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STUTTERING IN PERSIAN-SPEAKING CHILDREN BASED ON THE CALMS ASSESSMENT (COGNITIVE, AFFECTIVE, LINGUISTIC, MOTOR AND SOCIAL)

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A R T I C L E   I N F O

A B S T R A C T

Background: Stuttering is known as a multi-factorial fluency disorder. The CALMS assessment assesses stuttering from a multidimensional perspective, and the valid and reliable Persian version of CALMS (CALMS-P) is available. Due to the importance of stuttering treatment as a multi-factorial disorder, this study involved the use of the CALMS-P in order to assess the impact of variables such as age, gender, and family history on stuttering components in 115 Persian-speaking children who stutter. Methods: The study was performed from March 2015 to January 2016 in Tehran, Iran. In this cross-sectional and analytic study, the relation between the five components of CALMS-P and the age, gender, and family history of stuttering variables were examined. A p-value less than 0.05 was considered as statistically significant. A one-way ANOVA was performed on the stuttering factors at different ages to see if there was a relationship between the components and the age of people who stutter. In the second analysis, independent t-tests were performed on the stuttering factors for the different genders and family history of stuttering. Results: There was a difference between girls and boys in the linguistic and social components. The family history of stuttering had significant differences with affective, linguistic, and motor and social components of stuttering. Results also tentatively suggested that for people who stutter, increasing age may show higher cognitive information of stuttering. Conclusion: These findings have implications for treatment such as the necessity to address the cognitive aspects of stuttering at different ages and the need for additional clinical resources to be invested in stuttering treatment.

Introduction

Most experts in clinical management of stuttering agree that it is important to evaluate clients 'thoughts, feelings, attitudes, and the social impact of the disorder rather than just the disfluent speech behavior. The concept of stuttering as a multidimensional disorder is not new and is reflected in frameworks such as the demand and capacities model [1], the revised component model [2], the multifactorial dynamic disorder model [3], and Alms (2007) dual premotor model of stuttering. Recently, an assessment evolved from a complex interaction of cognitive affective, linguistic, motor, and social factors (CALMS) of stuttering [4]. Collectively, these models focus on a client's speech-related neurophysiological

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processes, linguistic skills, emotional and attitude components, and various reactions to listeners and speaking situations. There are a large number of potential factors that could impact stuttering and assessing all of them would be difficult and time consuming.

The CALMS Assessment [5] is an evaluation instrument designed to provide the speech-language pathologist with a multidimensional evaluation of stuttering for school age children (ages 7-14). It is comprised of 23 items spread across the five CALMS domains. A profile of performance is developed from data acquired during the assessment that can be used to determine areas of strength and weakness within each domain. Studies on a group of people who stutter show differences that could be culturally determined. Many investigations have examined the influence of culture on stuttering disorders [6-10]. An important question in stuttering studies is how to provide clinical services to culturally and linguistically diverse populations.

According to Tellis and Tellis (2003), "speech language pathologists often report that they encounter difficulties when treating stuttering patients of cultural and linguistic diversity" [11]. Thus, the factors effect on stuttering must be examined in different cultures with different linguistic populations. Because this study was done on Persian-speaking children who stutter, some studies on stuttering in Persian population are reviewed below.

Epidemiological studies of stuttering in Iran report a prevalence of approximately 1%. The rate of stuttering among male and female children were within the same range as in other reports, and generally accepted stuttering prevalence is higher in males than females with a ratio of about 3 to 1 [12]. Studies in Iran that emphasized linguistic components [13-15] concluded that there was an effect of utterance length and syntax complexity at different rates for people who stutter. These studies showed the impact of utterance length does not change with age in Persian speaking children who stutter although the effect of syntax may. Studies on motor components mostly rely on validation instruments such as the stuttering severity instrument 3 (SSI3) [16], and the stuttering prediction instrument (SPI) [17]. Some studies on communication attitude in Persian children who stutter showed that there is a more negative attitude in children who stutter than their peers.

Through the lack of studies in stuttering as a multi-factorial disorder in Persian society, the intent of this study was investigate the effects of age, gender, and family history of stuttering as a multi-factorial disorder.

Method

Sample
Participants in this study were 7 to 14 year old Persian-speaking children (mean age=10 years, Standard deviation = 2.2 years) who stutter in speech therapy clinics of Tehran, Iran.

Measurement
CALMS assessment was designed to assess cognitive, affective, linguistic, motor, and social factors in 7 to 14 year old children who stutter. In this study we used CALMS-P that is a valid and reliable Persian version of the CALMS assessment. The validity and reliability of the Persian version of this assessment was previously assessed by Jalilian et al. (in press).The Content validity for individual items (I-CVI) was 0.92 and the internal consistency analysis using the Cronbach's alpha test showed a value of .84 for the complete instrument (in press).

The instrument is divided into six sections including history, cognitive items and form, affective items and forms, linguistic items, motor items, and social items and forms. This assessment is widely used and consists of 23 items divided into five domains of cognitive, affective, linguistic, motor and social. Scores for each section range from 0 to 5, where0 represents Normal, No Concern, High Ability and 5 represents Severe Impairment, Extreme Concern, Very Poor Ability [4]. The first section includes 10 questions about family history of stuttering, time of stuttering onset, and worries about stuttering (parental responses). There are five items in the second section as cognitive component. These items assesses awareness, knowledge, and understanding of stuttering such as (1) identify stuttering events while reading (2) determining stuttering while speaking automatically ,(3) identify stuttering events of the therapist's stuttering, (4) awareness form that tests a child's knowledge of facts about stuttering, and (5) tests of the child's knowledge and understanding strategies that have been used in therapy. Assessing reactions, feelings, and attitudes toward stuttering as affective component is the third section of the CALMS assessment. Three items include (1) determining the level of negative reactions, (2) emotional labels related to stuttering (3) attitudes related to communication. Three forms are used to assess these items. The fourth section as linguistic component includes the assessment of linguistics characteristics (1) the impact of increasingly length and syntax complexity on stuttering, (2) the assessment of language function (formally or informally), and (3) the assessment of speech sound production ability (informally).Section five as motor component deals with assessing specific aspects of the stuttering behavior by eight items such as (1) types of stuttering ,(2) the average number of repetition, (3)the struggle and tense, (4) determining the percentage of stuttering in automatic speech, (5) the percentage of stuttering in reading, (6) the duration of stuttering moment, (7)the presence of secondary behaviors related to stuttering and determine tempo of repetition . The last section as social component is about assessing the social communication and different listener that includes four forms that each assess (1) avoidance of people (2) avoidance of words and events, (3) various people and in various social situations, (4) friendships and interactions with peers.

Method and data analysis

The study was performed from March 2015 to January 2016 in Tehran, Iran. In this cross-sectional and analytic study, the relation between of the five components of the CALMS model of stuttering in Persian setting and the variables age, gender, and family history of stuttering variables was assessed. Persian-speaking children who stutter were given the CALMS-P assessment. Convenient sampling was used to acquire the 115 Persian-speaking children who stutter and who were affiliated with speech and language clinics in Tehran, Iran. See Table 1 for demographic information. Data for age, family history of stuttering, gender, cognitive, affective, linguistics, motor, and social components were extracted from the CALMS-P assessment. After explaining the study purpose to the participants, they were informed that participation in the study was voluntary and that they could refuse to participate in the study without being penalized.

The data were analyzed using SPSS software version 17. In addition to descriptive statistics, thedata were analyzed by the one-way analysis of variance (ANOVA) and independent t-tests. A p-value less than 0.05 were considered as statistically significant. A one-way ANOVA was performed on the stuttering factors at different ages to see if there was a relationship between CALMS components and age of people who stutter. In the second analysis, independent t-tests were performed on the stuttering factors for different gender and family history of stuttering.

The parents of all the participants provided written informed consent and also informed consent was obtained for experimentation with human subjects. The privacy rights of human subjects have been observed. The study was approved by the research ethics committee of the University of Social Welfare and Rehabilitation Sciences by the number IR.USWR.REC.1394.58.

Results

The CALMS-P assessment results showed that the three variables age, gender, and family history of stuttering had an effect on stuttering components. The results are presented in three sections.

Section one investigate the relation between age and five components of stuttering (CALMS). As shown in Table 2, the Cognitive factor had a significant difference relative to age groups ($p<0.05$). The four other factors (affective, linguistic, motor and social) were statistically not significant.

Section two examines affect of gender on stuttering components. The results showed that the male to female gender ratio is about 3:1. Evidence of increasing male to female ratio has been suggested by most studies that investigated gender differences in stuttering [18-21]. In the second analysis, independent T-tests were performed on the stuttering factors and different gender. Table 3 indicates that there was a significant difference between the linguistic (t=2.16 p =0.03) and social components (t=2.05 p =0.04) related to girls and boys CALMS-P scores. Section three examines family history of stuttering as an important variable in factors of stuttering. Table 4 shows the results of independent t-tests detecting significant differences in family history and CALMS-P scores. There were significant differences between family history and affective (t=2.63 p =0.01), linguistic (t=3.22 p <0.001), motor (t=2.25 p =0.02), and social components (t=6.09 p <0.001) of stuttering (p< 0.05). The other factor (cognitive) was not significant.

Discussion

The primary goal of this study was to investigate the relation between three variables, age, gender, and family history of stuttering, with the CALMS components. The common factors in these analyses are: cognitive(C), affective (A), linguistic (L), motor (M), and social(S).

In this study an investigation of five factors for different age groups was performed to see if there is a relationship between the CALMS components and the age of people who stutter. The results suggest that cognitive factors were significantly different across the age groups. Many studies have investigated age and cognitive components such as stuttering awareness, thoughts and understanding of stuttering details, and the results showed that their awareness and understanding of stuttering tend to become more extreme with increasing age [22-25]. Due to previous researches and the findings of this study, we conclude that there is a greater likelihood of increasing awareness of stuttering in higher age groups. With increasing age, the school age children compare themselves to their peers and as a result this leads to an increase in self-awareness about their speech.

Awareness as a cognitive aspect of stuttering could be considered from two perspectives. One aspect might be positive: with increasing age, the child who stutters can identify moments of stuttering and associated tension during a disfluent moment. The greater their own knowledge about stuttering and their awareness of their thinking as it relates to their communicative abilities, the more effective a communicator the individual can be overall. On the other hand, awareness might be problematic in that increased sensitivity to stuttering may lead to an increase in the severity of the problem.

Relative to gender, the girls' scores were lower than the boys' in the linguistic subscales. This suggests increasing in length of utterance and syntactic complexity has a greater effect on boys' stuttering than on girls' stuttering. It is also known that stuttering is influenced by linguistic factors such as lexical class of word, length, and sentence complexity. Language complexity appears to affect sensory-motor control of speech to trigger the occurrence of stuttering in a moment to moment fashion. The linguistic component within the CALMS instrument is related to the disfluent speaker's language skills and

abilities that impact the frequency of stuttering. As studies have shown, children are different in how quickly they achieve linguistic milestones. Gender has been shown to be one of the most important contributors to this variability. From an early age, children exhibit gender differences in their verbal abilities, with girls exceeding boys in most aspects of verbal performance. Researchers have long agreed that girls have superior language abilities than boys, and thus the areas of the brain associated with language are more fully developed in girls than in boys during language tasks. Due to these findings we can conclude that linguistic complexity may have less effect on girls' language performance than boys so they act more nearly like their normal peers.

In our study girls who stutter achieved lower scores than boys, suggesting that it their stuttering affect on their communications less. The social component of communication involves a client's communicative competence relative to reactions that the person who stutters has to various communicative partners in a variety of speaking situations. The social component also is concerned with any avoidances of speaking situations as well as peer teasing that could occur as a result of the stuttering and also it is concerned with the effect of the type of listener and speaking situations. When a young stutterer experiences negative emotion more frequently during stuttering, such as being teased by peers or experiencing uncomfortable responses by listeners, he/she becomes afraid to participate in social activities. In the Persian culture girls often speak about their feelings more eagerly than boys. They are not afraid to explain their feeling and even encourage crying. But boys are mostly inhibited by parents and their entourage to show their feelings or even to cry. So in social situations boys approach communication with dread and later may go to great lengths to avoid communication situations. So the symptoms such as fear of stuttering and avoiding communicating that differ in girls and boys maybe dependent on culture and the definition of being male or female in their community.

The presence or absence of a family history of stuttering appears to be related to the extent to which certain forms of disfluency and secondary behaviors are displayed. It has been known for several years that family history of stuttering is much higher in some families and affect stuttering components [12, 26-29]. The data from this research provides evidence to support the hypothesis that those with a history of stuttering in the family are consistently different from those whose family history is negative. In this study we found significant difference of family history relative to four components of stuttering. Children who had family history of stuttering had higher scores compared to those who had no family history of stuttering in components such as affective, linguistic, motor, and social. Some studies have been conducted that have compared the behavioral, cognitive, and physiological characteristics of diagnosed stutterers who do or do not have a family history of stuttering. For example, Andrews and Harris (1964) found that the presence or absence of a family history of stuttering was unrelated to any of the variables such as severity of stuttering and secondary behaviors that they studied [30]. Janssen and Keraaimat (1990) investigated the importance of the presence or absence of a history of stuttering. They find a relationship between genetic history and speech- associated variables [31].

Conclusion

In this study we have attempted to demonstrate that the CALMS-P instrument is consistent with current perspectives of stuttering as a multidimensional disorder. In conclusion, the current results support the notion that, three variables of age, gender and family history of stuttering can affect on stuttering in Persian speaking children , this is the first time stuttering being investigated as multidimensional disorder in Persian speaking children.

Specifically, the current results might suggest that family history of stuttering is the important variable that can widely affect on Persian speakers with stuttering. Clinician can considerate this variable as an important component in treatment of stuttering. Further, these findings in Persian speakers are similar to those previously reported in English speakers, suggesting the findings are likely independent of the language spoken mostly dependent on the gender of children.

As such, findings of this study can help the clinician in assessing the integrative and relative contributions of cognitive, affective, linguistic, motor, and social components upon the communication disorder recognized as stuttering. Additionally, it can help the clinician in determining how the various components influence and are influenced by other variables and lead to choose the best stuttering treatment technique for every client.

As this study was done only on children who stutter, further studies with a control group are needed to re-examine and investigate the effect of these variables on Persian children. Also further research is needed to examine other variables such as severity of stuttering, subcultures, the economic situation of the family.

Acknowledgements

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Tables:

Table1. Demographic characteristics of Persian-speaking children who stutter (n=115)

Characteristic	No. of children	%
Sex	115	
Male	91	80
Female	23	20
Family history	115	
With family history	61	53
Without family history	54	47
Age, Years	115	
Median	10	-
Range	7-14	

Table 2. The mean scores of 115 children who stutter on CALMS-P instrument by Age

Age→ Subscale↓	7-8 (n=29) Mean(SD)	9-10(n=31) Mean(SD)	11-12(n=29) Mean(SD)	13-14 (n=26) Mean(SD)	ANOVA
Cognitive	2.79(0.75)	2.68(0.81)	2.17(0.91)	1.87(0.82)	F=7.62 P=0.00
Affective	2.09(0.66)	2.11(0.74)	2.24(0.95)	2.34(0.72)	F=0.64 P=0.58
Linguistics	1.63(0.52)	1.64(0.44)	1.43(0.59)	1.43(0.53)	F=1.44 P=0.23
Motor	1.88(0.67)	1.90(0.69)	2.05(0.83)	1.97(0.86)	F=0.30 P=0.82
Social	1.78(0.60)	2.01(0.60)	1.91(0.80)	1.99(0.67)	F=0.67 P=0.56

ANOVA= analysis of variance; SD= standard deviation

Table 3. The mean of CALMS-P scores by gender

Subscale	Male(n=91) Mean(SD)	Female(n=23) Mean(SD)	Independent- t test
Cognitive	2.44(0.90)	2.29(0.84)	t=0.75 p=0.45
Affective	2.25(0.81)	1.97(0.60)	t=1.84 p=0.7
Linguistics	1.59(0.54)	1.36(0.42)	t=2.16 p=0.03
Motor	1.95(0.74)	2.00(0.84)	t=-0.28 p=0.77
Social	1.97(0.68)	1.69(0.54)	t=2.05 p=0.04
TOTAL	91	23	-

SD= standard deviation

Table 4. The mean of CALMS-P scores by family history

Family History→ Subscale↓	Yes(n=61) Mean(SD)	No(n=54) Mean(SD)	Independent- t test
Cognitive	2.51(0.82)	2.28(0.92)	t=1.43 p=0.15
Affective	2.36(0.80)	1.99(0.69)	t=2.63 p=0.01
Linguistics	1.67(0.58)	1.37(0.41)	t=3.22 p=0.00
Motor	2.09(0.76)	1.78(0.72)	t=2.25 p=0.02
Social	2.23(0.66)	1.57(0.48)	t=6.09 p=0.00

SD= standard deviation