ABSTRACT

Title of Thesis: RETHINKING RARITY: ASSESSING CLINICAL REPORTS OF WORD FINAL DISFLUENCY (WFD)

Lily Trossman, Master of Arts, 2026

Thesis directed by: Dr. Nan Bernstein Ratner
Department of Hearing and Speech Sciences

Existing literature highlights that word-final disfluency (WFD), a type of atypical dysfluency involving final sound/syllable repetition, is distinct from developmental stuttering. However, current research is limited primarily to case studies, restricting the generalizability of those findings. The purpose of this study is to characterize speech language pathologists' knowledge, document current assessment and intervention practices, and highlight both the reported frequency of WFD and uncertainty in its management. A total of 496 speech-language pathologists in the United States participated in an online survey consisting of multiple-choice and open-ended response opportunities. A cross-tabulation analysis of quantitative data showed that among the wide range of treatment approaches clinicians have tried, none stood out as more successful than others. Qualitative reports were analyzed with a reflexive thematic analysis. Major themes included co-existing conditions, linguistic behaviors, and nonlinguistic behaviors commonly reported alongside WFD. Understanding current SLP practices, and where large knowledge gaps exist can inform future research that supports the development of evidence-based practices for individuals with WFD.

Key Words: Atypical disfluency, Word-final disfluency, Autism, ADHD, Reflexive Thematic analysis

RETHINKING RARITY: ASSESSING CLINICAL REPORTS OF WORD FINAL DISFLUENCY (WFD)

by

Lily Trossman

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Advisory Committee:
Dr. Nan Bernstein Ratner
Clinical Professor Emeritus Vivian Sisskin
Dr. Shelley Brundage

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Introduction

Speech-language pathologists are trained to rely on research to guide diagnosis and treatment. But what happens when that evidence is unclear, limited, or missing altogether? In a field grounded in evidence-based practice, this lack of clarity can disrupt both diagnosis and intervention. Such is the case with word-final disfluency (WFD), an under-researched phenomenon that leaves many clinicians without clear guidance on how to interpret or treat what they observe.

Given that WFD has been documented in case studies and small populations but not in controlled trials or larger cohort studies, this study is an attempt to understand what clinicians are observing, as well as what they are doing to assess and treat WFD on a wider scale. Importantly, patterns may also occur in what is unknown or not understood. What is the state of SLPs' knowledge of WFD? In what areas is there clinician consensus about approaches to WFD, and where is there a need for further clarification and future research? More broadly, what do clinicians do when they do not know what to do?

This thesis takes a descriptive approach to develop an understanding of current clinical practices surrounding WFD by surveying speech-pathologists on core clinical experiences: client profiles, types of assessment, types of intervention, and success of intervention.

1. **Client Profile:** In cases of WFD, are there commonly reported linguistic behaviors? If so, are those characteristics related to a co-occurring diagnosis or consistent across co-occurring diagnoses? What diagnoses, if any, commonly co-occur with WFD?
2. **Assessment:** How are clinicians assessing reported cases of WFD? A major limitation of research in this area of research is an established protocol for assessment of WFD. Should we use standardized stuttering assessments despite emerging differences between

WFD and developmental stuttering? Understanding how clinicians are approaching assessment is essential for understanding why research in this area is needed for effective treatment and what, if any, reported approaches should be empirically studied in the future.

3. **Treatment:** How are clinicians treating cases of WFD, and what, if any, treatment approaches are they reporting to be successful? Like assessment, research on evidence-based treatment of WFD is limited. Do clinician reports of treatment align with this limited research, or are clinicians struggling to find effective treatments? Should treatment differ depending on co-occurring diagnosis? Examining reported treatment attempts will inform and stimulate needed research on this increasingly common form of disfluency.

Background

As stated in the *Handbook on Stuttering*, "In order to quantify a behavior one must know what - and what not - to count" (Bloodstein et al, 2021). The role of defined stutter-like disfluencies (SLDs) and other disfluencies (ODs) in distinguishing types of disfluencies relies on the large body of research that contributed to the definitions of each. Accurate definitions of SLDs and ODs are not just crucial to making an accurate diagnosis, but also paramount to how therapy is approached. In comparison to SLDs and ODs, atypical disfluencies (ADs) occur in word-medial and word-final positions, and are generally less defined in research. ADs characterize the linguistic behaviors of "children who display impaired fluency and stutter like behaviors but who differ in their profiles from those seen in developmental stuttering" (Sisskin & Wasilus, 2014, p. 145). ADs are also often associated with acquired neurogenic conditions, such as brain lesions from surgery or traumatic brain injury (Canter, 1971), as well as neurodegenerative conditions like Parkinson's (Reif & Goberman, 2021; Gooch et al., 2023; Goberman et al., 2008). However, there is also documentation of developmental word final disfluencies (WFD), a type of AD, in those who are neurotypical or who hold other diagnoses such as autism (ASD), attention-deficit/hyperactivity disorder (ADHD), and learning differences (Eichorn & Donnan, 2021; Evans & Owens, 2019; McAllister & Kingston, 2005; Sisskin & Wasilus, 2024; Stansfield, 1995).

Across existing studies, numerous researchers have suggested diverse causes for word final disfluency. Is the etiology related to primary diagnosis, atypical language development, developmental stuttering, or a factor yet to be discovered? All existing claims about why WFD occurs are guided by individual case studies and are therefore not easily generalizable.

Moreover, most existing claims regarding etiology differ quite widely – researchers postulate that phonological features, cognitive processing demands, language formulation difficulty, stress, and co-existing conditions co-morbid with stuttering may cause WFD. For example, Garbarino et al. (2022) analyzed four speech samples of an adolescent with ASD to determine potential triggers of WFD, and found that WFDs occurred more when syntactic planning demands were high. Alternatively, Pirinen et al. (2023) attribute WFD to "by-products of the cognitive processing demands" (Pirinen et al, 2023, p. 5) of social challenges. Social challenges have been shown to impose a high cognitive load for people with ASD, (Loukusa, 2021), which may in turn increase WFD. Additional theories about the etiology of WFD can be found in the Appendix.

While these theories may be individually compelling within specific case accounts, they are premature given the type and amount of existing research. There is no established definition of WFD and its behaviors, so there is not yet a solid basis of data from which to substantiate any etiological theory. Conclusions drawn from these case studies are valuable for informing future research and adding to the research pool that is beginning to describe the behaviors of WFD as opposed to creating etiological theories. A main aim of the present study is to similarly stimulate future research on classification, assessment, and treatment that will supply the data needed to support theory development.

1. Defining Word-Final Disfluency - A Comparison to Stutter-Like Disfluencies

In investigating WFD, researchers have explored the general characteristics (Sisskin, 2006; Teitler et al., 2016), temporal aspects (Sutkowski et. al., 2023), and potential causal factors (Garbarino et al, 2022). According to Sisskin & Wasilus (2024), WFDs include repetitions of the final rhyme of a whole or partial syllable and prolongations of word-medial or word-final sounds. Examples of word-final disfluencies (WFDs) include "food-d-d-d, "water-er," and "da—

addy." Sisskin & Wasilus (2014) also include within-word syllable repetitions (e.g., "ba-a-a-al"), filled pauses within words (e.g., "ma-uh-ple), and exhalations akin to an /h/ sound (e.g., "see-hee").

Along with determining characteristics of WFDs, researchers have begun to compare characteristics of WFDs to those of stutter-like disfluencies (SLDs) through case studies. Overall, WFDs and SLDs share the characteristics of being part-word repetitions and prolongations, but differ based on their word level location. Healy et al. (2015) analyzed the speech of a child with ASD to determine how utterance complexity, length, topic, and initiation impacted the percentage of WFDs produced. WFDs occurred more frequently in complex utterances, in longer utterances, in topics of high interest to the participant, and in utterances that were initiated by the participant themself as opposed to the conversation partner. Similar to SLDs, the frequency of WFD increases in people who stutter when utterances are longer (Wagovich & Hall, 2017) and more complex (Ratner & Sih, 1987; Yaruss, 1999). Research surrounding the impact of utterance length and complexity on frequency of disfluency in stuttering is more robust and has begun to parse length and complexity as two distinct variables. Because research on how these variables relate to WFD is limited, these two variables have not been detangled. Healy et al. (2015) acknowledge that their study does not isolate complexity and length (e.g., longer utterances may also be more complex).

Another similarity between WFDs and SLDs is that they both occur more frequently on content words (Howell et al, 1999; Dayalu et al, 2002; Evans & Owens, 2019; Garbarino et al, 2022). Dayalu et al. (2002) posit that for stuttering, this increase of disfluency on content words is due to word frequency - content words are more diverse, therefore individual content words

are used less frequently as compared to function words which are repeated often. While this may also be the reasoning for WFDs, there is no confirming research.

Two major differences that separate WFDs from SLDs and may suggest that WFDs are not sub-features of developmental stuttering are awareness and tension. People who stutter are aware of the disfluencies they produce, and that often leads to feelings of shame, embarrassment, anxiety, or other emotional responses (Bloodstein et al, 2021). These emotions can give way to avoidance behaviors, where the person anticipates a moment of stuttering and uses a coping strategy to prevent that feared moment (Plexico et al, 2009). This cognitive and affective response has not been consistently documented in cases of WFD.

In fact, researchers have primarily recorded a lack of awareness of WFD in neurotypical participants, as well as participants with ASD and ADHD (Teitler et al, 2016; Scaler Scott et al., 2007; Van Borsel et al., 2005; Evans & Owens, 2019; McAllister & Kingston, 2005; Sisskin & Wasilus 2024). While the participant in Sisskin & Wasilus (2014) demonstrated an awareness that people found his speech atypical and reported a mild-moderate life impact, he was not specifically aware of his WFDs. Similarly, Eichorn and Donnan (2021) documented a participant who was "quite aware" (p. 972) of his stuttering and reported mild-moderate perceived life impact based on the *OASES*, but did not report strong negative reactions or decreased quality of life because of his WFDs. In their 2024 study, Sisskin & Wasilus reported that 15/20 participants were unaware of their disfluencies, and the 5 who were aware were made aware by parents. In cases where WFD co-occurs with SLDs, negative emotions are more often reported (Scaler Scott et al, 2014; Lebrun & Van Borsel, 1990). Based on the published research regarding awareness of and life impact due to WFDs, it is unclear whether negative affect may be associated with WFDs alone, or only when co-occurring with stuttering. Further understanding this relationship

between awareness, life impact, and disfluency is pivotal for treatment, as stuttering treatment focuses largely on life impact (Sisskin & Goldstein, 2022; Sisskin, 2018).

Another difference between WFDs and SLDs is tension. SLDs that characterize stuttering are accompanied by muscle tension in the jaw, front of mouth, front of throat, chest, or abdomen (Bloodstein et al, 2021). This tension can contribute to increased life impact of stuttering and is often a focus in treatment. In contrast, case studies of WFD do not report any accompanying tension, even during pauses similar to blocks (Eichorn & Donnan, 2021; Teitler et al., 2016; Evans & Owens, 2019; McAllister & Kingston, 2005; Humphrey & Van Borsel, 2001). Like the case with awareness, it seems that SLDs and WFDs are at odds. Many studies posit that because of these differences in tension and awareness, WFDs are distinct from stuttering (Teitler et al, 2016), while others continue to attribute WFDs and SLDs to similar causes (Stansfield, 1995; McAllister & Kingston, 2005). Current research to further investigate these discrepancies focuses on case studies of individuals or small groups, many of whom have co-occurring diagnoses.

2. Where Are We Now - WFD and ASD

Of these co-occurring diagnoses, ASD is commonly investigated in relation to WFD (Healy et al, 2015; Scaler Scott et al, 2014; Pirinen et al, 2023; Plexico et al, 2010; Sisskin & Wasilus, 2014; Sisskin & Wasilus, 2024). The connection between WFD and ASD in the literature has led researchers like Plexico et al. (2010) to ask whether WFD is a marker that can contribute to an ASD diagnosis, or if WFDs are simply present in a subset of people with ASD. Without larger scale sample sizes, this question cannot be answered.

Pirinen et al. (2023) focused on parsing differences between WFDs and stuttering in individuals with ASD, as well as using knowledge about the etiology of stuttering to investigate that of WFD. The study investigated disfluencies (i.e., WFDs, SLDs, TDs/ODs) in 32 adults with

ASD and an aged matched, typical control group. Using background knowledge on how cognitive load and social challenges often increase disfluency in people who stutter (Sisskin, 2018; Ratner & Sih, 1987; Yaruss, 1999), Pirinen et al. measured disfluencies in participant response following the presentation of a social scenario. They found that all types of WFDs were higher in the ASD group as compared to the control group, and 63% of adults with ASD produced both WFDs and SLDs.

In a study that included school-aged children with ASD, who stutter, and with no diagnosis, Scaler Scott et al. (2014) similarly found that WFDs were highest in the ASD group as compared to the group of children who stuttered and those with no additional diagnosis. With that said, there was no statistical difference between the frequency of WFDs in those with ASD and those who stuttered. Both groups also demonstrated SLDs and ODs, as well as varying levels of life impact. This led the authors to conclude that regardless of ASD or stuttering diagnosis, an individual's treatment plan should depend on life impact. Sisskin and Wasilus (2014) similarly emphasize how life impact should inform an intervention plan in their treatment case study for a child with ASD and WFD. In discussing their proposed treatment protocol that centers around identification and suppression of the behavior, Sisskin and Wasilus recognize that this protocol is at odds with that of stuttering intervention. Thus, treatment for WFD must be preceded by a "careful differential evaluation" (Sisskin & Wasilus, 2014, p. 151) to distinguish WFD from stuttering. An accurate differential diagnosis can prevent an individual from receiving inappropriate treatment.

Other studies have similarly applied background knowledge about stuttering etiology to create their investigation of WFD. Garbarino et al. (2022) analyzed four speech samples of an adolescent with ASD to determine potential causes of WFD, and noted that WFDs occurred

more at the middle and end of utterances. In this case, the repetition may provide speakers with a buffer time to plan further utterances, which differs from stuttering. One new hypothesis from Garbarino et al. (2022) is that WFDs come from an over-reliance on one's external monitoring channel and an under activation of the internal monitoring channel. Internal monitoring allows us to correct some errors before or shortly after they are produced; external monitoring is monitoring that we do after we produce the word, and it often requires a 200 ms delay (Hartsuiker & Kolk, 2001). Like previously mentioned studies, the present study was limited in size and the conclusions drawn must be corroborated with further studies and larger sample sizes.

3. Where Are We Now - WFD and ADHD

In addition to ASD and stuttering, researchers are investigating WFD with a co-occurring diagnosis of ADHD (Evans & Owens, 2019; Scaler Scott et al, 2007**;** Humphrey & Van Borsel, 2001**)**. It should be noted that much of the research on ADHD and disfluency does not mention WFD (Lee et al, 2017; Jang & Shin, 2021; Hannah, 2001) and the case studies discussed are not generalizable. Evans and Owens (2019) case study on an adult with ADHD measured speaking tasks with varying levels of cognitive, linguistic, and social demands. A total of 17% of the participant's disfluencies were WFDs. Evans and Owens (2019) found WFDs to occur more on content words and in the utterance final position, which may be explained by the previously discussed findings of Garbarino et al. (2022).

Evans and Owens (2019) also reported a unique pattern of WFD in which the final repetition included the final sound of the previous word and the target word (e.g., "this one-sone"). It is important to note that previous research has also shown that ADHD medication can influence stuttering in some individuals (Burd & Kebeshian, 1991; Donaher, Healey, & Zobell,

2009). The individual in Evans and Owens (2019) demonstrated more WFDs during speaking tasks when he was taking his medication in comparison to speaking tasks when he was not, although he demonstrated WFD under both circumstances. Again, patterns from this case study cannot be generalized to the larger diverse population that has ADHD and exhibits WFD.

4. Where Are We Now - WFD and Typically Developing Children

Finally, there have been minimal amounts of research on WFD in typically developing children (McAllister & Kingston, 2005; Eichorn & Donnan, 2021; Teitler et al, 2016; Sisskin & Wasilus 2024). Both McCallister and Kingston (2005) and Eichorn and Donnan (2021) identified characteristics of WFDs in three typically developing children that are similar to the characteristics described in people with ASD and ADHD. In their group of 20 participants, Sisskin & Wasilus (2024) recorded 9 children with WFD and no additional "medical or developmental concerns" (Sisskin &Wasilus, 2024, p. 4). These characteristics reported in typically developing children include a lack of tension and avoidance behaviors, more WFD on content words over function words, occurrence of at least some accompanying SLDs, and a pause between the target word and repeated word fragment like that described in Garbarino et al. (2022).

One difference between the typically developing children described in McAllister and Kingston (2005) is that WFDs occurred most in sentence-medial positions, whereas other studies have described it occurring in sentence-final position (Evans and Owens, 2019). Another marked difference in Eichorn and Donnan (2021) is that the subject noted an awareness of the WFD, which has not been described in any of the cases studies with people with ASD, ADHD, intellectual disability, or other typically developing children (McAllister and Kingston, 2005; Van Borsel, 2005). As discussed previously, no one case report can generalize. This also

highlights how awareness and the resulting life impact must be assessed in each individual to determine the appropriate intervention. Sisskin and Wasilus (2024) emphasize that both the decision to treat WFD and the treatment course must depend on the individual, their family, and their motivation for treatment.

5. The Current Study

In summation, existing research has confirmed that WFDs can exist independently or alongside additional diagnoses, such as ASD, ADHD, and stuttering. Patterns within this research have also highlighted marked differences between SLDs and WFD, including temporal presentation (Sutkowski et. al., 2023), word position (Sisskin & Wasilus, 2024), awareness, and presence of tension (Teitler et al., 2016). Although these differences have been widely explored through case studies and quasi experimental research, there is a lack of randomized control trials to back an evidence-based consensus on the characteristics of WFD, how it interacts with co-occurring diagnoses, and how to effectively assess and treat it. The questions of whether it typically co-occurs with these additional diagnoses and if those diagnoses are related to its etiology have yet to be studied on a larger scale. Therefore, the purpose of the present investigation is to use survey data from speech language pathologists to identify areas for future research by examining the following questions:

1. In cases of WFD, are there commonly reported characteristics? If so, are those characteristics related to a co-occurring diagnosis or consistent across co-occurring diagnoses?
2. How are clinicians assessing their reported cases of WFD? Is there a collective, clinical approach or reports of variable methods?
3. How are clinicians treating cases of WFD? Is there a pattern in approach or reports of variable methods?

4. What treatment approaches are clinicians reporting to be successful? Do clinician reports of treatment align with published accounts of therapy?
5. Is there a correlation between type of treatment, co-occurring diagnosis, and treatment success? Should treatment differ depending on co-occurring diagnosis?

Methods

Survey Format

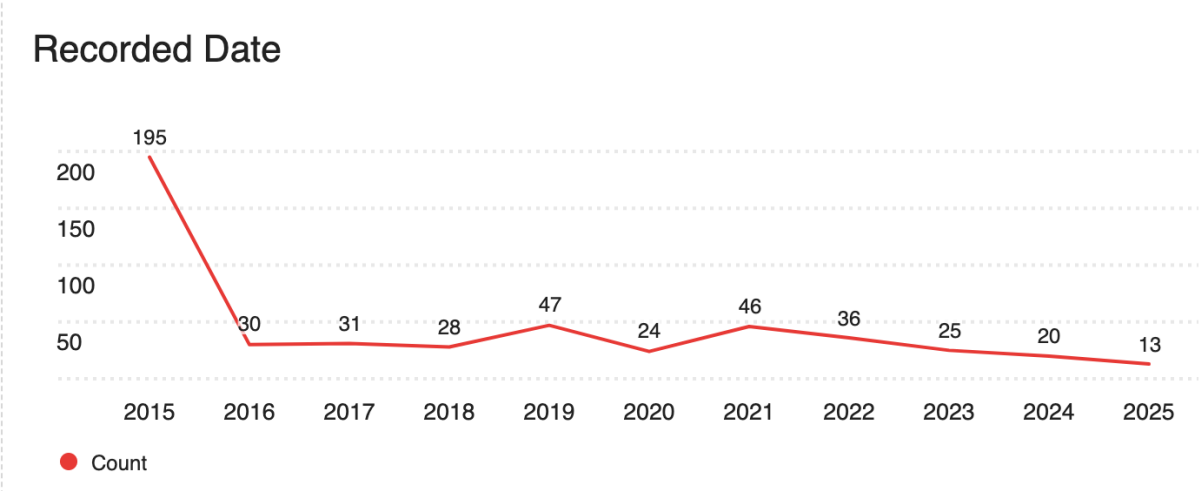
The present study was conducted as an exploratory analysis of a survey that included five multiple choice questions and three opportunities for open responses. The survey was completed digitally using Qualtrics data collection software. Respondents elected to complete the survey by going to a link. Thus, sampling was not conducted, and a survey response rate cannot be determined. The survey link was embedded in an article on atypical disfluency in a newsletter hosted by The Stuttering Foundation of America (SFA) and openly accessible to speech-language pathologists across the United States at https://www.stutteringhelp.org/My-client-isnt-fluent-but-is-it-stuttering. The survey and study protocol were approved by the University of Maryland Institutional Research Board.

Participants

Participants were 496 practicing or retired speech-language pathologists from across the United States who voluntarily took the survey between February 2015 and May 2025. Data collection was frozen at the ten-year mark of the survey's first availability. Because the survey was designed exploratory and qualitative, the number of final participants was based on how many people voluntarily took the survey and responded to all questions. All participants took the survey voluntarily and were not compensated for their participation. For any respondent who was not a habitual reader of the SFA newsletter, we presume that all other participants found the survey site following an Internet search for information on word-final disfluency. Almost 200 responses came within the first year of the survey's availability. Following that first year, a stream of between 20-47 responses were recorded each succeeding year, demonstrating that clinician concern has remained steady despite

evolving research. See Figure 1 for responses collected over time. Participants remained anonymous to the researchers. The study purpose as portrayed to participants was to help researchers "explore the dimensions and characteristics of clients presenting with atypical disfluency."

Figure 1: Survey responses over time



Inclusion/Exclusion Criteria

In order to be included in the final analysis, participants had to have indicated that they had seen at least one neurotypical client or client with ASD who demonstrated WFDs (i.e., Question 1 choices 3 or 4). They may have also indicated that they have seen or were seeing "Another type of disfluency profile," (i.e., Question 1 choice 6) and then have described that profile in the following response write-in section. write-in response fit into one of the following categories, it was maintained for analysis:

1. Word final repetition of sound (e.g., "play-ay-ay)
2. Word final repetition of syllable coda (e.g., "smile-ile-ile")
3. Word final prolongations (e.g., "miss-ss-ss-ss")

4. Word final exhalations (e.g., “see-hee”)

A total of 50 respondents were excluded for not meeting inclusion criteria. Reasons for exclusion included description of acquired disfluency due to a neurogenic condition (e.g., traumatic brain injury, Parkinson’s) or psychological trauma (e.g., PTSD), reporting symptoms related only to cluttering, or mentioning only a language-based disfluency. Acquired disfluencies were excluded because the focus of the study is WFD in child speakers. Examples of eliminated responses can be found below in Table 1. The process of eliminating these data points was completed separately by two individuals to promote reliability. Inter-rater reliability was 100%.

Table 1: Eliminated Survey Response Examples

Question Number	Response	Language Based Disfluency	Neurogenic Condition/ Acquired Disfluency	Characteristics of Stuttering/ Cluttering
2	“Trauma experiences- being in foster care for a significant amount of his life, not seeing siblings, moving to multiple foster homes.”		X	
2	“Repetition of the /n/ sound before initiating all utterances no matter what sound they start with also blocks so severe the teen stops walking, breathing, blinking.”			X
2	“Onset of notable phrasal repetitions			X

	(initial and medial mostly) in grade 1. Possible secondary behaviours of mouth opening and blinking."			
2	"Language organization issues, incoordination of breath support for speech, sound sequencing issues both in speaking and spelling."	X		

Survey Questions

Table 2: Survey Questions

Question	Provided Options	Number of Responses
In the past 3 years, have you seen a client with any of the following unusual fluency profiles that do not appear to be developmental stuttering? (you may select multiple answers below)	- Child with non-struggled, stutter-like behaviors that seem to emerge under language formulation problems - Adult with non-struggled, stutter-like behaviors that seem to emerge under language formulation problems - Neurotypical child with atypical disfluencies such as word- or clause final repetitions of sounds or segments (e.g., "play-ay", or "I am going to play a game - - ay a game." - Child or adult with ASD showing atypical disfluencies such as those described above - Bilingual or ELL client with disfluencies that are hard to differentiate from childhood onset stuttering (developmental stuttering) - Another type of disfluency profile not mentioned above that doesn't seem to be	1,026

	stuttering	
If you saw a client with an unusual disfluency profile NOT mentioned in the question above, can you provide a brief description?	N/A	150
Please try and help us understand how MANY children or adults you have seen with atypical disfluency in the past 3 years.	N/A	151
When you see clients who have been referred for disfluency who do not appear to stutter, which of the following assessment procedures do you typically use? (Indicate all that apply)	- A fluency assessment protocol, such as the SSI-4, to measure frequency and severity of disfluencies - An affective/cognitive scale measuring awareness and impact of disfluency, such as the OASES or CAT? - Expressive/receptive vocabulary tests - Language batteries (e.g., TOLD, CELF) - Other assessments beyond those mentioned above	1304
Please list the additional testing you have done in any of these cases; it doesn't have to be all cases.	N/A	290
Have you attempted to treat any of these cases of atypical disfluency?	- Yes, successfully - Yes, unsuccessfully - Yes, still in progress - No, couldn't qualify client - No, referred out - No, didn't seem to impede communication or function *sorted by formulation disfluency in native speaker, atypical disfluency in neurotypical client, atypical disfluency in client with ASD, and disfluency (not stuttering) in bilingual or ESL client	1060
Tell us about strategies you tried.	- Strategies similar to fluency shaping - Strategies similar to stuttering	1757

	modification - Lidcombe - Other behavioral strategies such as increased monitoring or awareness - Language intervention: syntactic - Language intervention: lexical or vocabulary - Language intervention: pragmatic - “Demands and Capacities” - Organizational or formulation strategies - Other *sorted by worked well, helped a little, and didn’t work	
- If you used different strategies with different cases, please tell us more here, if you have time. If you would rather interact with us to explain your experiences, fill in your email, and we will contact you privately.	N/A	175

Data Analytic Plan: Quantitative

To address the research questions posed, a cross-tabulation analysis of the multiple-choice survey answers was conducted. This allowed for a comparison of relationships between questions (e.g., population and treatment success), as well as relationships within a subcategory of a question (e.g., treatment type and treatment success). When analyzing the relationship between diagnosis and treatment success, a Pearson's Chi-squared test with Yates’ continuity correction was conducted. Data distributions for further analysis of diagnosis, treatment type, and treatment success did not meet requirements for parametric analysis. Therefore, we utilized the Fisher Exact Test rather than conventional Chi-square analysis for the remaining statistical analysis. Factors in the quantitative analysis include:

1. Treatment type x Treatment success

2. Treatment type x Treatment success x Diagnosis
3. Diagnosis x Treatment success

Data Analytic Plan: Qualitative

To analyze the qualitative survey data, or write-in answers, Braun and Clarke's (2006) reflexive thematic analysis approach was used because it aligns with the exploratory aims of this study. The study follows an inductive, bottom-up approach where data drives the development of concepts and themes, rather than a deductive approach where the aim is to test if data are consistent with prior themes, theories, or hypotheses (Thomas, 2006). Through reflexive analysis, the researcher has a role in extracting the patterns and themes that emerge from the data. It should be noted that written responses are analyzed at surface level to avoid overinterpretation, as the data are clinician reports and cannot be probed beyond what is stated (Boyatzis, 1998).

In Step 1, researchers familiarized themselves with the data through reading each written response, then rereading responses while conducting the data elimination protocol. This allowed for a broad picture of initial themes. Step 2 involved generating initial semantic codes for written responses based on commonalities in the data. For Step 3, codes were grouped into themes and subthemes based on patterns in the initial codes. Each response could contribute to multiple themes and subthemes if applicable. At the point of this paper's completion, the qualitative results are preliminary. Step 4, where themes from multiple, independent reviewers are compared and reviewers participate in discussion to improve coherence within individual themes and distinction between themes (Ahmed et al., 2025), has not yet been completed. Enlisting multiple reviewers and interpretations of themes in the data is crucial to reliability, so the qualitative tagging of data is ongoing.

For the purposes of this paper, each theme was defined and named without the completion of Step 4. In Step 5, each theme was related back to the research question to ensure that themes are relevant to the larger study aims. Finally, in Step 6, all answers were organized according to the codebook and the following written analysis of themes was produced. Because this coding process has not yet been collaboratively discussed, qualitative results and findings are preliminary. Further vetting of themes and coding is necessary before data can be considered final. The number of respondents who contributed to each preliminary theme and subtheme can be seen in Tables 9-12.

Quantitative Analysis

General: How many respondents reported seeing clients with WFD?

A total of 566 respondents reported seeing a case of WFD in either a neurotypical client or a client with ASD. Among those responses, 31.80% reported only seeing a client with WFD (n = 180). Fewer participants reported seeing WFD in only neurotypical clients (n = 121) or only in clients with ASD (n = 23). However, the average number of WFD encounters per respondent was higher in the category of clients with ASD than neurotypical clients, as seen in Table 3. The following quantitative analyses focus on the 180 respondents who identified seeing only neurotypical clients or clients with ASD who demonstrated WFD. Focusing on this sect of responses ensures that all responses that follow are in reference to cases of WFD.

Table 3: Average number of WFD cases per respondent

Client with WFD	Mean Case Encounters	Standard Deviation
Client with ASD	2.41	2.13
Neurotypical client	1.98	1.49
Other clients with "confusing" disfluency profiles	1.79	1.83

Assessment: Of those who reported seeing clients with WFD, what types of assessment procedures were used?

Most respondents reported following a fluency assessment protocol when evaluating clients with WFD, as seen in Table 4. No assessment protocol was followed by a majority of respondents, despite all respondents describing similar behaviors (i.e., WFD in a neurotypical or ASD population).

Table 4: Breakdown of reported assessment approaches for WFD

Assessment	Response Number	Total Percentage
A fluency assessment protocol, such as the SSI-4, to measure frequency and severity of disfluencies	136	33.8%
Language batteries (e.g., TOLD, CELF)	88	21.9%
Other assessments	61	15.2%
Expressive/receptive vocabulary tests	59	14.7%
An affective/cognitive scale measuring awareness and impact of disfluency, such as OASES or CAT	58	14.4%

General Treatment Success: Did participants judge treatment attempts of WFD to be successful?

Reported treatment success statistics are based on participants who reported "yes," they had either successfully or unsuccessfully treated WFD in neurotypical clients and/or clients with ASD. Participants who responded "yes, in progress" were excluded, as treatment in progress does not provide insight to how successful treatment is when completed. In total, 66.7% of respondents reported successful treatment of WFD in a neurotypical client. A total of 41.2% of respondents reported successful treatment of WFD in clients with ASD. A Pearson's Chi-squared test with Yates' continuity correction was conducted to determine whether there is a significant correlation between population and treatment success per respondent report. This Chi-squared revealed a statistically significant difference in treatment success between populations, x^2 (1, n = 172) = 10.246, p = .00137, where treatment was reported to be more "successful" in the neurotypical population than the ASD population.

Table 5: Treatment success per population

Population	"Successful" Response Number	"Unsuccessful" Response Number	Total Respondents
Autism	35	50	85
Neurotypical	58	29	87

Specific Treatment Success: Which therapy approaches respondents employ, and what approaches did they judge to be helpful?

Participants were asked to indicate if they had tried any of the following treatment strategies: Demands and Capacities, fluency shaping, Lidcombe, stuttering modification, behavioral strategies such as monitoring, syntactic language intervention, lexical language intervention, pragmatic language intervention, organizational/formulation intervention, or other. Within these treatment strategies, there are approaches that treat WFD from a stuttering lens (i.e., stuttering modification, fluency shaping), a language lens (i.e., syntactic, lexical, pragmatic, and organizational/formulation intervention), a preschool development lens (i.e., Lidcombe, demands and capacities), and a monitoring lens. Participant ratings of "Didn't work" were compared to combined ratings of "Helped a little" and "Worked well" for each treatment category via a Fisher Exact Test with significance level of $p < .05$. Separate analyses were completed for neurotypical and ASD populations to determine if population influences treatment method success. Within each population, each treatment approach (i.e., language, stuttering, preschool, monitoring, other) was compared against its counterparts to determine if any treatment approaches were significantly more successful than others. In the tables below, variable 1 and variable 2 are compared to one another to determine if they yielded a significantly different treatment outcome. Each population's values are presented in Tables 6 and 7 respectively.

Table 6: Treatment Effects of WFD in Neurotypical Population

Variable 1	Variable 2	n	p	Significant
Language	Stuttering	194	0.5944	No
Language	Preschool	202	0.2362	No
Language	Monitoring	120	0.0341	Yes
Language	Other	123	0.0099	Yes
Stuttering	Preschool	182	0.4943	No
Stuttering	Monitoring	100	0.0839	No
Stuttering	Other	103	0.0290	Yes
Preschool	Monitoring	108	0.1896	No
Preschool	Other	111	0.0757	No
Monitoring	Other	29	1.0000	No

Table 7: Treatment Effects of WFD in ASD Population

Variable 1	Variable 2	n	p	Significant
Language	Stuttering	35	1.0000	No
Language	Preschool	37	1.0000	No
Language	Monitoring	23	1.0000	No
Language	Other	24	0.3256	No
Stuttering	Preschool	34	1.0000	No
Stuttering	Monitoring	20	1.0000	No
Stuttering	Other	21	0.3254	No
Preschool	Monitoring	22	1.0000	No
Preschool	Other	23	0.3428	No
Monitoring	Other	9	0.5238	No

Quantitative Analysis of Qualitative Reports

Regarding write in responses, 75 total responses were sorted into three larger themes, constituting a total of 186 meaningful statements. Of those 75 responses, 25 reported on multiple cases, as seen in Table 8. If responses held meaningful statements related to multiple themes, those responses were categorized into multiple themes. In total, responses contained 71 meaningful statements about diagnoses, 88 meaningful statements about linguistic features, and 27 meaningful statements about non-linguistic features associated with WFD. This distribution can be seen in Table 9 and Figure 2.

In Theme 1, Common Diagnoses Associated with WFD, the majority of participants reported encountering students with ASD, ADHD, or in the neurotypical population, as represented in Table 10 and Figure 3. In Theme 2, word final repetition and /h/ insertions were the most commonly reported linguistic behaviors describing or associated with WFD, as seen in Table 11 and Figure 4. Across Theme 3, increased WFD during reading tasks as compared to conversational tasks was the most commonly reported non-linguistic feature, as seen in Table 12 and Figure 5.

Table 8: Participants Described Per Response

Participants Described	Count of Responses
Two	10
Three	4
“A few” or “several” clients/students	11

Table 9: Distribution of statements per theme

Theme	Count of Meaningful Statements
Common Diagnoses	71
Linguistic Features	88

Non-linguistic Features	27

Figure 2: Meaningful Statement Distribution

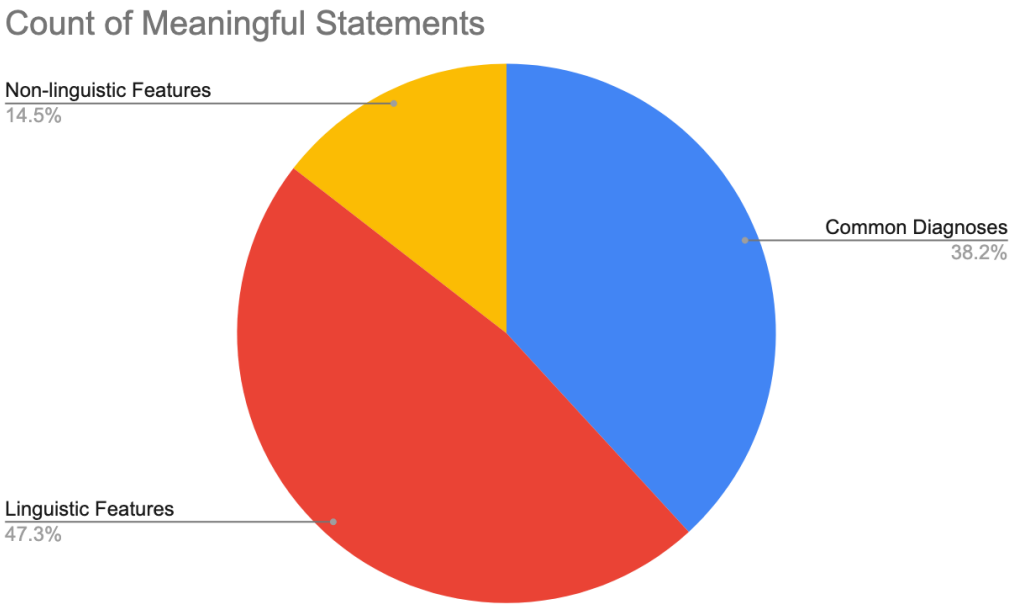


Table 10: Theme 1 Distribution

Diagnosis	Count
ASD	24
ADHD	14
SSD	7
Language	6
Mood/Anxiety	7
Neurotypical	13

Figure 3: Theme 1 Distribution

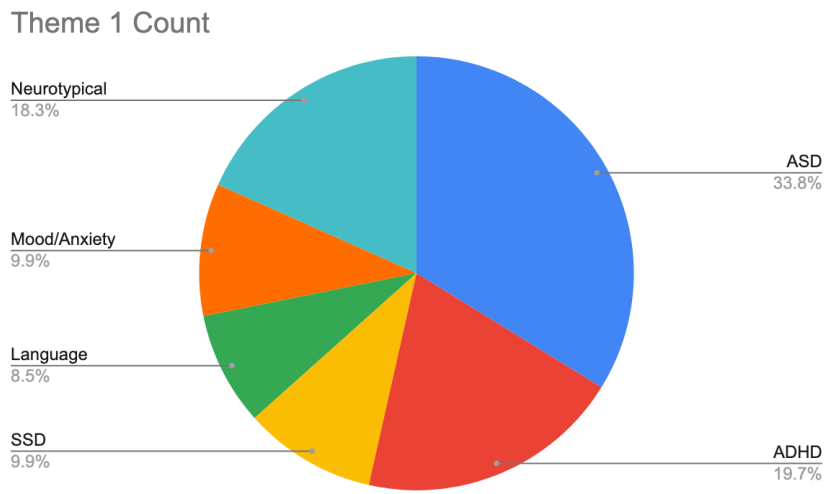


Table 11: Theme 2 Distribution

Linguistic Feature	Count
Filled Pauses	6
Glottal Stops	12
/h/ Insertions	15
Within Word Repetition	11
Word Final Repetition	35
SLDs	4
ODs	5

Figure 4: Theme 2 Distribution

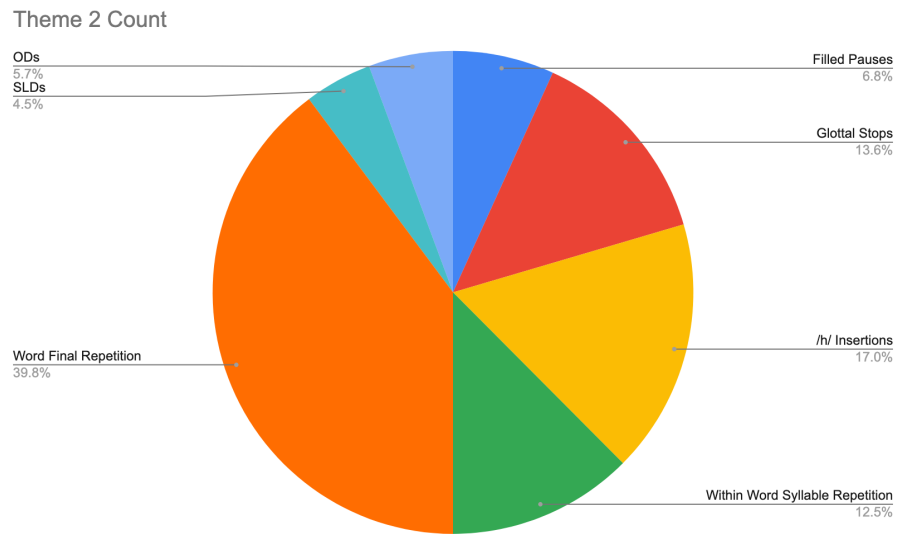
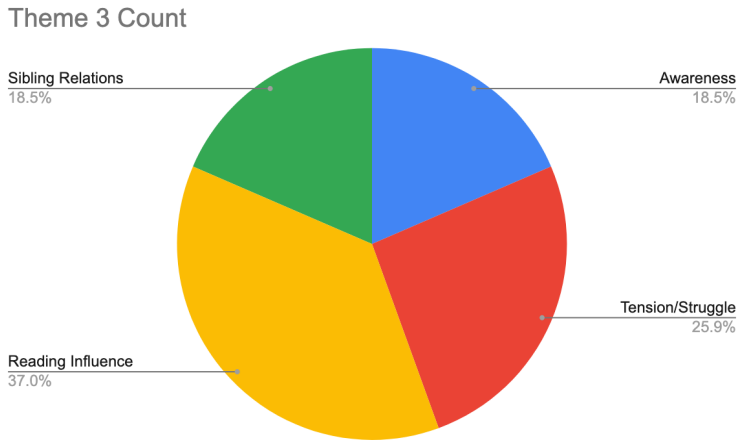


Table 12: Theme 3 Distribution

Non-Linguistic Features	Count
Awareness	5
Tension/Struggle	7
Reading Influence	10
Sibling Relations	5

Figure 5: Theme 3 Distribution



Qualitative Analysis

Given that reports largely included co-occurring diagnoses and features of WFD, that is what the following data reflect. Examples of respondent quotes related to each theme and subtheme can be found in Tables 13-15, as well as within the main text. The total number of subtheme reports does not equal the total number of responses because some responses were included in multiple themes. To capture the variability and lack of clarity with which participants approached this question of WFD, examples of answers that did not describe WFD are also provided in Table 16. Because there were a significant number of reports unrelated to WFD, these answers were also grouped into themes as discussed in the *Future Research* section of this paper.

Common Diagnoses Associated with WFD

In all, 59 respondents provided responses including diagnoses that co-occurred with WFD, yielding 71 meaningful statements. These meaningful statements were subsequently organized into six subthemes.

Subtheme 1.1 ASD

Participants reported that many of the clients they have seen with WFD also have an ASD diagnosis. Disfluency features described alongside the ASD diagnosis included WFD, /h/ insertions, SLDs, and mid-word glottal stops. While most participants reported on clients with ASD diagnoses, many also made a note to mention clients that did not have an ASD diagnosis, but “have some characteristics of ASD” or are “not specifically diagnosed with ASD, though demonstrated some possible pragmatic behaviors.”

Subtheme 1.2 ADHD

A common pattern throughout reports of clients with ADHD included an additional co-occurring diagnosis; dyslexia, ASD, anxiety disorders, and language disorders were all mentioned alongside ADHD. Disfluency characteristics described alongside ADHD diagnoses included glottal stop insertions, /h/ insertions, mid word repetition, and WFD. In many responses, respondents mention changes in disfluency as participants tired or their medication wore off. One respondent noted that in this population, "Focusing on awareness is challenging coinciding with attention difficulties to begin with."

Subtheme 1.3 Speech Sound Disorders

While articulation disorders and phonological processing disorders were both mentioned, childhood apraxia of speech (CAS) was the most commonly reported speech sound disorder. One clinician reported that the child did not originally present with WFD, but as an issue of prosody where "he started a mid-vowel abrupt pause, which has now progressed into the final half of the word repetition." Several respondents wondered if the behavior was related to a type of stuttering, or due to the apraxia. Only word final repetitions were mentioned as atypical behaviors in those with accompanying speech sound disorders.

Subtheme 1.4 Language Disorders

Numerous respondents reported expressive-receptive language disorders occurring alongside WFDs. More specifically, reports centered around deficits in language organization and pragmatics. Participants made statements such as the client had "pragmatic challenges, restricted interests but no diagnosis of ASD," and "I would NOT consider these children neurotypical - they just haven't received an ASD diagnosis." In these statements, respondents recognize that language disorders rarely exist in isolation, and such diagnoses may be related to

ASD or other co-occurring conditions. Word final repetitions were the dominant disfluency behavior reported in this theme.

Subtheme 1.5 Mood/Anxiety Disorders

Across reports of anxiety disorders, specific diagnoses ranged from subclinical OCD to generalized anxiety to bipolar disorder. Other reports were vague, citing "undiagnosed emotional-behavioral issue[s]" and a history of neglect. Two participants reported ADHD as a co-occurring diagnosis, while several respondents shared that word final repetition was the most common disfluency observed in these clients.

Subtheme 1.6 Neurotypical Population

A common report among those having seen neurotypical clients was word final repetition, which is unsurprising given the article in which the survey link was embedded. In addition to word final repetition, three participants reported concurrent instances of "insertion of /h/ or pause mid word" and one reported an added "uh" in the middle of words, such as "break-uh-fest." Also of note, a lack of awareness was also a common pattern in this neurotypical population.

Table 13: Common diagnosis associated with WFD: Themes, subthemes, and representative respondent quotes

Theme and subtheme	N contributing to (sub)theme	Example Survey Response
Theme 1: Diagnoses reported to be co-occurring with WFD	n = 71	
Subtheme 1.1: ASD	n = 24	"Most of the children that I see with this fluency profile are **either on the autism spectrum or have some characteristics of ASD**." "...They were either **previously diagnosed as within the autism spectrum** or had some characteristics w/o the diagnosis."

Subtheme 1.2: ADHD	n = 14	"**Child with ADHD** showing atypical disfluencies (mid-word repetition, in-word sound insertions)" "I have another student with a similar profile to above, but he has been **recently diagnosed with both ADHD and Dyslexia**."
Subtheme 1.3: Speech Sound Disorders	n = 7	"Both the students I have worked with who have shown final word or final sound (e.g.- play, play, play or play a a a) **have been students with resolving phonological process disorders**. By resolving, I mean their intelligibility is much improved and there are many fewer sound errors…" "I also have a kiddo with **prior diagnosis of CAS** (currently post intensive early intervention so he is using all syllable shapes, is highly intelligible, has all speech sounds except /r/) who does the word final reps CONSTANTLY." "I have a 7 year who has **CAS**… his pauses were every syllable. At the point at which the pauses were occurring every 3-4 syllables, he started the mid vowel abrupt pause, **which has now progressed into the final half of the word repetition…**"
Subtheme 1.4: Language Disorders	n = 6	"...who had **final sound/syllable repetitions along with significant expressive language organization issues…**" "primarily word final repetitions, but some final repetitions of phrases. However, the child is not neurotypical: he has a **severe language disorder** and ADHD and LD…" "I've seen children who are not diagnosed with ASD, but have **pragmatic deficits and higher level receptive-expressive deficits with atypical word-final repetitions** (e.g., "boy-oy-oy" "fish-hish")..."

Subtheme 1.5: Mood/Anxiety Disorders	n = 7	"I currently have a 12 year old male student in my school system that presents with many word-final word repetitions, medial word nasal stops and overall dysfluencies that frequently occur in his speech. He is diagnosed with ASD, **emotional disorder**, and ADHD…" "Six grade male Who has final syllable and final sound repetitions only when reading aloud… **he has anxiety disorder and ADHD…**" "Profile is as described above in item #3. Student does not have ASD, but is also not neurotypical **(FASD and bipolar)**."
Subtheme 1.6: Neurotypical population	n = 13	"**Neurotypical child with atypical disfluencies described above** AND with additional sound on the end of word (e.g. "went-a" or "goes-a")" "I am currently evaluating **Neurotypical child with atypical disfluencies such as word- or clause final repetitions** of sounds or segments (e.g., "play-ay", or "I am going to play a game - -ay a game."

Linguistic features of disfluency that describe or are reported alongside WFD

Participants providing responses including linguistic features totaled 60, yielding 88 meaningful statements. These meaningful statements were subsequently organized into eight subthemes.

Subtheme 2.1 Within Word Linguistic Features

Participants reported a number of linguistic behaviors observed within words. These within word features are described below.

Subtheme 2.1.a Filled Pauses

In describing filled pauses, respondents used a variety of terms, including “in-word sound insertions,” adding "uh" or a schwa in the middle of words, a voiced “glitch mid word,” and “noisy fillers.” Respondents noted that clients demonstrating these disfluencies had a variety of diagnoses (e.g., ASD, ADHD, no diagnosis). Two participants indicated that disfluencies were observed to increase during reading tasks, especially with the added time pressure of a reading fluency assessment. A prevalent sentiment about encountering filled pauses was clinical uncertainty - four participants reported their cases using language such as “I really wasn't sure how to address them [the filled pauses],” “I’m wondering if…,” and detailing their case with the caveat “what I can only describe as…”

Subtheme 2.1.b Glottal Stops

Of the participants describing glottal stops, all stated that these stops occurred mid-word. Most responses specified that these stops occurred “mid vowel” or “mid word post vowel,” and that they were the only linguistic behavior present. Three participants noted additional linguistic behaviors that characterized the disfluency pattern, one being SLDs (i.e., initial sound and syllable repetition) and ODs (i.e., word/phrases repetition), the other two being word final repetitions. Of note, no participants noted tension during the moment of the glottal stop, and one participant characterized the moment as a “relaxed glottal stop.”

Subtheme 2.1.c /h/ insertions

Respondents reported /h/ insertions in the context of word final repetition (e.g., “play-hay-hay,” “then-hen-hen,” “excuse-huse”) as well as after vowel production as “vowel interruptions with /h/” (e.g., “je-helly”, “bre-head”). Participants reported /h/ insertion occurring in both single syllable and multi-syllabic words. In two instances, respondents reported occurrences of word-medial and additional word final repetition alongside /h/ insertions;

however, most who reported /h/ insertions indicated that those insertions were the sole disfluency observed.

Subtheme 2.1.d Within Word Syllable Repetitions

Eleven participants reported within word repetitions, or "stuttering in the middle of words." In addition to within word repetitions, two participants also reported word final repetitions in these clients. Common diagnoses represented in this category included four reports of ASD, two of ADHD, one with a nonverbal learning disorder, and four who are neurotypical. Of note, one participant reported on a client who described an awareness of this disfluency as "something trying to get out of his throat" and something "he has to keep suppressed." The two other responses that noted awareness commented that the speaker appeared unaware of the behavior.

Subtheme 2.2 Word Final Repetitions

As the linguistic category with the largest number of responses, case descriptions of word final repetition tended to be the most diverse. Nineteen respondents reported word final repetition occurring alone, while sixteen reported within word repetitions, /h/ insertions, ODs, and/or SLDs occurring in conjunction. Also variable were reports of co-occurring diagnoses. Six participants reported co-occurring ASD diagnoses, three reported speed sound disorders (i.e., articulation disorder, CAS), and three reported ADHD. A theme across these reports was speculation and unsureness regarding co-occurring diagnoses; participants reported cases like "neurodivergent child (not Autistic)," "suspected but not official ADHD diagnoses," "will likely receive a learning disability diagnosis," and "may or may not be neuro-typical."

Subtheme 2.3 Stutter-like Disfluencies (SLDs)

The only SLD mentioned in conjunction with WFD was word initial sound and/or syllable repetition. However, there was diversity in the type of WFD mentioned, including word final repetition, word medial repetition, and /h/ insertions. Two participants also reported accompanying pragmatic and language formulation deficits.

Subtheme 2.3 Other Dysfluencies (ODs)

Of note, only one participant reported a client with SLDs and ODs, as well as WFDs. Both whole word repetition and phrase repetition were reported in three instances, while interjections were reported twice. No other ODs were reported. Among answers that reported ODs, no diagnoses were reported, although one respondent described a student who is "not specifically diagnosed with ASD, though demonstrated some possible pragmatic behavior."

Table 14: Linguistic features of disfluency that describe or are reported alongside WFD: Themes, subthemes, and representative respondent quotes.

Theme and subtheme	N contributing to (sub)theme	Example Survey Response
Theme 2: Linguistic features of disfluency that describe or are reported alongside WFD	n = 88	
Subtheme 2.1 Within word features	n = 44	
Subtheme 2.1.a Filled pauses	n = 6	"Typical child with **different types of what I can "noisy fillers" or filled pauses;** ASD type children(not all diagnosed) with 'noisy fillers'" "My student is a neurotypical 3rd grader…**the student also will add "uh" in the middle of words "breakuh fest" "dolphuh in**".
Subtheme 2.1.b Glottal stops	n = 12	"I have seen two siblings (boy and girl) and another boy all who present with the features of ASD. **All three children insert a glottal stop mid vowel**" "He has several word final repetitions like

		"grandparentsents" and "other-er" as well as **insertion of glottal stops such as nobo-y (nobody).** He has quite a few blocks and unusual pausing and breathing. His speech is often broken into syllables. He also had a severe articulation disorder."
Subtheme 2.1.c /h/ insertions	n = 15	"Child with ASD who **inserts 'h' after vowel production: fre-hends (friends), swi-him (swim), o-hon (on), excu-hus (excuse).** No secondary characteristics. No other sound or word repetitions or prolongations. No blocks." "His primary type of disfluency is a sound-syllable repetition (SS) in the middle/end of the word, **sometimes with an /h/ sound before echoing the middle/end of the word again.** For example, Student said: then-hen-en"
Subtheme 2.1.d Within word syllable repetitions	n = 11	"My student is a female, 15 years of age who presents with ASD. She has **frequent disfluencies in the middle of words in which she repeats a syllable.**" "I have a 2nd grade female student who was just brought to my attention by her teacher…She was observed to use mid-word inhalation and sometimes, **she would repeat a syllable mid-word."**
Subtheme 2.2 Word final repetitions	n = 35	"He has **several word final repetitions like "grandparentsents" and "other-er"** as well as insertion of glottal stops such as nobo-y (nobody)..." "I have two students who both exhibit **varying degrees of word-final repetitions**, mid-word breaks, mid-word insertion of /h/, and mid-word inhalations. Neither student has a diagnosis of any kind, but both struggle greatly with reading,

		writing, and spelling, despite years of intervention, and will likely receive a learning disability diagnosis.””
Subtheme 2.3 SLDs	n = 4	“11 year old with ASD with a **combination of typical disfluencies (sound repetitions)** as well as atypical disfluencies (inserting /h/ such as je-helly, bre-head)” “Student presented with **mild word initial sound and syllable repetitions**, some word/phrase repetitions, and many mid-word or word final (at morphological marker) repetitions or glottal insertions.”
Subtheme 2.4 ODs	n = 5	“His primary type of disfluency is a sound-syllable repetition (SS) in the middle/end of the word, sometimes with an /h/ sound before echoing the middle/end of the word again. For example, Student said: then-hen-en, ca-ame, horse-orse, turtle-le-le, blow-ow, frog-og, so-o, door-or. Some less **commonly heard disfluencies were whole-word repetitions (WW) such as “and-and-and” and interjections such as “um um.”** “The child frequently **seems to start his though over "I want to....I want....I want to...I want to go play."** He also has "h" insertion or "mid word breaths," he might say the word "fun" but then add a breath/h sound in it (ex: fu-hun")...”

Non-linguistic features of disfluency reported alongside WFD

Participants providing responses including non-linguistic features totaled 23, yielding 35 meaningful statements. These meaningful statements were subsequently organized into four subthemes.

Subtheme 3.1 Awareness

Of those respondents mentioning awareness, all but one reported “no awareness,” or that students “weren't even aware of doing it.” One participant shared that the student only “knows she stutters because other people tell her she does.” Lack of awareness was a common theme reported across neurotypical, ASD, and ADHD populations. While the common sentiment was lack of awareness during speaking, a few participants noted that students could “identify them [word final disfluencies] when viewing a video recording.” For example, it was noted that identification and monitoring was sometimes used as a method of treatment. However, one participant did report a case where the student was already aware of the disfluency, having “described it as something trying to get out of his throat” and that “he has to keep it suppressed.” This individual student with reported awareness also had a diagnosis of ADHD and language formulation deficits.

Subtheme 3.2 Tension/Struggle

Consistent with impressions of lack of awareness, most respondents noted a lack of tension and struggle, with concomitant behaviors, such as “heavy eye blinks, head turns, physical tension, [and] facial grimaces” absent. With that said, one participant reported observing a student with word final repetition and occasional “strain in the larynx.” Lack of tension and/or struggle was reported across diagnostic groups, including ADHD, ASD, and neurotypical. It should be noted that many respondents reporting lack of tension or struggle did not report an accompanying diagnosis. Absent tension and/or struggle was also reported alongside filled pauses, word final repetition, mid word repetition, and /h/ insertions, each one time.

Subtheme 3.3 Influence of Reading

Of the ten respondents who reported on WFD during reading, six reported that disfluencies were “significantly worse when they're reading aloud,” “occur on a very limited

basis in verbal conversation and heavily in oral recitation," and were overall "more prevalent while reading." One participant reported that in evaluation, frequency of WFD was 17% during reading and only 1% in conversational speech. Another participant hypothesized that the increased frequency of disfluencies during reading could be caused by the "pressure to read quickly and fluently" during reading fluency assessments, which is "exacerbating disfluency in kids who are neurologically predisposed to it." Three respondents reported that observed disfluencies were similar across spontaneous conversation and reading tasks, while one respondent reported on a student who only demonstrated WFD while reading aloud and not at all during conversation.

Subtheme 3.4 Family History

Although not a specific question on the survey, respondents emphasized family history, whether or not siblings demonstrated similar behaviors, and if any older siblings experienced a resolving of the disfluencies. Two participants reported on sets of twins who shared both the presence of WFD, as well as the specific linguistic features that describe that disfluency (i.e., /h/ insertions and word final repetitions respectively). One participant reported on a case of siblings who both had an ASD diagnosis and exhibited WFD, while other participants reported on sibling pairs where only one had an ASD diagnosis, but both demonstrated WFD.

Table 15: Non-linguistic features reported alongside WFD: Themes, subthemes, and representative respondent quotes

Theme and subtheme	N contributing to (sub)theme	Example Survey Response
Theme 3: Non-linguistic features reported alongside WFD	n = 35	
Subtheme 3.1: Awareness	n = 13	"Two have word-final repetitions, the other has medial sound repetitions or /h/ breathiness when speaking. **None of them are aware that they are doing these**

		repetitions when speaking. Focusing on awareness is challenging coinciding with attention difficulties to begin with." "14 year old female with ASD --- **told SLP she knows she stutters because other people tell her she does. But she was unable to identify it…**"
Subtheme 3.2 Tension/Struggle	n = 7	"She exhibits mid-word inhalation and repetition. Her teacher says she does it both during reading and just when conversing but does not seem self-conscious or reluctant to speak. I observed her reading during a timed reading passage and she was dysfluent several times per utterance **but was able to move through the episodes without apparent struggle.**" "His primary type of disfluency is a sound-syllable repetition (SS) in the middle/end of the word, sometimes with an /h/ sound before echoing the middle/end of the word again…No secondary behaviors were observed any days (e.g., heavy eye blinks, head turns, **physical tension**, facial grimaces)."
Subtheme 3.3 Influence of reading	n = 10	"Neurotypical child, with non-struggling stutter-like behavior more **prevalent while reading but also seen in connected speech**, insertion of /h/ or pause mid word." "A neurotypical child who inserted the schwa in the middle of words as well as between words. **This occurred during spontaneous speech as well as during reading tasks**. He appeared to have no awareness of the problem." "It appears to occur on a very

		limited basis in verbal conversation and **heavily in oral recitation (reading out loud).** In one short paragraph of 65 words he was dysfluent on 20 instances. Examples include: "there-hair-hair" "where-air-r" "gradually-he-he" "there-her" "defenses-ses", "or-her-her…"
Subtheme 3.4 Family History	n = 5	"**Neurotypical children (twins)** with atypical disfluency of mid-word insertions (insertion of /h/ mid-vowel)." "Child is 3;0. He repeats /s/, /t/, and sometimes /l/ in wd-medial and wd-final positions…**Family hx positive for the same atypical disfluencies** (older brother; onset @same age, resolved independently about a year later) and misc. language delays."

Discussion

The current study examined speech language pathologists' experiences with WFD through qualitative and quantitative methods to characterize SLPs' knowledge, document current assessment and intervention practices, and highlight both the reported frequency of WFD and uncertainty in its management. The first aim of this project evaluated reported patterns in diagnoses co-occurring with WFD. The second aim of this project evaluated reported patterns in assessment, while the third aim centered around reported patterns in treatment approach and success. Given the preliminary and exploratory nature of this study, the data is representative of how clinicians view and treat WFD, not of evidence-based protocols that should be put into practice. As discussed in the Future Research Directions and Implications section of this paper, the data about classification, assessment, and treatment of WFD treatment that follows are examined to inform and stimulate needed research on this increasingly common form of disfluency. We also add data to existing research that documents the presence of WFD and highlights the future potential for larger scale clinical trials.

Analyses of diagnoses reported alongside WFD showed that ASD and ADHD were most common associated diagnoses, although many cases did not report any co-occurring diagnostic labels. This aligns with existing literature, which focuses primarily on WFD in the context of the autistic population, with lesser investigation of WFD in ADHD speakers, together with fewer reports in neurotypical populations. Speech sound disorders, language disorders, and anxiety were also commonly reported alongside WFD in these data, but have been reported minimally in research (Sisskin & Wasilus, 2024, Evans and Owens, 2019; Van Borsel et al., 2005). For example, Sisskin & Wasilus reported one case of CAS, one articulation disorder, and two cases of obsessive-compulsive disorder (OCD) in their 20-participant study. While these data provide some insight into the diagnostic groups that may experience WFD, they also provide insight into

other client features that clinicians think may be etiologically relevant to report. For example, clinicians reported family dynamics, prior SLP treatment, and differences in voice onset time as potential etiologic causes for WFD. This wide range of reported characteristics demonstrates that clinicians are grasping for potential causes or explanations for WFD and do not have enough background training and research to help them understand their clients.

In completing the qualitative analysis of speech features reported as WFD, many clear patterns emerged. Participants reported word final repetition, /h/ insertions, glottal stop insertions, and within word repetitions to be the most common. As is the case with diagnoses, these features broadly align with current research, which most commonly cite word final repetition. In reducing the data to ensure analyses focused on responses that reported WFD, our behavior of primary interest, a significant number of responses were excluded – the survey link was embedded in an article describing atypical disfluency as well as target features of WFD, so respondents reported a variety of linguistic behaviors that are atypical, but not WFD. These included airflow differences, final schwas, and cluttering.

Some responses described these additional differences in conjunction with WFD and were included in the final analysis. For example, SLDs and ODs were described amongst other linguistic behaviors such as /h/ insertions and word final repetition. However, a significant number of responses described only non WFD related features. This highlights that there is clinical uncertainty surrounding what SLPs understand to be WFD, possibly because there are no clear diagnostic criteria, and clinicians placed any “atypical” fluency profile into this category. Understanding what WFD is and how it is distinct from stuttering, cluttering, or other atypical breathing patterns is imperative for making differential diagnoses, as well as subsequent treatment plans.

Clear diagnostic criteria must accompany clear assessment protocols. Clinicians expressed difficulty in picking appropriate assessments because the features of WFD did not appear to align with any existing assessment protocols. While a fluency assessment protocol such as the *SSI-4* was most frequently reported, it was not used for the majority of cases. Least commonly reported assessments were affective scales (e.g., *OASES* and *CAT*). This is unusual, as typical stuttering assessments often go hand in hand with affective scales as recommended best practice (Karani & Mupawose, 2020; Brundage et al., 2021). The fact that affective scales were not typically administered may be consistent with other reports of relatively low speaker awareness of the disfluency profile, unlike "garden variety" stuttering. "Other" assessments were reported in similar frequencies to all named treatment protocols, suggesting that clinicians are unclear about how to approach assessment of WFD and relying on a broad number of assessment choices. Without a clear understanding of the behaviors associated with WFD, thorough and comprehensive assessment cannot be completed. Respondents also reported a general lack of tension during moments of WFD. The present data and existing literature that document lack of awareness and tension during moments of WFD support the assertion that WFD is distinct from developmental stuttering. We must then consider if WFD warrants a distinct form of assessment from stuttering protocols such as the *SSI-4*, or a different severity scale.

Participants also included information from informal observations in their responses. Clear themes emerged from these observations, as seen in Subtheme 3: Non-linguistic features of disfluency reported alongside WFD. For example, many participants reported that WFDs increased during reading. There exists little research to determine if this is a common occurrence with WFD, or if there is variability from person to person. In comparison, the body of research related to reading disfluencies in people who stutter explains variability between and within

people (e.g., the adaptation effect (Max & Caruso, 1998), differences in brain activity (Miller, 2024). Instances of WFD amongst family members were also noted in responses. This could be a similarity between stuttering and WFD, as Sisskin and Wasilus 2024 reported that 7/20 of their participants exhibiting WFD had a sibling with similar disfluencies (Sisskin & Wasilus, 2024; Darmody et al., 2022). However, no participants had a family history of stuttering. Further research is needed to explore the influence of family history on likelihood of WFD versus developmental stuttering.

Preliminary quantitative analyses of treatment showed that no attempted treatments stood out as more successful than others. Language based approaches, stuttering approaches, and monitoring approaches all yielded similar success rates, with the majority of people reporting middle ground success (i.e., that treatment "helped a little"). No reported treatment can be deemed the "best" or "most effective" approach based on these data. Instead, we must focus on the wide range in types of treatment - clinicians are trying everything - and similar frequencies with which each has been tried. Inconsistency in treatment approach and outcome highlights the lack of guidance with which SLPs approach WFD.

Currently, two studies have examined treatment protocols for WFD (Sisskin & Wasilus, 2024; Van Borsel et al., 2005). Both studies reported success with a monitoring-based approach in both autistic and non-autistic populations, respectively. One possible explanation is that clinicians are unaware of these reported successes of monitoring approaches. It could also be that clinicians are not yet using a monitoring-based approach because the evidence is too limited, and we lack full clinical trials. Based on the reportedly low success rates of monitoring in those who did attempt it, another possible explanation is that treatment did not follow the protocols proposed in the existing research or that speaker profiles are too heterogeneous for monitoring to

be effective for all presenting profiles. Such discrepancies in these reports highlight a key gap in our field's understanding and treatment of WFD. In this regard, the present data could motivate further research to support clinicians in providing evidence-based care for clients with WFD.

Limitations

Similar to other survey-based research projects, a limitation is that participant reports may not be representative of all possible cases of WFD. Moreover, participant reports can be subject to both reporting and recall bias. Clinical frustration may have led to more unsuccessful cases reported than successfully treated ones. It is also possible that some participants reported on cases they had seen a considerable time ago, leading either to misremembered or omitted details regarding their clinical experiences. Unlike most survey-based projects which contact a preset cohort of respondents chosen for various attributes, a limitation to the present survey is that participants likely came across this survey if they had a special interest in this topic or if they were actively seeking further information on WFD. The survey did not get sent to a general list-serve and participants were not queried or asked to take the survey. Instead, participants proactively responded to the survey, likely when looking for guidance or further resources to help a client. Thus there could be bias in the theme of clinical uncertainty that runs throughout the data as well as an overrepresentation of the frequency with which clinicians see cases of WFD.

Additionally, participants reported treatment success by indicating if the treatment approach "Did not work," "Helped a little," or "Worked well." A single individual assessing treatment success using these classifications is subjective. The unconfirmable nature of reports means that no factual claims about diagnosis, assessment, or treatment can be made from this project. However, the aim of this project is not to make claims about generalizable features of

WFD or treatment protocols, but to emphasize areas that require future clinical investigation in order to reliably make generalizable conclusions.

It is also possible that exclusion criteria and data filtering inadvertently excluded responses that did describe true WFD. A respondent who did see WFD but described characteristics that were not clearly WFD or provided a vague description would have been excluded from the current analysis. Survey reports "cannot be probed beyond what is stated" (Boyatzis, 1998), so responses must be analyzed at surface level to avoid overinterpretation. This system of analysis ensures that the data reflects the approaches, observations, and clinical uncertainty only of those who actually observed WFD.

Another limitation pertains to the construction and wording of the survey. In prompting participants to describe the populations they have seen with WFD, the survey asks about autistic and neurotypical populations. It does not distinguish between populations that are not neurotypical, but are not autistic, such as learning differences and ADHD. Some participants clarified the population described in their clinical experience in the short answer section, but we cannot be certain that that was the case for all participants to which this situation pertained.

Additionally, the survey did not ask participants to explicitly state client characteristics when asking about attempted treatment approaches and subsequent levels of treatment success. Thus, the present analysis of treatment focused on participants who selected only seeing clients with WFD and autism or only seeing neurotypical clients with WFD. This left out those who had indicated seeing clients with other characteristics (e.g., disfluencies likely due to language formulation or bilingualism) in addition to those with WFD. However, as stated previously, the aim of this project is to emphasize that clinicians require further, research-based guidance for

identification, assessment, and treatment of WFD rather than provide research-based evidence. Given that the priority of this paper is to explore potential areas for and encourage future research, these limitations are of lesser concern.

Future Research Directions and Implications

Based on the results of this study, one path for future research should focus on solidifying or amending the definition of WFD. Sisskin & Wasilus (2014) identify four major classifications of WFD, as noted in the discussion section. However, further research can examine the validity of this proposed definition by evaluating the extent to which the four identified behavioral patterns reliably characterize this disfluency. Once a definition of WFD is substantiated, researchers and clinicians can develop diagnostic and assessment protocols. Without a diagnostic protocol, clinicians appear to have difficulty distinguishing WFD from other types of atypical disfluency, cluttering, and even stuttering. Making a differential diagnosis between these types of disfluencies through appropriate assessment is key to providing suitable treatment. For example, a diagnosis of stuttering entails specific linguistic behaviors at a minimum frequency that can be objectively measured, as well as report of life impact (Yairi & Ambrose, 2005). Without such established criteria for WFD, clinicians are struggling to accurately identify it.

One possible way to move towards diagnostic and assessment protocols is with further survey research using more specific and explicit prompting language. For example, researchers may list the linguistic features reported in this data to determine how common each one is. Researchers may also ask participants to specify the diagnoses they see alongside WFD. Finally, with permission from families, researchers may contribute video data of WFD to research archives such as FluencyBank to increase overall validity and ensure that the clinician is truly reporting on WFD. Archival data that could be analyzed objectively using a single set of criteria

would increase generalizability of results, since most clinicians reported experiences with a very small number of WFD cases. Future surveys can decrease bias of clinical uncertainty and overrepresentation of WFD frequency on caseloads by requesting participation from both general practitioners and fluency specialists rather than solely relying on proactive responses that may over sample those already searching for answers. This will provide a more accurate, generalizable representation of clinical knowledge and interaction with WFD in the field.

Another future direction should also include standardized, clinical trials for different types of WFD treatment approaches. The present survey highlights that clinicians are attempting a wide variety of treatments with varying success. Conducting randomized control trials of the treatment approaches that participants reported using most, in combination with replicating existing research on treatment approaches (Sisskin & Wasilus, 2024; Van Borsel et al., 2005), can provide clinicians with a clearer outline of how to approach WFD, as well as what treatment protocols may be inappropriate for this population. Based on the frequency of clinicians' reports of treatments that "Did not work well," clinicians are trying many approaches unsuccessfully, which leads to inefficient care and decreased likelihood for client growth.

Many respondents reported on clients experiencing a large range of disfluencies that were not considered WFD by our definition and therefore excluded from the present analysis. However, these reports could lead towards future research on atypical disfluencies separate from WFD. The patterns that emerged within these excluded responses were clear enough to complete an additional thematic analysis. The two main themes included differences in airflow and word final schwa, which included 18 and 8 meaningful statements respectively. In describing airflow differences, participants used phrases such as "audible gasps," "mid-word breaths," "mid-word inhalation," "mid-word glottal stop," and "rough" breathing within words. Much like WFD, it is

clear that clinicians feel uncertainty treating clients exhibiting these additional behaviors not frequently associated with stuttering because they filled out the present survey to seek support.

Conclusions

The findings of the current study suggest that WFD is not as rare or unusual as people presume. The quantitative and qualitative analyses suggest that clinicians are unsure of how to proceed with assessment and treatment for their clients with WFD. Clinicians are using a wide variety of assessments, including stuttering protocols, language batteries, and assessments identified as "other." Left without a solid foundation of research to refer to, clinicians report a large variety of attempted treatment approaches and outcomes - mostly of limited success - emphasizing that this is an under-investigated area of disfluency. Moving forward, researchers must address the gaps in existing literature and clinical trials to ensure that people with WFD are receiving effective, appropriate, evidence-based care.

Appendix

Proposed Etiological Theories of WFD

Study	Theory
Camarata, 1989	"Cognitive hypothesis": WFD stems from the effort to match adult phonological system within a child's neurological and motor system
Mowrer, 1987	Parent modeling: WFD results from parental modeling of final consonants for a 2-year-old with final consonant deletion
Rudmin, 1984	Phonological: WFD is a case of "articulation oscillation," potentially related to environmental stress
Eichorn & Donnan, 2021	Sense of loss of control
Garbarino et al., 2022	Linguistic/syntactic planning; WFD increases as sentence complexity increases External monitoring: WFD results from an over-reliance on one's external monitoring channel and an under activation of the internal monitoring channel
Sutkowski et al., 2023	Language formulation
McAllister & Kingston, 2005	Impaired motor timing
Evans and Owens 2019; Plexico et al., 2010	Diagnosis: WFD is related to a coexisting condition
MacMillan et al., 2015; Stansfield, 1995	Stuttering: WFD is a subgroup or subtypes of developmental stuttering
Pirinen et al., 2023	Cognitive processing demands: WFD is a result of increased cognitive load during social interactions

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