.

Table 3 Descriptive data for levels of education

Education Levels	Mean	S.D.
High School	56.8	13.9
UG	56.9	12.84

The results revealed *no statistically significant* [F (2, 97 = .615, P value= .543] *difference* between the groups based occupation. The results of independent samples t-test revealed *no significant difference* [t (97) = -.038, p= .970] based on the educational levels included.

Table 4 Descriptive data for occupation

Occupation	Mean	S.D.
Student	56.2	12.75

Service	59.32	14.4
Business	56.2	13.4

6 Discussion

The current study was an attempt to construct a short version of the ISACS, and validate the same. Exploratory Factor Analysis was successful in delineating the essential elements of the test to construct the ISACS-s (A). The same questions were taken up for ISACS-s (B), in third person. The verification of effectiveness of the newly constructed scale was performed by administering it on 100 PWFD, 58 TS, and 34 FM of the PWFD. The statistical analyses performed using the aforementioned data and their results were elaborated on in the previous chapter. This chapter discusses the implications of each of these results in detail.

6.1 Creation of the ISACS-s through factor analysis

As elaborated in the results section, data collected using the 100 item ISACS was put through a PCA to give a 38 item version. This was further put through an exploratory Factor Analysis, which yielded 29 loading on to four factors as follows:

Factor 1: Items from Subscale IV and items 12, 14, 15 and 28 from subscale III.

Factor 2: Items from the Affective subsection of Subscale II

Factor 3: Items from the Activities subsection of Subscale III

Factor 4: Items pertaining to the PWF's perception of others' reactions from the Environmental factors subsection of Subscale III.

On further scrutiny, items 12, 14, 15 and 28 form subscale III pertained to family members, neighbors and acquaintances which were readdressed in Subscale IV and were hence found to be redundant. These were removed to yield the final 25 item ISACS-s.

A pertinent step that warrants discussion is the removal of Subscale I and the behavioral and cognitive components of subscale II from the short version. Items from these sections did not seem to load on any of the components of the factor analysis. As the ISACS was constructed closely adhering to the codes of the ICF (WHO, 2001), this finding implied that Subscale I or the behavioral and cognitive sections of Subscale II did not contribute

significantly to the overall impact of the disorder. A well created short version of a tool mirrors the scores of the long version, while compromising on its descriptiveness, owing to the reduced length (Millard & Davis, 2016). Thus, these items from Subscale I and II are desirable in the long version of the ISACS so as to completely "describe" the disorder as the ICF should, in addition to computing the impact of the disorder. However, removing these from the short version would not reduce the agreement in scores obtained from the ISACS and the ISACS-s. These were, hence, removed.

Subscale I as well as the behavioral section of Subscale II consist of items that describe the symptomatology of the disorder. E.g. the more severe the stuttering, the higher the scores on these items. However, the correlation between severity of stuttering and its impact have been found to be moderate at best in literature (Chun et al., 2010). This is probably the reason why these items do not contribute to the overall impact of the fluency disorder.

Cognitive-behavior theories put forth that emotions are often the result of automatic thoughts, cognitive statements, or beliefs (Knapp & Beck, 2008). They further state that these thoughts are often not consciously noted by an individual. The focus of Cognitive Behavior Therapy approaches is, in fact, to make a person aware of these thoughts, so as to modify them and therefore reduce the intensity of negative emotions (Menzies et al., 2009). It might, then, be possible that the PWF might not realize the intensity of their cognitive statements about their fluency disorder. As a result, the scores of items from the cognitive section of Subscale II did not seem to align with the overall impact scores.

The components which did contribute to the overall impact were activities, quality of life, the way the PWFD perceives reactions of persons in their environment, and personal contextual factors in the form of affective reactions of the PWFD. This is aptly reflected in the four subscales of the ISACS-s, namely:

Subscale I: Activities

Subscale II: Participation/ Quality of Life

Subscale III: Environmental factors

Subscale IV: Personal contextual factors

Sample items of the ISACS-s can be referred to in Appendix 4.

6.2 The equivalence of ISACS and ISACS-s

The combined subjective and the objective assessment of the ISACS-s confirmed the equivalence of the long version with the short version. The reason for the perception of high subjective equivalence was revealed to be due to the fact that the shorter version had questions derived from the long version of ISACS. This was further fortified by the results of the Wilcoxon signed-ranks Test, which statistically ensconced the similarity between the two versions. Thus, the ISACS-s may be considered at par with the ISACS in delivering the impact scores in PWFD, providing an opportunity to be used as a valuable screening tool (Iverach et al., 2016).

6.3 Construct Validity

The construct validity of ISACS-s was confirmed by the comparison of the percentage scores between the overall groups of PWFD and TS mentioned in *section 5.2.1* was re-affirmed by the randomized comparison of 58 PWFD to the TS group. This statistically significant difference between the two groups with a large effect size is suggestive of the success of ISACS- s in distinguishing between TS and PWFD. The comparison between PWFD and TS, employing ISACS found that there was a highly significant difference amongst the groups(Kelkar, 2013). Discriminant analysis also supported the high construct validity. The present study proves the high construct validity of the ISACS-s, at par with its original counterpart.

Overall, the results of the analyses based on the Discriminant analysis, cross validation, and independent samples t- test comparing PWFD and TS groups, indicate high construct validity of ISACS-s. These results equate the ISACS-s with the other tests such as Behavioral Assessment Battery (Brutten&Vanryckeghem, 1973, 2003a, 2003b, 2007, 2011,2018), that are seen to have high validity and replicable high reliability, with the added advantage of indigenous normative. Additionally the ISACS-s is capable of offering a unique purview of the impact of the disorder, that have not been the case in the past, with the use of attitude assessment scales such as the Communication Attitude Test for Adults who Stutter (BigCAT) (Brutten&Vanryckeghem, 2011), Perceptions of stuttering Inventory (Woolf, 1967), Subjective severity of stuttering (SSS, Riley, Riley & Maguire, 2004), etc. The ISACS-s, similar to the ISACS covers the impact in various aspects of PWFD, under the headings of Activities, Quality of Life, Environment factors and Personal contextual factors. The tool encompasses a diverse range of domains that are prominently probed by the existing literature in the area. In line with the studies that explored the effect of fluency disorder on employment, (Klien& Hood, 2004; Rice & Kroll, 2004) many activities such as group interaction, debate, addressing a crowd, etc., was reported to be adversely affecting in most of the PWFD who participated in the study. In accordance to the literature on the quality of life, where PWFD are said to be negatively impacted in terms of all aspects including their relationships with family (Craig, Blumgart& Tran, 2009, Klompas& Ross, 2004), this study was in agreement of the same.Bricker- Katz, Lincoln & Cumming (2013) drew attention towards the negative psychological impact, and the section based on emotions strived to uncover those aspects of the disorder.

The above mentioned aspects of the results, and the aspects captured by the tool, place the ISACS-s as a tool that maybe incorporated successfully in clinical conditions. In spite of its brevity, itcan provide insights into various aspects that highlight the impact in the lives of

PWFD. A mean usefulness rating approaching 4 out of a maximum possible 5, indicates that the tool has high face validity as well.

6.4 Reliability

The confirmation of high reliability of the test was performed by employingCronbach's alpha and Spearman- Brown split half reliability. The obtained value of Cronbach's Alpha (r_1=0.749, r_2=0.74) is seen to be in the range of values described to be good. (Taber, 2018) The Spearman- Brown split half reliability (rkk_1= 0.778; $rkk_{2=}$ 0.779) is also suggestive of good reliability, for a test with less than 30 items. (Brown, 2002) Thus, the values indicate high internal reliability.

6.5 ISACS-s (A) and ISACS-s (B)

The comparison between the PWFD and FM performed through an Independent samples t- test revealed no statistically significant difference among the two groups. This was not seen to be the case with the original version of ISACS, and is a discrepancy amongst the two. This difference may be attributed to the additional involvement of participants who were family members [parents or friends, rather than spouses], as evidence exists in literature for the magnitude of impact being perceived by FM and PWFD to be similar. The number of FM who answered the ISACS-s (B) and the difference in the number of questions amongst the two tests are other plausible explanations for the discrepancy. Regardless, there is overwhelming evidence for the positive effect of involving the FM of the PWFD in treatment of fluency disorders and additional awareness about the disorders is said to cause a positive reaction in FM and others (Boberg&Boberg, 1990). Administering the ISACS-s (B) gives an opportunity to FMs to acquaint themselves with various aspects of the disorder that may have an impact on the PWFD, serving as a tool to initiate the process. Thus, the ISACS-s (B) could still be used as a valuable clinical tool.

6.6 Additional analyses

The effect of severity on the impact has been discussed equivocally in the literature; the current study supports the available literature that claims that the influence of severity is incongruent with respect to the impact of stuttering. (Panico, Healy, Brouwer&Susca, 2005; Andrade, Sassi, Juste&Ercolin, 2008).

The results are not suggestive of gender based differences in realizing the impact of stuttering. Similar findings on gender based differences have been ensconced by a studies like those by Patterson andPring (1991).This part of the results must be interpreted with caution due the small sample size that may possibly affect the power of generalization. The levels of education, occupation did not influence the impact scores of the sample. These results are in line with the available evidence in literature regarding the effect of these factors on the Impact in PWFD. (Freud, Kichin- Brin, Vinacour, Roznier& Amir, 2017)

In summary, results and discussion of the current study, suggest the following:

i. A Wilcoxon signed ranks test revealed no significant differences between long and short versions administered to the same individual, suggesting that the ISACS-s was equivalent to the long version.
ii. While a paired t-test across the mean scores of ISACS (A), and ISACS-s (B) scores revealed no statistically significant difference between the scores of the PWFD and FM,the trend seen was the same as that seen for the original ISACS, (A) scores being higher than (B) scores (Kelkar, 2013).
iii. Construct validity was also evaluated by the independent samples t- test which revealed that the mean impact scores of PWFD were significantly higher than mean impact scores of TS.

iv. Discriminant analysis revealed that the ISACS-s correctly classified 98.1% of the sample, indicating high construct validity.

v. Cronbach's alpha and Spearman- Brown split half reliability coefficients for both, the PWFD and TS groups indicated good reliability.

vi. Although the mean impact scores did show an upward trend with an increase in stuttering severity, a one way- ANOVA revealed no statistically significant difference in impact scores across degree of severity.

vii. Gender, educational levels, and occupation of participants did not seem to have an effect on impact scores.

7 Summary &Conclusion

7.1 Summary

Fluency translates to the forward flow of speech. The disorders of fluency encompassing stuttering and cluttering are accompanied by a multitude of issues that may hamper psychological and emotional well-being. Historically, there have been a limited number of attempts at capturing the impact of fluency disorders on the quality of life of PWFD. Even fewer are the available tests that cater to the population with stuttering and cluttering, supplemented by the view of the significant others. The ISACS was a preliminary attempt to create such a scale in the Indian scenario. The creating of ISACS-s was preliminarily instigated due to the low doctor-patient ratio, and low motivation for repeated assessments in the Indian scenario.

The objectives of the study were as follows:

1. Reducing the length of the ISACS employing factor analysis and assessing its equivalence to the original version
2. To assure equivalence of the short version to the original version by
    i. assessing the construct validity
    ii. assessing the reliability
3. To check the trends of responses given by the participants through ISACS-s (A) and (B).

The ISACS-s was created by employing exploratory factor analysis of the data collected on 100 PWFD. The equivalence of the short version to the original ISACS was determined by a combination of subjective and objective assessments. The results revealed the equivalence of ISACS to ISACS-s. Thus, null hypothesis 1 was accepted.

To confirm the validity of the ISACS-s, it was administered on 100 PWFD and 58 TS. Discriminant analysis, cross validation and a comparison of ISACS-s (A) scores of TS and PWF through an independent samples t-test was carried out to ascertain the construct validity of the ISACS-s. A mean usefulness rating was computed to estimate face validity.Internal consistency (Cronbach's alpha) and split half reliability (Spearman- Brown coefficient) of the ISACS-s (A) was assessed. The results of the above conferred good reliability and construct validity of the ISACS-s. Thus, null hypothesis 2, was rejected, as ISACS-s could show robust difference amongst the two groups.

Further, the 25- question ISACS-s (B) was administered on 37 FM. The corresponding ISACS-s (A) and (B) scores of the PWFD and the FM were compared using an independent t-test. The comparison revealed no significant difference amongst the two groups, unlike the original version, possibly linked to the reduction in the number of statements included. Thus, null hypothesis 3, was accepted.

Additionally, the trends of responses across the severity levels, gender, education, and occupation were explored statistically with the available data.There was no significant difference revealed by any of the demographic details compared.

7.2 Conclusions

The ISACS-s seems to be a reliable and valid tool to measure the impact of fluency disorders, with the added advantage of availability of indigenous normative. While retaining the qualities of the original ISACS, it could make the tool easier to administer, score and interpret, thus adding efficacy to assessment of fluency disorders.

7.3 Limitations

1. The current study included a few of the same participants in the original ISACS, and ISACS-s, a method utilized in shortening the UTBAS (Iverach, et al., 2016) thus, the study did not explicitly follow measures to check the test-retest reliability.

2. This study was an attempt to develop a tool to encompass the impact measures of all PWFD, despite the efforts to include a sample that was representative of all; the study only included 2 Persons with Cluttering.

3. The scores of FMelicited using the ISACS- s (B) did not differ significantly from those of ISACS-s (A). This was probably one of the limitations of reducing the length of the tool.

7.4 Implications

The present tool is a pioneering attempt at a compact way to measure the impact of fluency disorders on PWFD and their FMs. Implications of the tool extend from its use in assessment camps where large numbers need to be assessed in a limited amount of time; to assessments done during tele-rehabilitation or long distance surveys, where the short length of the tool would reduce the number of non-respondents. Further, this tool maybe included as a part of therapeutic protocol to objectively provide the outcome measures. Future research could work towards adding data from PWC, as well as validating the tool across other languages in India.

7.5 Suggestions for future research

i. Future research may need to include more PWC, for the sample to be representative of all the PWFD, and to confirm the usefulness of the current tool in measuring the impact of the population.

ii. In order to confirm preliminary findings based on severity, supplementary data may need to be collected, replicating the study by balancing the sample, representing each of the severity types, alike.

iii. Translation and validation of the tool to different languages of India could certainly be the next step towards making holistic assessment of fluency disorders available throughout the country.

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Appendix 1

ISACS (A) Sample Items

Section I (Body functions)

Do you think you speak.....?

		Extremely	Very	Some-what	A little	Not at all
1.	fast	1	2	3	4	5
6.	with a proper idea of what you want to say	1	2	3	4	5

Section II (Personal contextual factors)

BEHAVIORAL

How often do you do the following?

		Never	Rarely	Sometimes	Often	Always
7.	Avoiding certain sounds/ words while speaking	1	2	3	4	5
8.	Mumbling while speaking	1	2	3	4	5

COGNITIVE

How often do you experience the following thoughts?

		Never	Rarely	Sometimes	Often	Always
12.	Thinking that your speech will never be good enough	1	2	3	4	5
14.	Thinking that people unnecessarily criticise your speech	1	2	3	4	5

AFFECTIVE

How much do you experience each of the following emotions when you think about your speech?

		Not at all	A little	Somewhat	Very	Extremely
18.	Self- consciousness	1	2	3	4	5
19.	Anger	1	2	3	4	5

Section III (Activities and environmental factors)

How difficult do you think the following situations would be for you?

		Not at all difficult	Not very difficult	Somewhat difficult	Very difficult	Extremely difficult
5.	Continuing a conversation with a group of people for 10-15 minutes	1	2	3	4	5
23.	Speaking to a large crowd over a microphone	1	2	3	4	5

How do you think the attitudes of the following people would be towards you?

		Extremely positive	Very positive	Somewhat positive	Not very positive	Not at all positive
25.	Family members	1	2	3	4	5
27.	Friends	1	2	3	4	5
33.	Strangers	1	2	3	4	5

How much would the attitudes of the following people matter to you?

		Not at all	A little	Somewhat	A lot	Extremely
34.	Family members	1	2	3	4	5
42.	Strangers	1	2	3	4	5

Section IV (Participation/ QoL)

How much (if at all) according to you is your speech negatively affecting the following:

		Not at	A	Somewhat	A	Extremely

		all	little		lot	
1.	Relationships with family members	1	2	3	4	5
11.	Getting a suitable job	1	2	3	4	5
15.	Social life	1	2	3	4	5

Note: ISACS (B) has identical statements but in second person (e.g. Do you think this person speaks…..?)

Appendix 2

Participant details of the PWFD group

ID	AGE/ GENDER	EDUCATION	OCCUPATION	FLUENCY DISORDER	LANGUAGE	THERAPY ATTENDED	SESSIONS	SSI SCORE	Severity
PIIC1	21/M	UG	Student	Stuttering	English	YES	2	33	Severe
PIIC 2	14/M	High school	Student	Stuttering-Cluttering	English	YES	2	30	Moderate
PIIC 3	15/M	High school	Student	Stuttering	English	YES	2	31	Moderate
PIIC 4	13/M	High school	Student	Stuttering	English	YES	2	21	Mild
PIIC 5	15/M	High school	Student	Stuttering	English	YES	2	28	Moderate
PIIC 6	28/M	UG	Service	Stuttering	English	YES	2	11	Very Mild
PIIC 7	13.5/ F	High school	Student	Stuttering	English	YES	2	26	Moderate
PIIC 8	15/ M	UG	Student	Stuttering	English	YES	2	28	Moderate

PIIC 9	14/M	High school	Student	Stuttering	English	YES	2	22	Mild
PIIC 10	22/M	UG	Student	Stuttering	English	YES	2	27	Moderate
PIIC 11	29/M	UG	Business	Stuttering	English	YES	2	25	Moderate
PIIC 12	14/M	High school	Student	Stuttering	English	YES	2	30	Moderate
PIIC 13	20/M	UG	Student	Stuttering	English	YES	2	28	Moderate
PIIC 14	21/M	UG	Student	Stuttering	English	YES	2	33	Severe
PIIC 15	21/M	UG	Business	Stuttering	English	YES	2	36	Severe
PIIC 16	23/M	UG	Student	Stuttering	English	YES	2	32	Severe
PIIC 17	19/M	UG	Student	Stuttering	English	YES	2	38	Moderate
PIIC 18	26/M	UG	Student	Stuttering	English	YES	2	31	Moderate
PIIC 19	29/m	UG	Student	Stuttering	English	YES	2	24	Mild
PIIC 20	13/M	High school	Student	Stuttering	English	YES	2	21	Mild
PIIC 21	23/M	UG	Service	Stuttering	English	YES	2	19	Mild
PIIC 22	16.5/M	High school	Student	Stuttering	English	NO	2	22	Mild
PIIC 23	34/M	UG	Student	Stuttering	English	YES	2	24	Mild
PIIC 24	26/M	UG	Business	Stuttering	English	YES	2	44	Very

									Severe
PIIC 25	21/M	UG	Student	Stuttering	English	YES	2	26	Moderate
PIIC 26	24/M	UG	Business	Stuttering	English	YES	2	30	Moderate
PIIC 27	26/F	UG	Service	Stuttering	English	YES	2	35	Severe
PIIC 28	19/M	UG	Student	Stuttering	English	YES	2	34	Severe
PIIC 29	27/M	UG	Service	Stuttering	English	YES	2	29	Moderate
PIIC 30	24/M	UG	Service	Stuttering	English	YES	2	26	Moderate
PIIC 31	13/M	High school	Student	Stuttering	English	YES	2	31	Moderate
PIIC 32	23/M	UG	Student	Stuttering	English	YES	2	38	Very Severe
PIIC 33	22/M	UG	Student	Stuttering	English	YES	2	25	Moderate
PIIC 34	29/ M	UG	Service	Stuttering	English	YES	2	28	Moderate
PIIC 35	21/M	UG	Student	Stuttering	English	YES	2	33	Severe
PIIC 36	25/M	UG	Service	Stuttering	English	YES	2	35	Severe
PIIC 37	30/F	UG	Student	Stuttering	English	YES	2	32	Severe
PIIC 38	20/F	UG	Student	Stuttering	English	YES	2	40	Very

									Severe
PIIC 39	19/F	UG	Student	Stuttering	English	YES	2	25	Moderate
PIIC 40	36/M	UG	Business	Stuttering	English	YES	2	28	Moderate
PIIC 41	23/M	UG	Student	Stuttering	English	YES	2	30	Moderate
PIIC 42	22/M	UG	Service	Stuttering	English	YES	2	19	Mild
PIIC 43	22/M	UG	Student	Stuttering	English	YES	2	22	Mild
PIIC 44	22/M	UG	Student	Stuttering	English	YES	2	27	Moderate
PIIC 45	27/M	UG	Service	Stuttering	English	YES	2	31	Moderate
PIIC 46	19/M	UG	Student	Stuttering-Cluttering	English	NO	2	32	Severe
PIIC 47	22/M	UG	Student	Stuttering	English	YES	2	30	Moderate
PIIC 48	21/M	UG	Student	Stuttering	English	YES	2	34	Severe
PIIC 49	28/M	UG	Service	Stuttering	English	YES	2	18	Mild
PIIC 50	20/F	UG	Student	Stuttering	English	YES	2	26	Moderate
PIIC 51	27/M	UG	Service	Stuttering	English	YES	2	28	Moderate

PIIC 52	28/M	UG	Service	Stuttering	English	YES	2	36	Severe
PIIC 53		UG	Student	Stuttering	English	YES	2	28	Moderate
PIIC 54	24/M	UG	Service	Stuttering	English	YES	2	29	Moderate
PIIC 55	21/M	UG	Student	Stuttering	English	YES	2	19	Mild
PIIC 56	31/F	UG	Service	Stuttering	English	YES	2	26	Moderate
PIIC 57	18/M	UG	Student	Stuttering	English	YES	2	29	Moderate
PIIC 58	18/M	UG	Student	Stuttering	English	YES	2	31	Moderate
PIIC 59	25/M	UG	Service	Stuttering	English	YES	2	43	Very Severe
PIIC 60	21/M	UG	Student	Stuttering	English	YES	2	35	Severe
PIIC 61	45/M	UG	Service	Stuttering	English	YES	2	25	Moderate
PIIC 62	18/M	UG	Student	Stuttering	English	NO	2	21	Mild
PIIC 63	17/M	High school	Student	Stuttering	English	YES	2	19	Mild
PIIC 64	20/M	UG	Student	Stuttering	English	NO	2	29	Moderate
PIIC 65	25/M	UG	Service	Stuttering	English	YES	2	20	Mild

PIIC 66	22/M	UG	Service	Stuttering	English	YES	2	26	Moderate
PIIC 67	19/M	UG	Service	Stuttering	English	YES	2	29	Moderate
PIIC 68	28/M	UG	Business	Stuttering	English	YES	2	22	Mild
PIIC 69	29/M	UG	Business	Stuttering	English	YES	2	32	Severe
PIIC 70	13.5/M	High school	Student	Stuttering	English	YES	2	25	Moderate
PIIC 71	19/M	UG	Student	Stuttering	English	YES	2	31	Moderate
PIIC 72	24/M	UG	Service	Stuttering	English	NO	2	18	Mild
PIIC 73	24/M	UG	Service	Stuttering	English	YES	2	28	Moderate
PIIC 74	23/M	UG	Student	Stuttering	English	YES	2	10	Very Mild
PIIC 75	25/M	UG	Service	Stuttering	English	YES	2	27	Moderate
PIIC76	21/M	UG	Service	Stuttering	English	YES	2	36	Severe
PIIC 77	25/M	UG	Service	Stuttering	English	YES	2	3	Moderate
PIIC 78	21/M	UG	Student	Stuttering	English	YES	2	34	Severe
PIIC 79	22/M	UG	Student	Stuttering	English	YES	2	30	Moderate

PIIC 80	14/M	High school	Student	Stuttering	English	YES	2	28	Moderate
PIIC 81	15/M	High school	Student	Stuttering	English	YES	2	27	Moderate
PIIC 82	26/M	UG	Service	Stuttering	English	YES	2	37	Very Severe
PIIC 83		UG	Service	Stuttering	English	YES	2	32	Severe
PIIC 84	24/M	UG	Service	Stuttering	English	YES	2	30	Moderate
PIIC 85	24/M	UG	Service	Stuttering	English	YES	2	18	Mild
PIIC 86	24/M	UG	Student	Stuttering	English	YES	2	22	Mild
PIIC 87	18/M	UG	Student	Stuttering	English	YES	2	25	Moderate
PIIC 88	19/M	UG	Student	Cluttering	English	NO	2		Mild
PIIC 89	40/F	UG	Service	Stuttering	English	NO	2		Mild
PIIC 90	45/M	UG	Business	Cluttering	English	YES	2		-
PIIC 91	15/M	High school	Student	Stuttering	English	NO	2		Moderate
PIIC 92	20/M	UG	Student	Stuttering	English	NO	2		Mild
PIIC 93	24/F	PG	Service	Stuttering	English	YES	2		Mild
PIIC 94	25/M	UG	Service	Stuttering	English	NO	2		-

PIIC 95	25/M	UG	Student	Stuttering	English	NO	2		Severe
PIIC 96	15/F	High school	Student	Stuttering	English	NO	2		Severe
PIIC 97	25/M	UG	Service	Stuttering	English	NO	2		Moderate
PIIC 98	27/M	UG	Service	Stuttering	English	NO	2		Moderate
PIIC 99	25/M	UG	Service	Stuttering	English	YES	2		Moderate
PIIC100	14/M	High school	Student	Stuttering	English	YES	2		Severe

Appendix 3

Participant details of the TS group

ID	AGE/ GENDER	EDUCATION	OCCUATION	LANGUAGE
PWNS1	25/F	PG	Service	English
PWNS2	24/F	PG	Service	English
PWNS3	20/F	UG	Service	English
PWNS4	24/F	PG	Service	English
PWNS5	25/M	PG	Service	English
PWNS6	32/M	PG	Service	English
PWNS7	27/M	PG	Student	English
PWNS8	24/F	PG	Service	English
PWNS9	27/M	UG	Service	English
PWNS10	40/M	PG	Service	English
PWNS11	25/F	PG	Service	English
PWNS12	23/M	UG	Service	English

PWNS13	25/F	PG	Service	English
PWNS14	30/M	UG	Service	English
PWNS15	25/F	UG	Service	English
PWNS16	28/M	UG	Service	English
PWNS17	29/M	UG	Business	English
PWNS18	29/M	UG	Service	English
PWNS19	29/M	UG	Service	English
PWNS20	28/M	UG	Service	English
PWNS21	25/M	UG	Service	English
PWNS22	29/M	UG	Service	English
PWNS23	25/M	UG	Student	English
PWNS24	24/M	UG	Service	English
PWNS25	24/M	PG	Service	English
PWNS26	24/M	UG	Service	English
PWNS27	35/M	PG	Student	English
PWNS28	25/M	UG	Student	English
PWNS29	30/M	UG	Student	English

PWNS30	23/M	UG	Student	English
PWNS31	25/M	UG	Service	English
PWNS32	23/M	UG	Student	English
PWNS33	24/M	UG	Student	English
PWNS34	29/M	UG	Service	English
PWNS35	25/M	UG	Student	English
PWNS36	25/M	UG	Service	English
PWNS37	25/F	UG	Service	English
PWNS38	25/F	UG	Housewife	English
PWNS39	25/M	UG	Service	English
PWNS40	19/M	UG	Student	English
PWNS41	21/M	UG	Student	English
PWNS42	27/M	UG	Student	English
PWNS43	21/M	UG	Student	English
PWNS44	18/M	UG	Student	English
PWNS45	27/M	UG	Student	English
PWNS46	22/M	UG	Service	English

PWNS47	28/M	UG	Service	English
PWNS48	21/F	UG	Service	English
PWNS49	28/M	UG	Service	English
PWNS50	19/M	UG	Student	English
PWNS51	21/M	UG	Student	English
PWNS52	26/M	UG	Student	English
PWNS53	22/M	UG	Service	English
PWNS54	22/M	UG	Student	English
PWNS55	28/M	UG	Service	English
PWNS56	24/M	UG	Student	English
PWNS57	24/M	UG	Service	English
PWNS58	34/M	UG	Service	English

Appendix 4

ISACS-s (A) Sample items

Section I (Activities and environmental factors)

How difficult do you think the following situations would be for you?

		Not at all difficult	Not very difficult	Somewhat difficult	Very difficult	Extremely difficult
2.	Continuing a conversation with a group of people for 10-15 minutes	1	2	3	4	5
8.	Speaking to a large crowd over a microphone	1	2	3	4	5

Section II (Participation/ QoL)

How much (if at all) according to you is your speech negatively affecting the following:

		Not at all	A little	Somewhat	A lot	Extremely
2.	Relationships with friends	1	2	3	4	5

4.	Relationships with neighbours	1	2	3	4	5

Section III (Environmental Factors)

How do you think the attitudes of the following people would be towards you?

		Extremely positive	Very positive	Somewhat positive	Not very positive	Not at all positive
3.	Neighbours	1	2	3	4	5
5.	Superiors	1	2	3	4	5

Section IV (Personal Contextual Factors)

How much do you think you experience the following?

		Not at all	A little	Somewhat	A lot	Extremely
1.	Anger	1	2	3	4	5
2.	Sadness	1	2	3	4	5

Note: ISACS-s (B) has identical statements but in second person (e.g. Do you think this person speaks…..?)

Appendix 5
Factor loading values of each item of the ISACS

Rotated Component Matrix[a]

	Component									
	1	2	3	4	5	6	7	8	9	10
I1	.324	.205	-.100	-.264	.163	.161	-.186	-.291	-.360	-.020
I2	-.033	.091	.143	.127	-.137	.103	-.026	-.171	.674	-.288
I3	.026	.141	.174	.089	.098	.051	.280	.391	-.112	.047
I4	.233	.094	-.151	.291	.301	.143	.077	-.150	.579	-.038
I5	.153	.044	-.029	.193	.057	-.040	.200	.085	.597	.144
I6	.194	.035	.280	.050	-.010	-.100	.069	-.257	.440	.228
I7	.158	.032	-.009	.211	.364	.115	.151	.131	-.022	-.067
I8	.120	.407	.082	.004	.519	.075	-.042	.225	-.091	.012
I9	.179	.021	.050	.051	.170	.103	.609	.182	.162	.166
I10	.177	.181	.058	.218	.178	-.058	.518	.153	.152	.067
I11	.114	.114	-.009	-.114	.026	-.246	-.019	.538	.001	-.014
I12	.067	-.005	-.063	.118	.034	-.296	.139	.598	-.162	-.031
II1	.097	.266	-.051	.142	.552	-.178	.122	-.223	-.058	.096
II2	.273	.064	.033	.195	.670	.078	.024	-.123	.059	.086
II3	.220	.158	.014	-.032	.649	.008	.177	.015	-.001	-.080
II4	.171	.405	.341	.068	.456	.012	.103	.057	.107	.194
II5	.336	.476	.070	.106	.096	.032	.120	.188	.091	.407
II6	.418	.316	.044	.203	.255	.042	.149	.346	.147	.185
II7	.175	.189	.120	.105	.599	.053	.138	.188	-.016	.398
II8	.489	-.018	.154	.060	.175	-.024	.281	.011	-.072	.513
II9	.052	.408	.153	.043	.041	.156	.502	-.147	.181	.043

II10	.184	.320	.132	-.028	.087	.133	.553	-.055	-.095	.151
II11	.302	.168	.106	-.035	.448	.089	-.121	.228	.495	.142
II12	.220	.137	.210	.160	.506	.051	.367	-.086	.193	.134
II13	.426	.119	.239	.128	.572	.013	.038	.214	.056	.148
II14	.548	.207	.259	.064	.085	.074	.106	-.403	.158	.206
II15	.257	.176	.235	-.027	.189	.055	-.141	.504	.356	.186
II16	.498	.255	.183	.134	.211	.278	.242	-.227	.000	.156
II17	.501	.212	.060	-.017	.330	.153	.504	.054	.120	.063
II18	.391	.238	.072	-.071	.435	.181	-.078	.379	.033	.077
II19	.559	.210	.326	.134	.218	.190	.285	.086	.076	-.108
II20	.628	.258	.180	.228	.330	.038	.057	-.042	.362	-.046
II21	.682	.274	.294	.133	.167	.079	.058	.009	.149	.071
II22	.572	.356	.081	.195	.276	.048	-.112	.319	.186	.227
II23	.726	.213	.164	.186	.252	.118	.001	.142	.042	.176
II24	.732	.186	.047	.108	.210	.174	.127	.080	.051	.172
II25	.668	.316	.268	.099	.231	.206	.022	.123	.092	.037
II26	.688	.272	.173	.154	.225	.134	.259	.012	.027	-.117
II27	.630	.011	.064	.255	.181	.170	.148	-.011	.102	.062
II28	.677	.004	.334	.135	.125	-.072	.190	.135	-.038	.119
III1	.393	.285	.357	.194	.106	.138	.035	.018	.169	.470
III2	.195	.361	.208	-.021	.300	.094	.140	-.095	-.070	.513
III3	.034	.470	.379	.088	.292	.040	.168	.180	.192	.322
III4	.199	.409	.244	.135	.158	.156	.223	-.191	.041	.433
III5	.049	.487	.347	.026	.385	-.002	.161	.246	.078	.318
III6	.476	.328	.176	.146	.052	.091	.209	.057	-.042	.335
III7	.209	.622	.107	.142	.227	.121	.071	.270	.025	.319
III8	.334	.332	.355	.049	.300	.126	.215	-.029	.300	.194
III9	.377	.397	.168	.078	.360	-.080	.256	-.048	.218	.152

III10	.140	.219	.213	.348	.509	.115	-.177	.181	.082	.020
III11	.423	.286	.625	.088	-.016	.068	.067	-.101	.096	.242
III12	.380	.082	.603	.148	-.163	.134	.142	.022	.107	.352
III13	.346	.171	.519	.265	-.058	.081	.021	-.128	.158	.244
III14	.223	-.018	.784	.245	-.100	.078	.118	.008	.037	.090
III15	.107	.172	.808	.042	.058	.060	.018	-.039	.138	.166
III16	.174	.318	.584	.151	.103	-.023	.063	.038	.149	.247
III17	.408	.611	.137	.104	.047	.204	.080	-.037	-.032	.138
III18	.328	.717	.246	-.029	.066	-.047	.108	-.171	.019	-.025
III19	.263	.727	.283	-.004	.098	-.093	.109	-.069	.159	-.027
III20	.316	.723	.159	.000	.234	.002	-.012	.135	.074	.124
III21	.080	.688	.047	.201	.173	.112	.183	.053	.042	.175
III22	.212	.323	.238	.222	-.033	-.068	.483	-.126	-.121	-.052
III23	.019	.744	-.051	.233	.227	.108	.106	.157	-.008	.168
III24	.046	.462	.332	.047	.193	-.052	.378	.167	.024	.076
III25	.195	.131	.372	.393	-.072	-.026	.347	-.018	-.238	.055
III26	.233	-.032	.285	.683	.045	-.125	.105	.127	.007	-.031
III27	.171	.009	.348	.698	-.057	-.101	.073	-.220	.103	.028
III28	.095	-.025	.361	.770	.080	-.038	.025	.079	-.023	.116
III29	.088	.126	.211	.686	.082	-.095	.061	-.361	.172	.186
III30	-.051	.172	.255	.657	.263	-.122	.037	-.101	.050	.190
III31	.280	.172	.107	.716	.143	.055	.033	.176	.177	-.131
III32	.158	.271	.100	.704	.235	-.009	.100	.045	.084	.042
III33	.165	.258	-.026	.595	.114	.216	-.179	.203	.254	-.008
III34	.098	-.107	-.060	.180	-.110	.629	-.439	-.042	-.198	.033
III35	.118	.003	.003	.007	.048	.794	-.045	-.224	-.014	-.037
III36	.036	-.011	-.014	.107	.103	.845	-.181	.002	-.116	.082
III37	.223	.083	.060	-.067	.137	.717	.302	.027	.015	.002

III38	.036	.198	.134	.013	-.090	.830	.008	-.027	.085	.040
III39	.182	.149	.044	-.078	-.034	.701	.225	.080	.227	.057
III40	.133	.063	.034	-.122	.116	.719	.094	-.106	.003	.010
III41	.032	-.071	.193	-.254	.058	.589	.323	-.025	.199	-.029
III42	.239	.052	.331	-.106	-.088	.274	.420	.052	.453	-.044
IV1	.029	.076	.804	.165	.233	.103	.222	.164	-.021	-.022
IV2	.163	.205	.740	.218	.258	.026	.175	.104	.056	-.101
IV3	.261	.233	.749	.255	.119	.031	.045	-.020	-.114	-.039
IV4	.181	.377	.601	.293	.222	-.017	-.109	-.015	-.079	-.072
IV5	.293	.457	.349	.276	.344	.069	.145	.044	.014	-.148
IV6	.232	.353	.582	.315	.141	.090	.074	.042	.084	-.174
IV8	.193	.486	.081	.380	.418	-.014	.296	-.129	.067	-.066
IV9	.138	.375	.317	.267	.281	.050	.113	-.287	-.060	-.138
IV10	.173	.469	.247	.322	.215	.062	.146	-.152	-.032	-.298
IV15	.522	.502	.323	.171	.091	.087	.082	-.010	.010	-.052
IV16	.496	.461	.240	.051	.144	.036	.077	.104	.026	-.095
IV17	.245	.522	.236	.079	-.005	.084	.179	.328	.132	-.147
IV18	.476	.440	.263	-.021	.016	.061	-.066	.087	.136	-.196

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.[a]

a. Rotation converged in 16 iterations.

Appendix 6

Factor analysis of the interim 38 item version of the ISACS

Rotated Factor Matrix[a]

	Factor

	1	2	3	4
I4	.002	.400	.183	.141
I5	.056	.318	.148	-.045
I11	-.045	.110	.158	-.224
I12	-.003	.106	.110	-.361
II19	.420	.618	.167	.183
II20	.338	.716	.238	.023
II21	.413	.699	.204	.080
II22	.168	.714	.404	-.039
II23	.272	.784	.221	.105
II24	.170	.769	.189	.180
II25	.353	.717	.282	.181
II26	.347	.681	.231	.160
III3	.349	.202	.596	.005
III5	.324	.244	.606	-.050
III7	.166	.311	.711	.058
III19	.322	.249	.597	-.002
III20	.205	.373	.679	.036
III21	.139	.206	.724	.055
III23	.060	.194	.817	.032
III12	.574	.286	.101	.140
III14	.778	.120	-.039	.112
III15	.699	.080	.163	.123
III26	.479	.272	.046	-.239
III28	.577	.157	.077	-.135
III31	.384	.426	.180	-.080
III32	.379	.296	.314	-.083

III35	.005	.081	-.024	.836
III36	-.024	.098	.037	.743
III37	.070	.268	.140	.712
III39	.031	.231	.146	.638
III40	.018	.126	.118	.637
IV2	.799	.187	.241	.012
IV3	.834	.192	.191	.065
IV4	.691	.175	.341	-.029
IV5	.499	.344	.467	.020
IV6	.717	.207	.330	.093
IV10	.404	.221	.356	.074
IV15	.459	.448	.409	.100

Extraction Method: Maximum Likelihood.

Rotation Method: Varimax with Kaiser Normalization.[a]

a. Rotation converged in 6 iterations.