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A Systematic Examination of Literature Review in Turn-Taking Behavior During Conversations in People Who Stutter Since 1985

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Abstract

Stuttering is a communication disorder which is characterized by intermittent and involuntary speech disruptions. It afflicts around 1% of the population. Reappraisal of scientific literature indicates that examination of turn-taking behaviors during conversations in those who stutter has emerged as an interesting area among the speech-language clinicians, and linguists. The objective of this paper is to conduct a systematic examination of the research works carried on turn-taking behaviors during conversations in the field of stuttering disorder since 1985. This was conducted using the PRISMA guidelines. PubMed, Google Scholar, and other bibliographical references were scrutinized for locating relevant research articles (or, items) on the topic under consideration. Keywords containing such as "*Turn-Taking*", AND/OR "*Conversation Analysis*" were entered in the search engine tabs. The PubMed database generated a total of 31 items. An additional list of 41 items was located using the Google Scholar, and other bibliographical sources. Out of these 72 items, only 22 of them were considered based on the inclusion and exclusion criteria of the current study. The search was conducted between 01/07/2019 to 20/08/2019. The selected research articles were, then, discussed according to the turn-taking behaviors (i.e. verbal, and nonverbal behaviors), and recruitment of target participants (i.e. Children Who Stutter-CWS, and Adults Who Stutter-AWS) followed up in those studies. To sum up, the significance of conducting systematic examination stemmed from the realization that a successful application of turn-taking mechanism during conversation allows an uninterrupted flow of meaningful information between a speaker, and a listener at regular intervals. However, in the case of those who stutter, any level of social interaction is difficult because of the interference of speech impediment while speaking with others. This restricts their participation in the interacting process. Systematic production of research work with adults is necessary to understand the cause of communication breakdown in natural settings among AWS.

Keywords: Stuttering Disorder, Turn-Taking Behavior, and Literature Review

1. Introduction

Stuttering is an intermittent, involuntary and a neurophysiological communication disorder which afflicts around 1% of the population (Ambrose & Yairi, 1999, p. 1097). Although, stuttering has been repeatedly defined from various perspectives, Sheehan (1958, p. 121-167) emphasized the significance of looking at the disorder both at the surface level and at a deeper level. According to him, only 20% of the overt stuttering features are produced and are visible to the listeners, while the rest of the stuttering symptomology, which accounts for 80 % of the covert features, remains invisible to the outside world. The overt features mainly consist of (a) speech-related symptoms such as part-word, single-syllable whole word repetition, audible prolongation, and silent blocks (Yairi & Seery, 2015, p. 11); and (b) presence of secondary behaviors or physical concomitants such as gaze aversion, facial grimacing, tongue protruding, eye blinking, and extraneous movement of limbs (Woolf, 1967; Zhang, Saltuklaroglu, Hough, & Kalinowski, 2009). The covert features, on the other hand, mainly encompass (a) psychophysiological changes in the body, such as changes in the heart and skin conductance rates (Bowers, Saltuklaroglu, & Kalinowski, 2012; Zhang, Kalinowski, Saltuklaroglu, & Hudock, 2010), and alternation in the neuronal activities (Yairi & Seery, 2015, p. 13); (b) development of strong negative emotional reactions associated with their own speech such as shame, self-consciousness, embarrassment (Ginsberg, 2000; Riper, 1982), guilt (Riper, 1982; Sheehan, 1970), entrapment, anger, humiliation, and resentment (Riper, 1982; Yairi & Seery, 2015); and (c) application of predictive cognitive strategies such as circumlocution, substitution, and/or avoidance of sounds, and words to overcome the stuttering events (Bloodstein, 1995; Kalinowski, 2006). While an extensive body of research has focused on the effect of stuttering disorder from the perspective of AWS themselves (Fiedler & Wepman, 1951; Ginsberg, 2000; Green, 1999; Hugh-Jones & Smith, 1999; Kalinowski, Lerman, & Watt, 1987), the manifestation and progression of the disorder have also been investigated from an outside perspective by looking at its effect on the external environment accompanying the AWS and the conversational partner (CP) during conversations (Freud, Moria, Ezrati-Vinacour, & Amir, 2016, p. 509). This observation is significant, since research studies in the past had provided substantial evidence in recognizing the debilitating impact stuttering has on the functional communication ability of those who stutter in various speaking situations (Banerjee, Casenhiser, Hedinger, Kittilstved, & Saltuklaroglu, 2017; Craig, Blumgart, & Tran, 2009; Crichton-Smith, 2002; Klein & Hood, 2004; Klompas & Ross, 2004; Yaruss & Quesal, 2006) such as classroom participation, initiating a conversation, answering telephone, adjustments to new environment (Yairi & Seery, 2015, p. 13), vocation, romance, marriage, family relationships, and friendships (Zhang et al., 2009, p. 20).

Face-to-face conversation is often conceived as one of the most intriguing, universal and distinctive ethological features of the human communication system (Bavelas, Hutchinson, Kenwood, & Matheson, 1997; Clark, 1996; Fillmore, 1981; Holler, Kendrick, Casillas, & Levinson, 2015; Levinson & Torreira, 2015; Linell, 2005; Stivers et al., 2009). During normal dyadic or multiparticipant interaction, an uninterrupted flow of information between a

speaker, and a listener is exchanged at appropriate intervals. This is largely operated by a whole set of structured and organized principles of conversational mechanism (Sacks, Schegloff, & Jefferson, 1974) or, as suggested by Yngve (1970), and Goffman's personal communication on 5th June, 1970 (Duncan, 1972, pp. 283) independently in their research work, the "*Turn-Taking Mechanism*" (Duncan, 1972, pp. 283). Nevertheless, turn-taking is an underlying mechanism for any successful conversation between two conversational partners (CPs). The verbal communicative actions made by the interlocutors during conversations are systematically synchronized with the messages delivered in the discourse (Clark, 1996; Garrod, 1999). This is made possible primarily by mutual coordination of signals (Duncan, 1972; Wiemann & Knapp, 1975), and finding acoustic accommodation (Gregory Jr. & Hoyt, 1982, p. 35) between the interactants during conversation. However, the problem gets aggravated when a person with a communication disorder fails to exchange speaking turns with his or her CP during an interaction at appropriate intervals. In the case of people with stuttering disorder, any level of social interaction (irrespective of the dyad, triad or multiparticipant interaction) seems to be difficult because of the interference of their speech impediment during transmission of a message to the listener. This eventually restricts their participation in the interaction process. At the time of speaking, they often have to implement complex cognitive strategies such as avoidance of sounds and words, substitutions and circumlocutions to overcome the fear of communication breakdown, as demonstrated in (*figure 1*), and continue to be part of the interacting group. Those who fail to apply these strategies, within a stipulated time frame, may either prefer to withdraw and collect all the negative experiences from the conversational situation, irrespective of their level of interaction. Or, they decide to remain silent most of the times by not contributing their views in the group. In sum, their participation in future social engagements depends on choosing any of these two options.

To date, a plethora of research work has been dedicated to the understanding of different facets of turn-taking behaviors during successful conversation among normal fluent speaking population over the years (Bedrosian & Wanska, 1988; Donald, 2000; Dubois, Boutin, & Sankoff, 1996; Duncan, 1972; Garrod & Pickering, 2015; Hilbrink, Gattis, & Levinson, 2015; Hirvenkari, Ruusuvuori, Saarinen, Kivioja, & Parakyla, 2013; Levinson & Torreira, 2015; Magyari & de Ruiter, 2012; Martinez, 2018; Pour & Yazd, 2015; Sacks et al., 1974; Schegloff, 2000; Sidnell, 2001; Wilson & Wilson, 2005). However, in the case of people with stuttering disorder, the examination of turn-taking behaviors has found to be an emerging field of interest among the speech-language clinicians, and linguists.

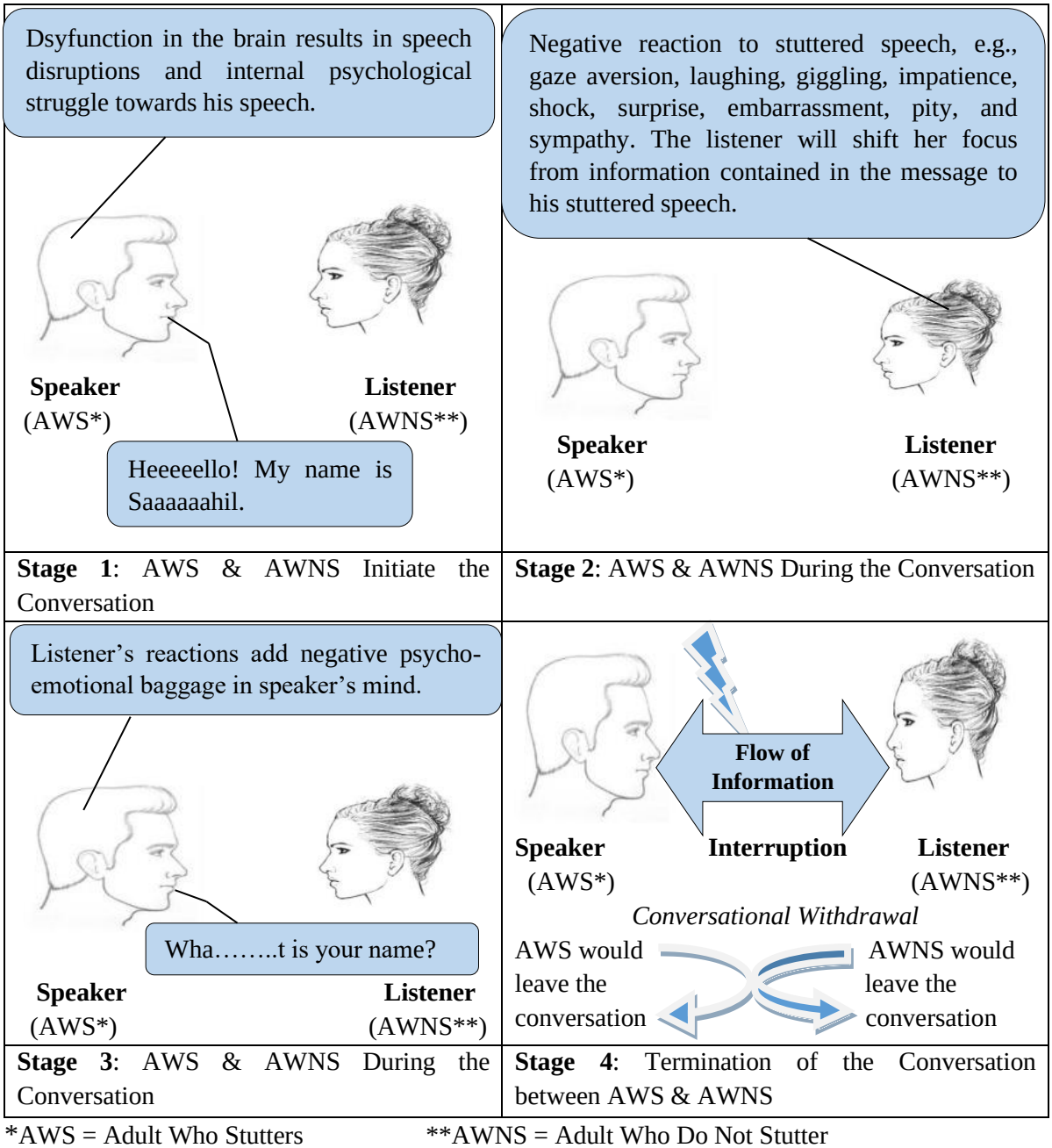

Figure 1: Stages of Communication Breakdown in Adults Who Stutter

Except three research studies involving adults with stuttering disorder (Freud et al., 2016; Lee, Van Dulm, Robb, & Ormond, 2015; Lee, Robb, Van Dulm, & Ormond, 2016), most of the studies in the field of stuttering disorder, to date, have significantly focussed either on examining the role of alternation in the communicative style, speaking rates and other verbal behaviors of parents when talking to CWS (Byrd, Coalson, & Bush, 2010; Byrd, Logan, & Gilliam, 2012; Dehqan, Bakhtiar, Panahi, & Ashayeri, 2008; Kelly, 1994; Kelly & Conture, 1992; Kloth, Janssen, Kraaimaat, & Brutten, 1994; Logan, 2003; LaSalle & Conture, 1995; Meyers & Freeman, 1985a, 1985b; Miles & Ratner, 2001; Millard, Nicholas, & Cook, 2008;

Millard, Edward, & Cook, 2009; Ryan, 2000; Sargent, Robb, & Zebrowski, 2006; Stephenson-Opsal & Ratner, 1988; Tetnowski, Damico, Bathel, & Franklin, 2004; Weiss & Zebrowski, 1992; Winslow & Guitar, 1994), or looking at the production of nonspeech behaviors in CWS during conversations (Conture & Kelly, 1991).

Therefore, the objective of this paper is to conduct a systematic examination of the research works carried on turn-taking behaviors during conversations among stuttering population since 1985. The paper is intended to serve as a resource material for the research scholars to identify the significant research articles published from this time-period in this area and utilize it according to the research questions and methodology to be addressed in their own scientific studies.

2. Research Methodology

2.1 *Protocol*: The systematic examination of scientific literature on turn-taking behaviors during conversations in stuttering population was conducted using the *Preferred Reporting Items for Systematic Reviews and Meta-Analyses* (PRISMA) guidelines (Liberati, Altman, Tetzlaff, Mulrow, GØtzsche, Loannidis, Clarke, Devereaux, Kleijnen, & Moher, 2009).

2.2 *Source of Information*: PubMed, Google Scholar, and bibliographical references were scrutinized for finding the research articles on the topic under consideration.

2.3 *Search Guidelines*: Relevant research articles were identified using the PubMed database, and Google Scholar browser by entering keywords such as "*Turn-Taking*" AND/OR "*Conversation Analysis"* in the search engine tab. Bibliographical references were also searched for locating relevant research articles. The search of research articles was conducted between 01/07/2019 to 20/08/2019. Applying the PRISMA guidelines, all the research articles had to undergo the four stages of selection processes (refer, *Figure 2*). These were as follows:

(i) Identification Stage: The PubMed database generated 31 relevant research articles. An additional list of 41 research articles were located using the Google Scholar, and other bibliographical sources. A total of 72 research articles were identified at this stage.

(ii) Screening Stage: Out of 72 research articles, 46 of them were excluded from the study because they were either published before 1985, or full-text research articles were not available, or only abstracts, and conference papers were available online. Therefore, after screening, a total of 26 research articles were generated at this stage.

(iii) Eligibility Stage: Three review articles and one research article based on sharing of personal experiences of AWS with clinician in dyadic fashion were also removed from the

list, generating then a total of 22 research articles. Only those research articles (n[1] = 22) that investigated either turn-taking behaviors, including verbal and/or non-verbal behaviors, or other aspects of turn-taking behaviors with those who stutter were considered in the study. These full-text research articles (n = 22) were then moved to the last stage of the selection process, i.e. Inclusion stage.

(iv) Inclusion Stage: Each of the 23 research articles at this stage was supposed to meet the inclusion/exclusion criteria of the study. Only those available full-text research articles were considered which were (i) available in English language, (ii) easily accessible, (iii) recruited either children or adults who stutter as research participants, (iv) published since 1985, and (v) focussed on "developmental" instead of "acquired" aspect of stuttering disorder. Those articles which failed to meet the inclusion criteria were excluded from the study.

3. Results & Discussion

A total of 22 relevant research articles addressing turn-taking behaviors during conversations in those who stutter since 1985 are being reported in this literature review. The selected research articles were initially classified into verbal (n = 21 research articles) and nonverbal/nonspeech behaviors (n = 1 research article). Each of the two categories was then further classified based on the type of research participants (CWS, or AWS) recruited in those studies. This classification, therefore, resulted into 18 research articles in the category of verbal behavior studies with CWS, 3 research articles in the category of verbal behavior studies with AWS, & 1 research article in the category of nonverbal/nonspeech behavior study with CWS. Research studies, examining both verbal (CWS & AWS) and nonverbal behaviors (CWS), were further scrutinized at the level of measurements followed in understanding the nature of interpersonal engagements between individuals. This resulted in categorizing research articles under the category of verbal behaviors studies measuring (a) language complexities (n = 2) and turn-taking behaviors (n = 1) in AWS; (b) clinical (n = 2) and non-clinical studies (n = 16) in CWS; and (c) secondary behaviors (n = 1) in CWS. The clinical studies discussed in this literature review examined the effectiveness of the Parent-Child Interaction Therapy (PCIT), & the effect of speech modelling by mothers in contributing to childhood stuttering. The non-clinical studies, on the other hand, examined varieties of paralinguistic behaviors, such as *Communicative Styles*, *Speaking Rates*, etc., and turn-taking behaviors, such as *Interruptions*, *Response Time Latencies* (RTL), etc. in CWS (refer, *Figure 3*). Three summary tables (Table 1, Table 2, & Table 3) are collapsed at the end of the article, providing important details such as methodology, sample recruitment, task applied, and main findings regarding the verbal, & nonverbal studies are reported in the *Appendix*.

[1] 'n' denotes number of research articles.

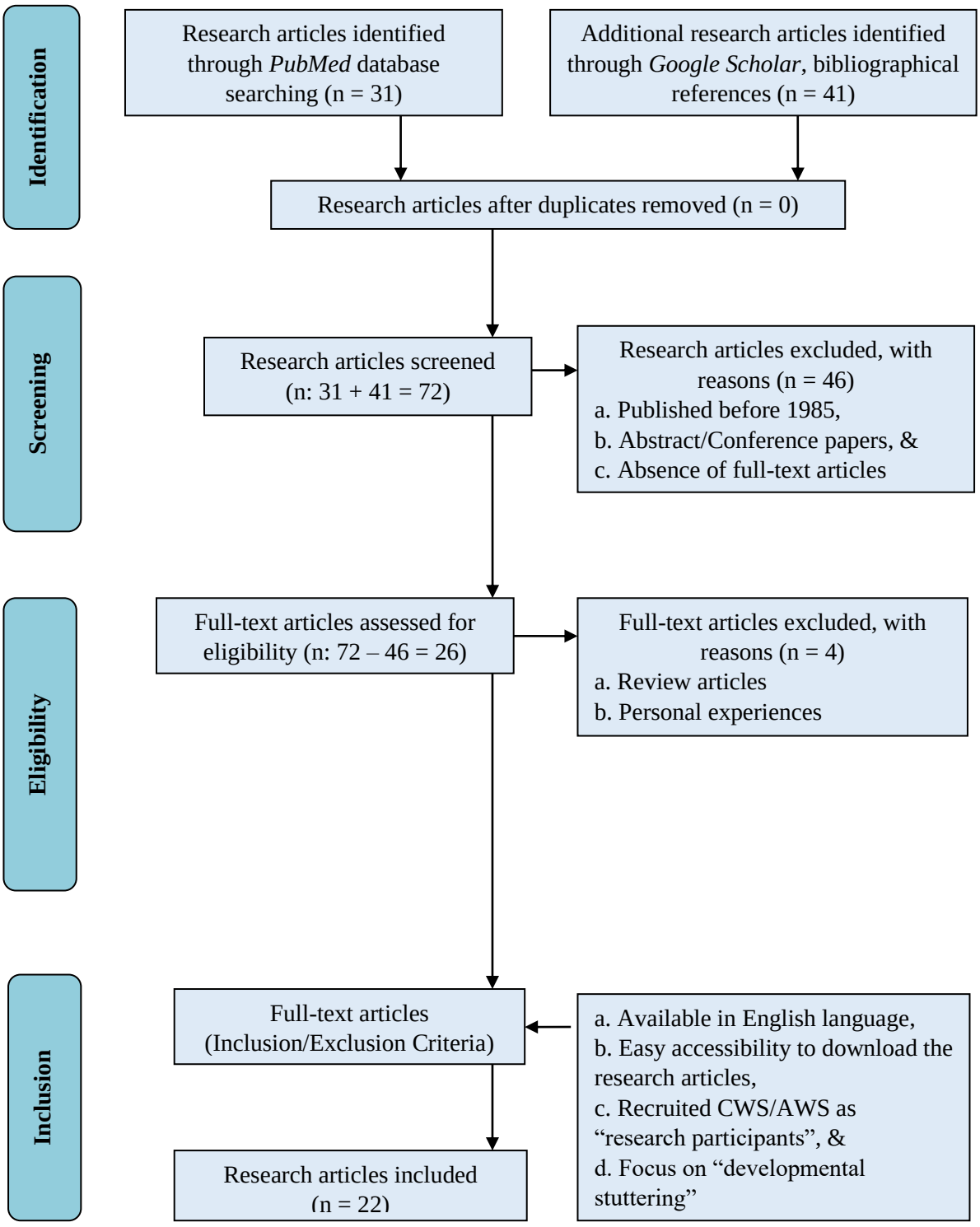

Figure 2: Flowchart Diagram of Systematic Selection of Research Articles

(**Adapted From**: Moher, D. Liberati, A., Tetzlaff, J., & Altman, D. G., The PRISMA Group. (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med, 6(7): e1000097. doi:10.1371/journal.pmed.1000097)

(a) Verbal Behavior Studies with Adults Who Stutter (AWS): There is no ambiguity in accepting that stuttering affects the functional communication abilities in day-today activities of those who stutter. This has been substantiated by several empirical evidences exhibiting the debilitating impact of the disorder on the lives of AWS (Craig, Blumgart, & Tran, 2009; Klein & Hood, 2004). In 2015 & 2016, Lee and group conducted two research studies with AWS to explore the communicative behavior in AWS (Lee et al., 2015; Lee, et al., 2016). The research group was precisely interested in examining the type of language being used by AWS by measuring their language productivity, language complexity, modality and appraisal produced during speaking situations. In the first study, the group recruited 20 AWS & 20 AWNS (Adults Who Do Not Stutter) sex and age matched participants to collect language samples from them. The language sample was analysed using the Systematic Analysis of Language Transcripts-New Zealand (SALT-NZ). Each participant had one-to-one conversation with the clinician on a range of conversational topics. The group reported that AWS produced less language output when compared with AWNS. They further added that AWS produced simple utterances, fewer modal operators, and more comment adjuncts than AWNS. In the following year, the group performed a pre- and post-treatment study with the same group of participants to examine following language measures: productivity, complexity, transitivity, modality, and appraisal. The group reported of finding an increase in the production of language output, and complexity; employing more modal operators, and appraisals during conversations. They also emphasized the significance of developing functional tools to be employed in the clinical and research settings to better understand the nature of communication restrictions in AWS in daily activities.

While, the previous two studies discussed the linguistic features exhibited by AWS during various speaking situations, another group, Freud et al. (2016), examined three selected verbal turn-taking behaviors (i.e. *Interruptions*, *Sentence*/*Word Completions*, and *Reinforcers*) exhibited by CPs during their interaction with speakers, i.e. AWS and AWNS. The study demonstrated that the turn-taking behaviors of CPs were similar towards adults both with and without stuttering disorder. It only differed significantly, however, in terms of CPs, using more verbal turn-taking behaviors (i.e. Interruptions, & Reinforcers) towards stuttered speech of AWS, as compared to fluent speech. The researchers reiterated that noticeable change in usage of turn-taking behaviors was observed when CPs were confronted with stuttered speech, and not with the person having stuttering disorder (For more details about the study, refer *Appendix: Table 1*).

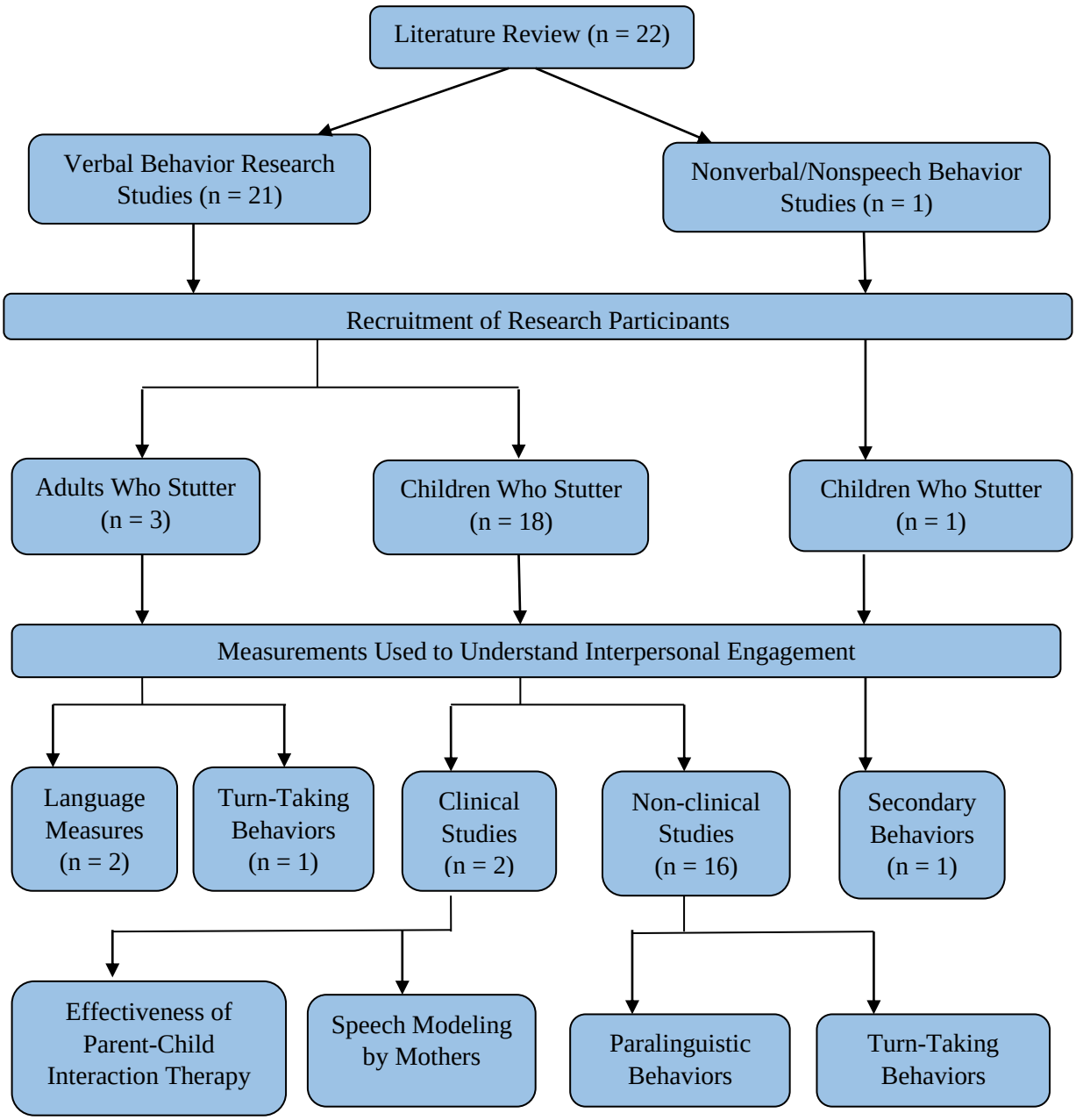

Figure 3: Flow Chart Diagram of Classification of Selected Research Articles

(b) Verbal Behavior Studies with Children Who Stutter (CWS): Research studies with respect to the examination of verbal communicative behavior in CWS have dominated this field for more than thirty years now. While the actual cause of the disorder is still unknown, the field has continued to offer various perspectives on understanding the elusive nature of this communication disorder. In this section of the literature review, the discussion has been subdivided into two parts, i.e. clinical studies, and non-clinical studies. The objective of this division is to understand the effectiveness of parent-child interaction in the domains of both outside and inside the clinic room.

Reappraisal of scientific literature shows that during the early stages of physical, emotional, and linguistic development, children tend to spend most of their times with caregiver or mother. Since, the onset of stuttering disorder (~ 2 years old) also coincides with the actual spurt of linguistic growth in young children (Bloodstein, 1995) that speech-language clinicians and researchers have consistently emphasized the significance of involving parents in the therapeutic sessions with children who stutter (Dehqan et al., 2008). For example, Stephenson-Opsal, & Ratner (1998) performed a pre-and post-instructional study with two mothers and their children with stuttering disorder to understand if the speaking rate of mothers have an effect on child's stuttering rates. The study collected conversational speech samples from the two dyads on five occasions. During the pre-instructional stage, the researchers asked the mothers to interact with their children normally. However, during the post-instructional stage, mothers were told to model their speech in such a way that they could produce slower speaking rates while talking to their children to reduce the stuttering behaviors. The findings of the study indicated that slower speaking rates of mothers resulted in the production of reduced stuttering rates in CWS. Another research study by Millard, Nicholas, & Cook (2008) was conducted with an aim to involve parents in the indirect therapeutic programs. The parent-child interaction therapy (PCIT) was designed to be conducted both at home and clinic. The study recruited six pre-schoolers who stuttered and their parents. The therapy provided substantial evidence in finding that four out of six children had significantly reduced stuttering with both parents after the therapy. The findings of the study underlined the significance of providing clinicians an option to consider this therapy as an indirect method of therapy especially for those children who are at the risk of developing persistent stuttering.

Non-clinical studies, on the other hand, have focused primarily on examining paralinguistic behaviors such as speaking rates, variously termed as *speech rates* or *communicative styles*, and articulatory rates; and turn-taking behaviors, such as interruptions, and response time latencies (RTL) in young children who stuttered while conversing with either of their parents in normal environment. Although, a wide range of research studies have been conducted since 1985 on understanding the mechanism of turns in young children who stutter, very little conclusive evidence has so far been produced. Of course, absence of consensus among the speech-language clinicians and researchers affects the efficacy of the therapy techniques. But it is also necessary to understand that the cause of the disorder is still not clear. For example, inconclusive evidence has been reported in explaining the role of altered parental speaking rate in the increase or decrease in stuttering events in young children who stutter (Kelly & Conture, 1992; Kloth et al., 1995; Meyers & Freeman, 1985a; Schulze & Johannsen, 1991; Stephenson-Opsal & Bernstein Ratner, 1988; Tetnowski et al., 2004; Yaruss & Conture, 1995); and shown repeated interruption of speech of children who stutter by their parents (Kelly & Conture, 1992; Meyers & Freeman, 1985b). In addition, some research studies have also reported mothers either displaying varying conversational speech styles when speaking to children who have either recovered from stuttering or continue to stutter (Kloth et al., 1995), or producing linguistic variabilities (Byrd, Coalson, &

Bush, 2010; Logan, 2003). Therefore, the contribution of parental speech behavior in the enhancement or diminution of stuttering events in children who stutter has remained controversial till this date. (For more details about the study, refer *Appendix: Table 2*).

(c) Nonverbal/Nonspeech Behavior Studies with Children Who Stutter (CWS): Communication does not encompass verbal components only. People do much more while talking with others such as moving their hands and arms, maintaining eye contact, making head movements and producing various facial expressions, to name a few. These behaviors, although nonverbal in nature, carry essential meaning and emotional component which is exchanged between a speaker, and a listener at regular intervals. In stuttering population, nonverbal behavior associated with stuttering disorder, also known as *accessory behaviors*, or *secondary behaviors*, or *physical concomitants*, has been of much interest to both the speech-language clinicians, and the researchers. However, there is substantial variability in the progression and the manifestation of these behaviors in those who stutter. Therefore, to understand the nature of these behaviors which are often produced during stuttering events objectively, it is necessary to measure these behaviors using a reliable and standardized research tool. In recent times, one such research tool, known as the *Facial Action Coding System* (FACS), is found to be objective, comprehensive, reliable, and standardized in nature. It is an anatomical-research tool. It is used for measuring human facial expressions by providing inference- and intention-free descriptions. This tool was developed by Paul Ekman and research group in 1978 (Ekman, 1982) and has been used extensively in other research studies (Camras, 1980; Bullock & Russell, 1985; Wiggers & Van Lieshout, 1985; Unzner & Schneider, 1990). It describes each observable facial movement based on *Action Unit* (AU). Conture & Kelly (1991) had implemented the FACS to measure the nonverbal/nonspeech behaviors associated with CWS and CWNS (Children Who Do Not Stutter) during instances of stuttering and fluent utterances. The researchers reported that young CWS produced significantly larger proportion of nonspeech behaviors during stuttered words than did CWNS. In addition, they also reported of finding a significant number of more left head turns, blinks, and raising of upper lip during instances of stuttering events by CWS than CWNS (Conture & Kelly, 1991, p. 1050). The findings of the study were found to corroborate with previous research studies (Schwartz & Conture, 1988; Schwartz, Zebrowski, & Conture, 1990) and the authors concluded that assessment of certain varieties of nonspeech behaviors in children can be used to differentiate them from fluent peers at the onset of stuttering disorder, with an emphasis on conducting further empirical investigations to support their claims (For more details about the study, refer *Appendix: Table 3*).

4. Conclusion

Although, to date, many research studies have continued their exploration in understanding the conversational dynamics between parents and CWS, very few research studies have actually focused on other features of turn-taking behaviors such as nonverbal behaviors in CWS, or verbal behavior in AWS. To our understanding, communication is a free flow of information between individuals. In this cyclic process, both verbal and

nonverbal modalities play an integral role in making the conversation successful. But, people with speech impairments tend to have communication difficulties in sending across their messages successfully. It is, therefore, necessary to study both the modalities in integration and, not in isolation, to better understand the negative impact the disorder has on the quality of life of people with stuttering disorder outside the clinical settings.

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Appendix

Table 1: Verbal Behavior Studies with Adults Who Stutter (AWS)

Study	Method	Sample	Task	Main Findings
Lee et al. (2015)	Conversational samples were transcribed using the SALT-NZ*** software.	Recruitment of age and sex-matched participants 20 AWS (*14M **6 F) (AWS Mean Age = 27.2 years) 20 AWNS (*14M **6F) (AWNS Mean Age = 27.4 years)	One-to-one conversation between the participants and the examiner (CP) for 10 minutes on open-ended topics was performed	Reported of finding less production of language output by AWS than AWNS. Verbal avoidance strategies used by AWS during stuttering events results in reduced language output. Also found to produce simpler utterances, fewer modal operators, and comment adjuncts than AWNS.
Freud et al. (2016)	Manual transcription of conversations	Speaker: *2M AWS (39 & 51 years) *2M AWNS (50 & 60 years) CP: *5M **5F (Mean Age = 24.6 years)	10 CPs conversed with 4 speakers generating a total of 40 conversations	CPs did not show significant differences on Turn-taking Behaviors (*Sentence/Word Completions*, *Interruptions*, & *Reinforcers*) when conversing with AWS & AWNS. CPs showed different TTBs to stuttered speech of AWS only.
Lee et al. (2016)	Conversational samples were transcribed using the SALT-NZ*** software	Same number of participants were recruited from Lee et al. (2015) study. Recruitment of age and sex-matched participants 20 AWS (*14M **6 F) (AWS Mean Age = 27.2 years) 20 AWNS (*14M **6F) (AWNS Mean Age = 27.4 years)	Similar task of data collection procedure was followed at pre- and post-treatment session at two treatment centers (NZ & USA). One-to-one conversation between the participants and the examiner (CP) for 10 minutes on open-ended topics	Reported of finding increase in utterance complexity after the treatment sessions in AWS. Treatment sessions facilitated AWS in the production of linguistically complex output. Relative increase in the usage of language appraisals post-treatment sessions.

*M = Male **F = Female ***SALT-NZ = Systematic Analysis of Language Transcripts-New Zealand

Table 2: Verbal Behavior Studies with Children Who Stutter (CWS)

Study	Method	Sample	Task	Main Findings
Meyers & Freeman (1985a)	Transcription of each conversation into English orthography by a trained coder	Total: ^24M Children-Mothers (CWS Age Range = 4 yrs, 0 months to 5 yrs, 11 months) *CG: 12 CWNS-Mothers **EG: 12 CWS-Mothers	10-minute of free play interaction between child (CWS/CWNS)–respective mothers	Increase in the stuttering severity rate in CWS leads to decrease in speech rate of CWS. Mothers tend to speak faster with their children who stutter when there is decrease in the speech rate of CWS.
Meyers & Freeman (1985b)	Transcription of each conversation into English orthography by a trained coder	Total: ^24M Children-Mothers (CWS Age Range = 4 yrs, 0 months to 5 yrs, 11 months) *CG: 12 CWNS-Mothers **EG: 12 CWS-Mothers	10-minute conversational sample between child (CWS/CWNS)-respective mother	Disfluent speeches produced by CWS were less interrupted by the mothers of CWS than mothers of CWNS. All mothers interrupted disfluent speech more often than fluent speech. Children tend to be disfluent when interrupted by mothers.
Stephenson-Opsal & Ratner (1988)	Transcription of 100 utterances in English orthography made.	^1M CWS-respective mother (CWS Age = 3 yr, 3 months) ^1M CWS-respective mother (CWS Age = 6 yr, 2 months)	2 dyads (CWS-mothers) observed on 5 occasions at their respective place for 10 weeks. Pre-instruction Stage: 10-minute free play activities on each occasion between CWS-mother. Post-instruction Stage: Modeled conversations were used by mothers with their CWS.	Slower maternal speech rate did not slow down the speech rate of CWS.

Kelly & Conture (1992)	Transcription of each mother-child pair conversation into English orthography by the first author	^13M CWS-respective mothers (CWS Mean Age = 4:0) ^13M CWNS-respective mothers (CWS Mean Age = 4:0)	Audio-video recording of child (CWS/CWNS)-respective mother conversational dyad for approximately 30-35 minutes.	No significant differences reported on speaking rates, response time latencies, interrupting behaviors between CWS-CWNS. Significantly faster speech rates of mothers of CWNS than either of the talker groups (CWS-CWNS). Strong positive correlation reported between stuttering severity index of CWS and overlapping duration of their mother's simultalk.
Weiss & Zebrowski (1992)	Transcription of parent-child conversations orthographically.	8 CWS - 8 respective parent dyads 8 CWS (^5M ^^3F) 8 respective parents (2 Fathers, 6 Mothers) (CWS Age Range = 4 yrs, 0 months to 10 yrs, 7 months)	Video recording of parent-child pair's conversation of 10-minutes.	Responses made by CWS contained significantly less disfluencies in response to the questions directed by parents. Irrespective of the production of questions or assertions, longer and complex utterances by CWS were predicted to contain more disfluencies than otherwise. Parents favored more question types of responses than assertions to lower the levels of demand in conversations.
Kelly (1994)	Transcription of each father-child dyadic conversations	^11M CWS-respective fathers (CWS Mean Age = 5:1) ^11M CWNS-respective fathers (CWNS Mean Age = 5:1)	Video recording of approximately 45- minute of free play interaction between child (CWS/CWNS)-respective father spontaneous conversation dyad	Fathers produced faster speaking rates, higher frequencies of interruptions, & shorter response time latencies than their sons (CWS-CWNS). No significant differences reported

				between fathers of CWS & fathers of CWNS on paralinguistic behaviors. No significant differences reported between CWS & CWNS on paralinguistic behaviors. Significant positive correlation reported between the Stuttering Severity Index (SSI) scores of CWS & dyadic speaking rates of CWS & their fathers. Identified potential differences on paralinguistic behaviors between fathers and mothers in their approach towards interaction with their children.
Winslow & Guitar (1994)	Transcription of dinner-time conversations conducted under different conditions of structured versus unstructured turn-taking	^1M CWS (5-year-old) Single-subject design	Tape recording of dinner-time conversations	Findings indicated that the rate of disfluencies decreased when structured conversational turn-taking conditions were implemented whereas, the rate of disfluencies increases when structured conversational turn-taking conditions were not implemented.
Kloth et al. (1995)	Transcription of each mother-child pair conversation	93 children = (^45M ^^48F) (Mean Age = 39 months) Shortlisted participants: 26 CWS-Mothers 67 CWNS-Mothers	30-minute free play interaction between mother & child	Communicative style and speaking rate of mothers of CWNS does not contribute to the development of stuttering.

LaSalle & Conture (1995)	Transcription of children's speech in English orthography.	30 CWS (^24M ^^6F) (Mean Age = 51.2 months) 30 CWNS (^24M ^^6F) (Mean Age = 51.5 months)	Audio-video recording of approx. 30-35 minutes of conversations between mother-child dyad.	Speech disfluencies produced by CWS was found to be more than speech disfluencies produced by CWNS. More number of phrase repetitions was produced by CWS. Consistent findings with previous research works. Also, reported of finding significantly greater number of particular sequence of disfluencies than other combinations in CWS.
Ryan (2000)	Transcription of 10-minute conversation was conducted by trained coder.	20 CWS (^15M ^^5F)-respective mothers (CWS Mean Age = 4 years, 4 months) 20 CWNS (^15M ^^5F)-respective mothers (CWNS Mean Age = 4 years, 5 months)	Two 10-minute conversational speech samples collected from CWS/CWNS-respective mother dyad. First 10-minute conversation took place when the mother and the child conversed while playing Lego. Second 10-minute conversation took place when the mother and the child conversed without playing with any toys.	Speaking rates of both mothers and CWS differed while interrupting behavior did not prove to be a contributing factor in evoking stuttering events. Conversational statements produced by CWS were found to be accompanied with stuttering.
Miles & Ratner (2001)	Transcription of each conversational speech using the Codes for the Human Analysis of Transcripts (CHAT)	12 CWS (^10M ^^2F)-respective mother (CWS Mean Age = 36.7 months) 12 CWNS (^10M ^^2F)-	Audio-video recording of dyadic conversations between mother-respective CWS	Did not find convincing evidence to support the claim that CWS mothers differed from CWNS mothers. Both mothers of CWS & CWNS

	Program conventions	respective mother (CWNS Mean Age = 35.5. months)		were equally sensitive to the linguistic abilities of their children. CWS did not perform well when compared with CWNS on standardized measures indicating slower progress in language learning skills.
Logan (2003)	Orthographical transcription of each conversational speech	15 CWS (^14M ^^1F)-respective parent (CWS Mean Age = 48 months) 15 CWNS (^14M ^^1F)-respective parent (CWNS Mean Age = 49 months)	Video recording of approx. 25-mintues of conversation between CWS-respective mother.	Reported of finding multiple utterances-turns produced by CWS to be linguistically longer, more complex, & fulfilling language assertive functions than single utterances-turns. Production of multiple utterances evokes long and complex utterances in CWS. Researcher emphasized the significance of considering conversational turn length as an important variable during clinical evaluation & assessment in CWS.
Tetnowski et al. (2004)	Data analyzed using the Computerized Speech Research Environment (CSRE)	Father AWS (M, 40 years old) Daughter CWS (2.7 years old, F)	Data collected during diagnostic sessions at home and in-clinic for over 8 months. Interaction between the father (AWS), daughter (CWS), & 2 clinicians.	Father (AWS) stuttered less when used Child-Directed Speech (CDS) with his daughter.
Sargent, Robb, & Zebrowski	Speech samples collected during dyadic	Group 1: 5 CWS-5 PCWS (Parent of Children Who	Audio-video recording of spontaneous conversation	PCWS differed from PCWNS on speaking rate. PCWS produced

(2006)	conversations were acoustically analyzed. Speaking rate, articulatory rate, & pauses were measured according to Robb et al. (2003) protocol	Stutter) Average Stuttering Severity Rate (CWS) = 9 % CWS = ^3M ^^2F CWS Mean Age = 4 years, 4 months PCWS = 3 Mothers 2 Fathers Group 2: 5 CWNS-5 PCWNS (Parent of Children Who Do Not Stutter) CWNS = ^3M ^^2F CWNS Mean Age = 4 years, 5 months PCWNS = 4 Mothers 1 Father	between one of the parents-respective children.	slower speaking rate than PCWNS. No statistical differences between PCWS & PCWNS reported on articulation rate. But, found to have different pausing pattern between the two groups. Consistent with previous studies, CWS had slower speaking rate than CWNS. Speaking rates of parent-child did not differ significantly between the two groups.
Dehqan et al. (2008)	Transcription of each conversational sample was orthographically conducted by the first author	35 pairs of mothers-CWS CWS (^29M ^^6F) (CWS Mean Age = 8.5 years)	Audio-video recording of approx. 15-minutes of dyadic conversation between mother-respective CWS on action pictures	As the speaking rate of mothers of CWS increases, the stuttering severity of CWS also increases. Increase in stuttering in CWS led to decrease in speaking rate of CWS. Emphasized the significance of involving mothers as main communication partner during therapeutic process for CWS.
Millard, Nicholas, & Cook (2008)	Orthographical transcription of 15-minutes of the later part of the video recording	6 CWS (^4M ^^2F)-respective parents (CWS Age Range = 3 years, 3 months to 4 years, 10 months)	Video recording of free play interaction between CWS & respective parent for 20-minutes. Multiple child speech data were collected at pre- (one recording/week for 6 weeks);	Out of 6 CWS participants, 4 of them were reported of producing significantly less stuttering with their parents at the end of the therapy sessions. This therapeutic technique seems to reduce stuttering in preschoolers

			during (one recording/week for 12 weeks); and post-therapy sessions (one recording/month).	CWS. Adds to the growing evidence of providing structured intervention with CWS.
Byrd, Coalson, & Bush (2010)	Transcription of each mother-child dyadic conversation	15 CWS (Mean Age Range = 2 years, 4 months to 7 years, 10 months)-respective mothers	Video recording of approx. 15-minute conversation between CWS & their respective mothers	Language length and complexity contributes to speech disfluency. Difficulties in maintaining speech fluency is facilitated by the production of assertive speech acts than responsive speech acts by AWS.
Byrd, Logan, & Gilliam (2012)	Using the Systematic Analysis of Language Transcripts (SALT), conversational speech sample was transcribed by a trained coder.	22 CWS (Divided into younger and older groups) Older CWS: Mean Age = 9 years, 5 months CWS = ^10M ^^1F Younger CWS: Mean Age = 6 years, 11 months CWS = ^9M ^^2F 22 CWNS (Divided into younger and older groups) Older CWNS: Mean Age = 9 years, 6 months CWNS = ^10M ^^1F Younger CWNS: Mean Age = 6 years, 11 months CWNS = ^9M ^^2F	Structured conversation and narration sessions were performed between the examiner and children (CWS/CWNS)	During narration, CWS produced more instances of stuttering like disfluencies (SLDs) than during conversation sessions. In comparison with older CWS, younger CWS produced a greater number of normal disfluencies in conversational sample. Acknowledged the incorporation of narration-based sessions in the assessment of stuttering disfluencies in CWS.

*CG = Control Group **EG = Experimental Group ^M = Male ^^F = Female

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Table 3: Nonverbal/Nonspeech Behavior Study with Children Who Stutter (CWS)

Study	Method	Sample	Task	Main Findings
Conture & Kelly (1991)	Frame-by-Frame analysis of audio-video recording	CWS (*28M **2F)-respective mothers (CWS Age = 54 months) CWNS (*28M **2F)-respective mothers (CWNS Age = 54 months)	Audio-Video recording of 30-minute semi-structured child-mother conversations	Certain types of non-speech behaviors in children can be indicative of presence of stuttering disorder. Presence of certain non-speech behaviors may be associated with cognitive, emotional, linguistic, & physical events of childhood stuttering.

*M = Male **F = Female