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## Temperament, Emotion and Childhood Stuttering

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### Abstract

The purpose of this article is to provide a brief description of temperament and emotion, review empirical evidence pertaining to their possible association with childhood stuttering, and discuss possible clinical implications. In general, temperament is typically thought of as an individual's constitutionally (biologically) based behavioral proclivities. These proclivities often include emotional reactivity and self-regulation. Reactivity refers to arousal of emotions, motor activity, and attention, and self-regulation refers to the ability to moderate those tendencies.

The trait-like nature of temperament makes it potentially salient to our understanding of the onset and development of stuttering because temperamental tendencies may result in greater reactivity or difficulty in coping. Emotions, which are more state-like and variable, may influence the variation of stuttering commonly observed both within and between speaking situations.

Temperament and emotion may serve as a causal contributor to developmental stuttering, with empirical findings indicating that preschool-aged children who stutter (CWS) exhibit differences in temperament and emotion when compared with children who do not stutter (CWNS). Given that empirical study of temperament in preschool-aged CWS is nascent, extensive discussion of clinical implications is challenging. With that caution, we present some early possibilities, including matching treatment approaches with the child's temperamental profile and using temperament as a predictor of treatment outcome.

### Keywords

Stuttering; Childhood; Temperament; Emotion; Development; Treatment

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This article briefly defines and reviews temperament and emotion and discusses their possible associations with childhood stuttering as well as implications for treatment. It is

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meant to serve as a primer to (re)introduce speech-language pathologists to psychological constructs that are receiving increasing empirical investigation relative to speech-language development and a variety of disordered populations we serve<sup>1</sup>. The focus is on childhood stuttering, particularly the preschool-age group, the age cohort when speech and language abilities are developing and developmental stuttering typically begins. As we describe below, this article neither explicates nor implies that temperament and emotion are the *sole* cause of stuttering. Instead, it suggests that temperament and emotion may be importantly associated with the onset and development of the disorder for at least some preschool-age children who stutter (CWS)<sup>2</sup>.

## Temperament and Emotion: Basic Definition and Characteristics

### Temperament

We begin by briefly discussing temperament and emotion, as well as important characteristics of these psychological constructs. Most researchers and clinicians do not conceptualize temperament as a singular trait itself, but rather as a group of related traits<sup>3</sup>. Rothbart and Derryberry<sup>4</sup>, similar to Goldsmith and colleagues<sup>3</sup>, define temperament as individual differences in emotional reactivity and self-regulation. More specifically, they describe temperament as "...individual differences in emotional, motor, and attentional reactivity measured by latency, intensity and recovery of response, and self-regulation processes such as effortful control that moderate reactivity"<sup>4</sup> (p. 207, as cited by Rothbart<sup>5</sup>). These characteristics are thought to be relatively stable over time, consistent across situations, and trait-like<sup>6</sup>. Further, there is growing consensus that temperamental traits are constitutionally- or biologically-based<sup>4,6,7</sup> and that individual differences in temperament are genetically influenced<sup>8</sup>. However, Buss and Plomin point out that the biological basis for temperament does not necessarily render these characteristics set for life<sup>3</sup>. Rather, they suggest that these individual differences may vary and are open to environmental influences.

### Emotional Reactivity and Regulation

Temperament is an overarching term for a collection of traits. With respect to emotional reactivity and regulation it can be thought of as an individual's relatively stable proclivity toward particular "types" of emotional reactivity (e.g., reaction to novelty) and regulation (e.g., shifting attention away from arousing stimuli). As such, temperament can be conceptualized as the season, that "sets" the general temperature parameters for a particular time of year, whereas emotion reactivity and regulation can be thought of as the temperature at a given moment, often following the trend of the season but capable of variability around that central tendency. As suggested above, two common components of emotion are *Emotional Reactivity* and *Emotion Regulation*. Researchers commonly compartmentalize these two emotional constructs for scientific investigations<sup>9</sup>, however, it can be argued that emotion and its regulation are inextricable, as they are co-occurring with infinite possibilities for interactions<sup>10</sup>.

For the purposes of this article, we will define both *Emotional Reactivity* and *Emotion Regulation* in an attempt to establish a common ground for their discussion. *Emotional Reactivity* can be thought of as an individual's tendency to experience frequent and intense

emotional arousal. Both negative and positive emotions are salient aspects of emotional reactivity<sup>11</sup>. *Emotion Regulation* involves the process of initiating, maintaining, or modulating the occurrence, intensity, or duration of emotional arousal<sup>12</sup>. First, it is worthy of noting that emotion and its regulation are not necessarily conscious processes. For example, Cole, Martin and Dennis define emotion as a "...process, a constant, vigilant process...which periodically reaches a level of detection for the person (i.e., a feeling) or an observer"<sup>9</sup> (p. 319). A second important consideration is that emotions are often rapidly occurring processes (on the order of milliseconds). For example, LeDoux<sup>13</sup> describes emotional behavior as "unconscious" and "quick," whereas feelings are "conscious" and "slower".

### Measurement of Temperament and Emotion

Numerous methods have been used to empirically study temperament and emotion, although an exhaustive coverage of all such procedures exceeds the current space. Certainly, caregiver questionnaires have been most widely used to study temperament<sup>7</sup>. Behavioral observations<sup>14</sup> have also been used, as well as various physiological methods such as salivary cortisol<sup>15</sup>, skin conductance<sup>16</sup>, and respiratory sinus arrhythmia<sup>17</sup>. Recently, neuroimaging<sup>18</sup> and EEG/ERP<sup>19</sup> have both emerged as measures used by researchers to study temperament and emotion. The relation among these measures may not always be straightforward and each method provides unique insights into temperament and emotional processes, with the "ideal" likely a multi-method approach, providing converging lines of evidence<sup>20</sup>, which should, at least in theory, provide a more comprehensive view of temperament than any singular means of measurement.

**Caregiver rating scales**—Caregiver rating scales have been the most widespread tools used to study children's temperament. These questionnaires assess various aspects of temperament, emotional reactivity and emotion regulation. Commonly used questionnaires include the *Behavior Style Questionnaire*<sup>21</sup>, *The Children's Behavior Questionnaire*<sup>22</sup>, the *EAS Temperament Survey for Children: Parental Ratings*<sup>23</sup>, and the *Dimensions of Temperament Survey-Revised*<sup>24</sup>. One of the assets of these caregiver reports is that they are thought to represent the "average" of repeated observations over relatively long periods of time. Thus, when assessing temperament, a construct thought to be relatively stable over time, the "averaged" nature of these questionnaires is a strength and is undoubtedly one reason such instruments have garnered attention relative to other measures. The downside of caregiver rating scales or questionnaires is that they are less sensitive detecting expressions of temperament associated with changes in specific environmental contexts or conditions (e.g., first experience at a large holiday party). Some researchers have questioned the accuracy of parent reports and suggested that parents are biased informants<sup>14,25</sup>. In contrast, Henderson and Wachs<sup>26</sup> suggest that "While parent report measures do contain some subjective parental components, available evidence indicates that these measures also contain a substantial objective component that does accurately assess children's individual characteristics" (p. 402).

**Behavioral observations**—Behavioral observations are another method used to assess temperament and emotional processes in children. Such observations can be made during a

variety of home, clinic, and experimental conditions. A major advantage is that this approach allows for the observation of temperament and emotion in specific contexts, with the downside being less generalizability across contexts and situations. One of the most widely used experimental procedures based on behavioral observations is Lab-TAB<sup>27</sup>, a procedure designed for the observation of child behavior during a variety of standard experimental situations (e.g., joy, fear, anger, activity level, interest). In general, behavioral observations are commonly coded using software designed specifically for the task (e.g., PROCODER<sup>28</sup>, Observer XT<sup>29</sup>). A major challenge with observations of children's behavior is establishing sufficient levels of inter-judge reliability, a time- and labor-intensive task. For a more detailed review of this methodology, see Rothbart and Goldsmith<sup>30</sup>.

**Psychophysiology**—Psychophysiological measures are a third means by which to assess childhood temperament and emotional processes. Methods include electroencephalography (EEG/ERP)<sup>19</sup>, salivary cortisol<sup>15</sup>, skin conductance<sup>31</sup>, fMRI<sup>18</sup>, and respiratory sinus arrhythmia<sup>32</sup> (for further review see Porges<sup>33</sup>). These measures are usually thought to be among some of the more objective indexes of emotion because they do not rely on parent or observer judgments and can be made during a variety of experimental situations; however, like behavioral observations, the generalizability of these data to other contexts is less straightforward. Another characteristic of psychophysiological measures is that they can be made with young children who have had very little experience with their speech-language disorders, which may help in better determining the “directionality effect”<sup>34</sup> (e.g., disorder → temperament/emotion vs. temperament/emotion → disorder). Using psychophysiological methods with preschool-age children poses challenges, such as optimizing participant cooperation and limiting movement that may produce artifacts in the data. Lastly, similar to behavioral measures, psychophysiological measures require trained individuals to perform data collection as well as data reduction and analysis.

### Temperament and Emotion: Implications for Speech-Language Development

We begin our discussion of the possible association between temperament, emotion and childhood stuttering by first considering how temperament may be associated with general speech-language development. Two apparent possibilities involve the notion that temperament and emotion may indirectly and/or directly impact speech-language development<sup>35</sup>. As discussed by Salley and Dixon<sup>36</sup>, a *direct* influence might consist of “... children's difficult temperaments...limit[ing] the extent to which they can process linguistically relevant information during language acquisition events” (p. 131). They suggest that, “...when children are very high in negative affectivity, a relatively greater burden is placed on their behavioral control systems, which must regulate this negative affectivity. The end result is fewer resources available for linguistically relevant activities such as paying attention to word-referent associations when learning novel labels” (pp. 131-132). As an example of such direct influence, Bloom and Capatides<sup>37</sup> reported that children who spent more time in relatively neutral affective states exhibited language achievements such as first words and vocabulary spurts at younger ages than children who spent more time in positive or negative emotional states. Of course, the notion that emotional states influence language achievement (i.e., emotion → language achievement) does not preclude the possibility that difficulty with language development may also

influence the same emotional states (i.e., emotion ← language achievement). Regarding *indirect* influences, Salley and Dixon suggest that "...the kind and duration of interpersonal exchanges entered into by temperamentally difficult children may be different than those entered into by easy-going children, and these interpersonal relationships may have differential consequences for language acquisition" (p. 132). For example, a shy child may engage in fewer communicative interactions, thus decreasing his or her exposure to speech-language and opportunities to "practice" their emerging language skills. Although the impact of temperament/emotion on speech-language development is not well understood, empirical findings discussed below suggest that there may be a relation between the two.

Generally speaking, speech-language development involves three inter-related sub-domains, that is, syntactic (grammar), lexical (words) and phonological (sounds) processes. Of these, vocabulary, or lexical acquisition and storage, has received extensive attention relative to childhood temperament<sup>38-43</sup>. Results from these empirical studies indicate that children with stronger receptive and expressive vocabularies, compared to those with weaker vocabularies, exhibited greater soothability, longer attention spans, less distractibility, greater adaptability, more positive moods, and less emotionality. Dixon and Smith<sup>39</sup> reported that attentional control and positive affect predicted language production and comprehension, a finding that led them to suggest that temperament may impact language development through attention and positive emotionality. Thus, it is possible that temperament-based "skills", such as attention and emotion regulation, or "characteristics", such as positive emotionality, may facilitate language-learning opportunities thereby influencing vocabulary development.

Regarding syntactic processing, Slomkowski, Nelson, Dunn, and Plomin<sup>44</sup> reported that affect-extraversion (high interest in persons, cooperativeness and happiness, and low fearfulness) at age two predicted both receptive and expressive language at age three and receptive language at age seven. Relatedly, researchers<sup>45</sup> have used measures such as latency to the sixth spontaneous comment during conversation with an unfamiliar experimenter to assess children's behavioral inhibition (a temperamental characteristic expressed as initial avoidance, distress, or subdued emotion when a person encounters novel people, places or situations<sup>46,47</sup>). The "latency to the sixth spontaneous comment" measure is based on the notion that behaviorally inhibited children tend to produce fewer spontaneous comments in a novel context. Therefore, the relation between language and temperament appears to have empirical support. However, the precise nature of the relation remains unclear, for example, does temperament predict language development, language development predict temperament, or is there a bi-directional relation between the two?

Recently, Conture, Kelly, and Walden<sup>1</sup> reviewed issues and empirical evidence regarding temperamental characteristics that may be related to (a)typical speech and language development. Their overview provides an in-depth description and definition of temperament and discusses many ways temperament and speech-language development may interact. They review research linking temperament and emotion to specific speech-language disabilities including specific language impairment, stuttering, and voice disorders. Therefore, whereas the current paper focuses on temperament and stuttering, there is mounting evidence that temperament and emotion may play a role in various aspects of

speech-language development as well as speech-language disorders other than stuttering. For example, researchers in Australia reported that in a sample of 4,983 children, more reactive temperaments predicted speech and language impairment, whereas more persistent and sociable temperaments were protective factors<sup>48</sup>.

## Temperament, Emotion and Stuttering

Regarding the relation between early childhood stuttering, temperament and emotion, in 2012 Kefalianos, Onslow, Block, Menzies, and Reilly<sup>49</sup> published a review of extant empirical findings in this area and tentatively concluded that there may be a relation between the two (for earlier similar discussions, see Conture<sup>50</sup>; Seery, Watkins, Mangelsdorf, & Shigeto<sup>51</sup>). The cautious nature of their conclusions was based on the small number of studies ( $n = 10$ ) reviewed as well as inconsistencies among reported findings. However, there were also consistencies. Specifically, they reported that preschool-age (CWS), compared to children who do not stutter (CWNS), exhibit (1) lower adaptability (three independent replications), (2) lower attention span/persistence (three independent replications), and (3) more negative quality of mood (two independent replications). Despite the fact that the above review was published in 2012, in the ensuing year or so at least six new empirical studies<sup>52–57</sup>, to be discussed below, have been published, improving our ability to evaluate the possible relation between temperament, emotion and stuttering.

In the following sections, we first discuss findings that have compared the temperamental characteristics of preschool-age CWS to their CWNS peers. We then discuss research on the association between temperament and emotion and changes in the frequency of stuttering (instances of stuttering) within preschool-age CWS. Table 1 summarizes these empirical studies on the temperamental and emotional characteristics of young children who stutter.

### Temperament and Emotion: Children Who Stutter Compared to Children Who do not Stutter

Evidence comparing CWS and CWNS on temperamental and emotional variables has been derived from caregiver reports, behavioral observations and psychophysiology. Results pertaining to emotion reactivity indicate that preschool-age CWS, compared to CWNS, are more emotionally reactive<sup>58</sup>, more negative in their affect/emotions<sup>57,59,60</sup>, and higher in anger/frustration, approach, and motor activation<sup>61</sup>. Relative to attentional and regulatory abilities, CWS, compared to CWNS, are less able to maintain or shift attention when appropriate<sup>61–63</sup>, more problematic on caregiver ratings of attention<sup>64</sup>, less efficient at orienting attention<sup>54</sup> (cf. Johnson et al.<sup>55</sup>), less able to ignore irrelevant background stimuli<sup>65</sup>, less adaptive to their environment<sup>59,66</sup>, less able to regulate their emotions or attention<sup>58</sup>, and lower in inhibitory control<sup>53,61</sup>. (Although not reported to date, to the present authors' knowledge, the potential role of blood glucose, possibly one salient part of the energy source for self-control or self regulation<sup>67–69</sup>, has not been studied in children, teens or adults who stutter.) In contrast to the above studies, there have been reports that CWS, when compared to CWNS, are less negative and more adaptable<sup>70</sup>, and similar in temperament and social-emotional development<sup>71</sup>. Thus, although there is not perfect consensus, there is mounting evidence—based on 12 published studies—that negative affect,

differences in attentional processes, and lower adaptability may be associated with childhood stuttering.

The above empirical studies employed caregiver reports and behavioral observations, methods that assess more *overt* aspects of temperament and emotion. Psychophysiological means for empirically studying temperament and emotion assess more *covert* aspects of these domains. As an example of this approach, researchers have measured the stress hormone cortisol and reported equivocal results indicating that CWS, compared to CWNS, exhibited (1) lower levels of cortisol during selected sampling times throughout the day (morning, noon, and evening)<sup>72</sup>, and (2) no differences in cortisol<sup>73</sup>. At present, however, it is difficult to interpret the implications of these findings because they are based on different comparison groups (i.e., use of published norms vs. control groups) as well as relatively small sample sizes (the latter calling to question a study's ability to reject the null hypothesis of no difference between groups). We anticipate that this will be an emerging area of interest relative possible associations between temperament and emotion with childhood stuttering.

### Temperament and Emotion: The Disfluencies of Children Who Stutter

Findings from recent research indicate an association between the behavior of stuttering (stuttered disfluencies) and temperamental characteristics and emotional processes. Specifically, for preschool-age CWS, their stuttered disfluencies increased (a) during a *positive* emotion condition (i.e., receiving a desirable gift)<sup>60</sup>, (b) when duration and frequency of regulatory strategies was low<sup>74</sup>, and (c) when high emotional arousal/reactivity was accompanied by lower emotion regulation<sup>52</sup>. In contrast, stuttering frequency was decreased lower in narrative tasks that followed diverting attention away from preceding non-speech tasks<sup>57</sup>. Further, more behaviorally inhibited CWS (i.e., children exhibiting strong reactions to novelty, change and difference), when compared to less behaviorally inhibited CWS, exhibited more stuttering during a conversation with an unfamiliar experimenter<sup>56</sup>. Therefore, similar to between-group differences (CWS vs. CWNS), some consistencies in the data relating temperament, emotion and childhood stuttering are beginning to emerge. Specifically, CWS' temperament and emotional processes appear to be associated with their frequency of stuttering, a finding similar to that indicating increased sympathetic arousal prior to stuttering for adults who stutter (AWS)<sup>75,76</sup>.

### Theoretical Account for the Role of Temperament and Emotion in Childhood Stuttering

Temperament and emotion are included as important causal factors in Conture and Walden's recent Dual Diathesis-Stressor Model of Stuttering<sup>2</sup>. There are three key components of this model; (1) the *diathesis* (vulnerability or predisposition for a given process or disorder), (2) the *stressor* (an event that disrupts the homeostasis or equilibrium of an individual), and (3) the *interaction* of diathesis and stressor, whereby "stress activates a diathesis, transforming the potential of predisposition into the presence of psychopathology" (p. 406)<sup>1</sup>. For preschool-age CWS, temperamental characteristics of heightened negative affect, lower adaptability to environmental change, and decreased capacity for emotion and attention

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<sup>1</sup>It should be noted that neither Conture and Walden nor the present authors are suggesting that stuttering is a psychopathology or that temperamental/emotional processes are the main/sole "cause" of stuttering

regulation can be thought of as part of the emotional diathesis that may contribute to the pathogenesis of stuttering. One might speculate that children with these proclivities or tendencies may be at increased risk for developing stuttered speech (onset) as well as negative reactions to stuttering and less resilience in coping with the disorder over time (development and persistence). Furthermore, relatively frequent and/or intense emotional responses during social-communicative situations may divert CWS's attentional resources away from speech-language planning and production, particularly during challenging conditions.

The above brief overview describes some potentially salient possibilities regarding how temperament characteristics and/or emotional processes may act as causal and/or exacerbating contributor(s) to the development of stuttering and variations in stuttering both between- and within-situations. Alternatively, one may hypothesize that differences in temperament and emotion result from experiences with stuttering.

Given the notion that temperament is a set of constitutionally-based individual differences (differences, as mentioned above, that may be genetically influenced<sup>8</sup>), can be observed from birth/infancy, and are relatively stable across time, it is unlikely that temperamental differences between CWS and CWNS at or very near the onset of the disorder are solely a result of experience with stuttering. Of course, this debate will not be settled in the present paper. However, the above review provides some insights into a few of the many possible ways in which temperament and emotion may be associated with childhood stuttering.

### **Temperament and Childhood Stuttering: Clinical Implications**

How might the various findings and/or issues discussed in this paper inform diagnostic and treatment protocols for childhood stuttering? We tread cautiously into the clinical arena based on our belief that alterations to clinical practice, as much as possible, should be grounded in sound theory, empirical findings, and evidence-based practice as well as practice-based evidence. With this in mind, especially given the nascent stage of development of empirical support for the association between temperament, emotion and stuttering, it is not feasible, possible, nor wise to presently provide extensive implications for clinical practice. For example, our present understanding of temperament, emotion and stuttering are not such that we can recommend attempting to directly modify or “train” or “remediate” emotion processes (e.g., train emotion regulation). That said, we also cannot equivocally write-off the possibility that emotion regulatory abilities may be impacted by clinical intervention(s) for stuttering and vice versa.

Indeed, one well-reasoned approach to the application of current information/understanding of the association of temperament/emotion and childhood stuttering, we believe, would be consistent with Ellis Weismer's<sup>77</sup> advice to the field of child language remediation to shift attention toward identifying “...variables that might predict which programs are relatively more efficient in producing specific desired outcomes, which may differ from child to child, rather than defend the premise that one type of approach was globally superior to any others” (p. 182, as described by Nan Bernstein Ratner<sup>78</sup>). That said, below are offered some tentative suggestions regarding potential areas in which temperament may be relevant to



clinical practice: 1) goodness of fit, 2) the child in therapy versus the type of therapy, 3) treatment outcomes, and 4) future directions. This is done with the caveat that additional, new information about temperament, emotion and their possible association to stuttering has the real potential for further modifying our suggestions for clinical practice.

### **“Goodness of fit” Between the *Child* in Treatment and the *Type* of Treatment**

A common question asked by speech-language pathologists is whether treating a child exhibiting an apparently vulnerable temperament (e.g., high emotional reactivity or behavioral inhibition) would ameliorate the child's stuttering. As mentioned above, we are not recommending direct modification of children's temperament and emotional processes. There are several reasons for this, and among them is that temperamental vulnerabilities, proclivities or tendencies do not represent, based on our present knowledge, a frank disorder. Certainly, a child's difference in approach to daily life activities may render their behaviors during these activities overtly different from their peers, but this difference, in most cases, is neither a clinically significant disorder nor psychopathology. However, a temperamental characteristic (e.g., consistently strong reaction to new situations, tasks and people) does not have to be clinically significant to impact clinical outcomes, but we presently do not know if any temperamental characteristics are important for diagnosis and treatment of stuttering (although, it is possible that with further research attentional processes, negative affect, inhibitory control and adaptability to novelty, change and differences may be found to be salient to our understanding and treatment of childhood stuttering). Certainly, at present, there are no empirical data that support the notion that systematically “training” selected temperament characteristics (e.g., effortful control) and emotional processes (e.g., emotional arousal) would appreciably impact stuttering.

Rather, we cautiously suggest that individuals' temperament be viewed not as a therapy target but an important piece of information that can be used to determine which treatment regimen might be employed to achieve the best outcome (or to help select another regimen, seemingly best suited for a child when their initial treatment, after a reasonable timeframe of application, does not result in sufficient improvement). This view is based on a well-known concept of “goodness of fit” formulated by Thomas and Chess<sup>79</sup> who posited that “goodness of fit” results when environmental expectations (e.g., covert/overt parental performance requirements) are in accord with the child's expressed temperament (e.g., emotional vulnerability).

According to this model, as Rothbart<sup>80</sup> suggests, children are considered an “...active agent in their own development” (p. 33-34), a perspective in contrast with the notion that children's individual differences are *solely* due to parental influence, or “...the child's history of rewards and punishments” (p. 30). According to Thomas and Chess, the issue was not so much the “wrongness” of the child's environment or the child's temperament as much as the *fit* or *match* between the child's temperament and the expectations/requirements of specific contexts. To clinically apply or consider such “matching,” the clinician needs to understand not only the similarities between the child in treatment and his or her peers, but also how the child may differ from other children. Such understanding may inform the clinician's decision to adjust the child's treatment regimen accordingly, if and when necessary, particularly when

progress is not being made and/or relapse occurs. For as much as we might like one standard form of treatment for all preschool-age, school-age, teenage and adults who stutter, some clients' individual differences can and do confound such strictly-adhered to standardization, just as they do for aspirin, penicillin and dietary regimens among the patient populations of medical practitioners. Or as Rothbart suggests when discussing Escalona's<sup>81</sup> notion of "effective experience," "...events in children's lives are experienced only as they are filtered through the individual child's nervous system, so that an environmental event is not the same for all" (p. 30). For example, one may speculate, indirect therapy<sup>2</sup>, compared to direct therapy, may be more effective in reducing stuttering frequency for emotionally reactive children who have greater vulnerabilities for or less resiliency to cope with everyday life hassles (e.g., getting out of bed and off to school on time), acute stressors (e.g., having a bicycle accident on the way to school) or chronic stressors (e.g., having a school teacher who routinely exhibits little tolerance for mistakes, imperfection and/or slowness to learn). This may be the case because indirect therapy is thought to impose less communicative/social requirements on the child, thus better "matching" with the child whose temperament is more reactive to stress associated with communication and social interactions (again, keeping in mind the notion that an "environmental experience is not the same for all" given each child's "filtering" the experience through his or her individual, unique "nervous system"). In other words, indirect treatment may represent a better "fit" for the child who frequently and relatively strongly exhibits emotional reactions to stress, whether everyday life hassles, acute or chronic in nature. Conversely, indirect therapy may not be as efficient or effective in reducing stuttering frequency for emotionally less reactive children, who are less prone to stress and are known to be less likely to respond strongly to environmentally stressful conditions<sup>83</sup>. For these children, direct therapy that explicitly help the children learn how to change their speech and related behaviors may represent the most efficacious route to effective change and best "fit" or match the child's temperamental and emotional characteristics.

Again, the above suggestions for matching treatment type to child are tentative until further empirical studies assess whether indirect therapy for childhood stuttering, compared to direct therapy for childhood stuttering, is more effective (short-, medium- or long-term) for emotionally reactive CWS and less effective for CWS who are less emotionally reactive. That said, the aforementioned suggestions might assist clinicians in their initial considerations regarding whether therapy should be direct, indirect or a meld of the two and when such treatment should start for the optimal therapy outcome. For example, for a CWS known to strongly react to change, the starting point of formal treatment may need to be adjusted if, on the basis of parental, teacher and/or SLP input/observations, the child is frequently and intensively expressing difficulties adjusting to a new house, new town and/or new school. In this case, treatment may need to begin once such expressions of difficulty adjusting to changes in his or her environment have subsided. Of course, at present, there are few established guidelines available to make such decisions<sup>3</sup>. This is especially true for clinicians who desire to directly treat stuttering at inception, but are reluctant to do so due to

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<sup>2</sup>Conture<sup>82</sup> (p.143-144) described indirect therapy as "any approach that does not explicitly, overtly or directly try to manipulate, modify or change the child's speech fluency in specific and oral communication skills in general." Conture also described direct therapy as any approach that "involves explicit, overt, and direct attempts to modify the child's speech and related behavior."

the possibility that this may make the child inappropriately aware of, concerned, or unduly worry about his/her disfluency, which may in turn, for some children, inappropriately focus the child on the accuracy, fluency and/or speed of their speech-language planning and production. (For further discussion of the unintended, possibly negative, consequences of treatment the interested reader is referred to related considerations in the field of psychology<sup>85</sup>.) With the above suggestions as a guide, clinicians may give some consideration to providing direct therapy to less reactive CWS but less apt to provide direct therapy to more reactive CWS (especially if a direct approach results in relapse and/or less than satisfactory outcome). In other words, such considerations could be one means for the clinician to provide a therapy best tailored to a child's specific needs.

### **Striking a Balance Between Focusing on the *Child* in Treatment and the *Type* of Treatment**

Based on the above discussion, there appears to be potential for the temperamental characteristics of preschool-age CWS to have meaningful impact on various clinical issues. For example, if a child's temperament “filters” his or her experiences, then perhaps it is possible that it may also filter the child's experiences with treatment and hence possibly impact treatment outcome. Such impact need not be deleterious, of course. Temperamental characteristics may also enhance treatment outcome or even be minimally associated with the child's treatment experiences and outcome. At this point we simply don't know. To achieve such knowledge, we will need to remember that (1) temperament is an omnibus or umbrella term for a variety of constitutionally- or biologically-based characteristics, from extraversion to self-regulation, and (2) that “individual differences” (in such characteristics) are part of the very definition of temperament.

Accordingly, not all events or experiences, whether during treatment or daily life activities, are precisely the same for all children. This is true even if all children receive the same form of treatment, individual differences in children's temperament may differentially filter their experiences with that treatment. This is not to suggest that we begin to “de-standardize” data-based, well-documented treatment protocols for childhood stuttering and start tailoring each and every child's treatment to each child's temperamental characteristics. To do so would be a rush to judgment until we know more, much more about the association of temperament and treatment of childhood stuttering. (Interestingly, there is a growing movement in medicine to do something very similar, that is, tailor well-established treatment regimens to individual client's genetic/DNA profiles).

Neither are we suggesting that our treatment protocols for childhood stuttering, standardized or not, remain treatment-centric. Instead, we are suggesting striking some sort of balance between procedural- and child-centricity in our clinical treatment of childhood stuttering. This means giving as much focus on *the child* in treatment as we do *the type* of treatment. Simply put, we need to know much more than we currently do about those temperamental characteristics of children who succeed (and fail) in treatments for stuttering, whether those

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<sup>3</sup>To these authors' knowledge, there is no across-discipline agreement regarding or set formula for making a decision about whether to employ indirect, direct or a combination of the two approaches to therapy. Factors commonly used to aid in this decision include: 1) the degree of a child's cognitive awareness and/or emotional concern about stuttering, 2) the effectiveness of previously implemented indirect therapy<sup>84</sup>, and 3) the events associated with/characteristics of a child's stuttering (e.g., time since onset, frequency and severity of stuttering, and the nature and/or frequency of parents' reactions to or concerns regarding their child's stuttering<sup>82</sup>).

treatments are based on direct, indirect and mixed models of intervention. Results of future empirical studies may indicate that temperamental predictors of success or failure in treatment are crosscutting, regardless of the nature of treatment. That would be helpful, important information. Unfortunately, at present we lack such information. In particular, we need empirical, objective information about temperament that are based on converging lines of evidence, that is, full-scale (not short-form or screening) caregiver-report-based questionnaires, coded behavioral observations and psychophysiology. This paucity of information challenges our comprehensive understanding of this association as well as our theoretical and treatment approaches to childhood stuttering. As one initial attempt to provide such information, the following section is presented.

### Treatment Outcome

In addition to the possibility that clinicians might consider matching children's temperament to the type of treatment they receive, there is some evidence that temperamental characteristics of preschool-age CWS (obtained at the time of diagnosis) may be useful as a tool to predict treatment outcome. This possibility seems consistent with the theoretical perspective that temperament and emotions may exacerbate the development and maintenance of the disorder<sup>86</sup>. In essence, through direct or indirect influences of temperament and emotion<sup>36</sup> on the development of stuttering, preschool-age CWS may either be: 1) at greater risk for persistent stuttering (regardless of stuttering intervention), or 2) less able to benefit from the positive affects of treatment. With continued empirical research in this area, the consideration of temperament data (that can be collected during a diagnostic evaluation) to predict treatment outcome may be shown to be useful for the practicing speech-language pathologist.

Recently, Richels and Conture<sup>87</sup> examined various components of diagnostic evaluations and their potential utility as predictive measures of *short-term* (data taken from the first 12 sessions of treatment) as well as *long-term* (data taken from a minimum of 12 sessions to the end of treatment) treatment outcome, with treatment outcome based on each CWSs frequency of stuttered disfluencies. In order to assess short-term change, they used a statistical procedure to group the children with different longitudinal trajectories of disfluency from the children's first 12 sessions of participation in an indirect treatment program. They identified "Improved" (n = 19), "No Change" (n = 10), and "Worsened" (n=13) groups. Findings indicated that children in the "Improved", compared to the "Worsened" group, were (a) significantly older, (b) exhibited higher percentages of stuttered disfluencies, and consequently higher severity scores, and (c) marginally lower articulation scores.

For the analysis of long-term change, these researchers assessed change in stuttered, nonstuttered, and total disfluencies over the course of treatment rather than grouping by trajectory. Unlike the case with short-term predictors of change, speech disfluencies at the diagnostic visit did not predict long-term outcomes. Given this, these researchers used "emotional" and "speech-language" variables in attempts to predict long-term change in stuttering. A regression analysis indicated that children with more expressive temperaments (i.e., lower levels of behavioral inhibition) exhibited the greatest decrease in stuttered and

total disfluencies as a result of treatment. In other words, the CWS who exhibited less proclivities to behavioral inhibition, exhibited the greatest decrease or change in stuttering (for further discussion of the possible association of behavioral inhibition and childhood stuttering see Choi et al<sup>56</sup>). Further, there was a marginally significant decrease in the ratio of stuttered to total disfluencies as a result of therapy for children with lower language abilities. These results suggest that when planning for and attempting to predict long-term change in children's stuttering, clinicians may want to also consider measures besides those related solely to speech disfluency.

As discussed by Richels and Conture, one of the most interesting results of this work (and most applicable to the current paper) was that those children with more expressive temperaments exhibited the greatest long-term decrease in stuttering as a result of treatment. The longitudinal nature of these clinical data indicate that emotional and speech-language variables have the potential to differentiate preschool-age CWS with high versus low potential for benefiting from treatment, of at least the indirect treatment studied by Richels and Conture. Obviously, this area of inquiry needs more longitudinal empirical exploration. Of course, whereas these results are seemingly applicable to clinical practice, Richels and Conture point out that they are based on two relatively small studies from one clinic and must await independent replication.

### Future Directions

This overview, and others like it<sup>1,49,51</sup> make apparent that temperament is associated with early (a)typical speech-language development, at least for some children. What this overview does not indicate, because data are not presently available, is (a) what extant theory best accounts for this association; (b) which temperamental characteristics, if any, are most salient to (a)typical speech-language development, especially stuttering; (c) whether the nature of this association is correlational, causal or exacerbating; and (d) what methods, if any, for the study of temperament and emotion are, for the purposes of clinical practice and empirical research, replicable, reliable and salient to the association of temperament and (a)typical speech-language development.

From a research perspective, investigators are encouraged to consider concurrently employing several methods to achieve a more comprehensive view of temperament. Such multi-methods approaches are not foreign to speech-language pathologists. For example, speech-language pathologists use such an approach in the study of speech sound articulation, employing perceptual, acoustic and physiological methods to circumscribe the issues under study. Investigators are also encouraged to move beyond mean difference comparisons (e.g., CWS exhibit greater negative affect than CWNS), and into the realm of within-group analysis of subtypes and/or clusters of CWS. Logistic regression analyses are well-suited to determine what temperamental characteristics, if any, predict speech-language disorder, both when tested by themselves as well as concurrently with other potential predictors (e.g., motor, language, etc.). Likewise, there is need to “shift the paradigm” such that temperamental characteristics are viewed not merely as risk but also possibly protective factors for (a)typical speech-language disorders (for example of such an approach, see Harrison & McLeod<sup>48</sup>).

From a clinical perspective, clinicians should expect empirical findings regarding the association of temperament and stuttering to continue to emerge in the coming years. As with many lines of investigation, some of these findings will be used to test extant and newly-emerging theory, some findings will be mainly descriptive in nature, some findings will have no apparent, immediate clinical applicability and some findings will likely contradict other findings. How to best evaluate this nascent field of study? Carefully, of course, employing a comprehensive, but critical view of the entirety of evidence, to best understand the whole as well as its parts.

In advance of published and/or commercially-available tests for discerning between-group (i.e., CWS vs. CWNS) as well as within-group (i.e., CWS who persist vs. CWS who recover) differences in temperament, clinicians may consider observing CWS who seem to improve versus those who do not during treatment. For example, a clinician may observe a child struggling in treatment who exhibits seemingly incompatible or contrasting (speech-language) abilities and (temperamental) characteristics. Specifically, the child may concurrently exhibit strong speech-language abilities (based on results of standardized tests of speech-language, which suggest the child's has the ability to readily communicate) and a temperamental characteristic to strongly react to novelty, change and differences. In this example, one might speculate, the child's potential for/ability to engage communicatively/socially contrasts with his or her temperamental unwillingness to do so. This may be particularly apparent when the child enters into new communication/social situations involving relatively unfamiliar conversational partners. It may, therefore, behoove the clinician to assist the child—as part but not the entirety of the child's treatment program—through the use of gentle, gradual and supportive procedures, to better deal with novelty, change and difference, especially in situations involving communication. This is but one possible example of how temperamental characteristics might interact with speech, language and fluency skills in young children, with a better understanding of such possible interactions awaiting future study.

In conclusion, the field of speech-language pathology has come a long way from early speculations that psychoanalytical constructs (e.g., arrested oral needs centering around nursing) caused stuttering, speculation that was seldom empirically examined. These early conceptualizations have gradually become overtaken by a more contemporary view of the association of temperament, emotion and stuttering. This contemporary view suggests that childhood stuttering may be associated with constitutionally-based temperamental/emotional processes, many of which are believed to be open to environmental influences. A nascent line of evidence supports this contemporary view. And although we have come a long way, we are still far from the end. More empirical studies, theories and clinical applications will need to be put forth before we better understand how, when and whether temperament takes its place under the tent of causal contributors to childhood stuttering.

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### Learning Objectives

As a result of this activity, the reader will be able to (1) define temperament, emotional reactivity and regulation; (2) summarize current research findings on the association of temperament, emotion and stuttering, and (3) discuss some possible clinical implications regarding the treatment of stuttering in the preschool-age population.

Summary of selected empirical studies of the temperament and emotional characteristics of young children who do (CWS) and do not stutter (CWNS).

Table 1

Study	Method of temperament / emotion assessment	Participants			Findings		
		N	Age	Age			
		Total CWS (n girls)	Total CWNS (n girls)	Overall Range	Mean (SD)		
		CWS	CWNS				
<i>Published empirical investigations</i>							
Anderson et al. (2003)	Behavior Style Questionnaire (BSQ)	31 (6)	31 (6)	3;0 - 5;4 years	48.03 months	48.58 months	CWS, compared to CWNS, exhibited less distractibility, nonadaptability to change, and irregular biological functions on BSQ
Arnold et al. (2011)	EEGs and behavioral observation of emotion regulation	9 (3)	9 (3)	3;0 - 5;11 years	4;5 (9) years	4;8 (8) years	No between-group (CWS vs. CWNS) difference in EEGs. Within-group: For CWS, decreased behavioral regulatory strategies related to increased stuttering
Choi et al. (2013)	Behavioral inhibition assessed by latency to 6th spontaneous utterance <sup>45</sup>	26 (4)	28 (15)	3;0 - 5;8 years	48.89 (8.00) months	46.96 (6.93) months	No between-group difference in behavioral inhibition (BI). Within-group: More CWS exhibited extremely high than extremely low BI. CWS with higher BI exhibited more stuttering than low BI CWS
Eggers et al. (2010)	Children's Behavior Questionnaire (CBQ)	58 (13)	58 (13)	3;04 - 8.11 years	5.11 (1.09) years	5.11 (1.10) years	CWS, compared to CWNS, scored higher on scales of 'anger/frustration' and lower on 'inhibitory control' and 'attentional shifting' on CBQ
Eggers et al. (2012)	Computerized Attention Network Test	41 (10)	41 (10)	4;0 - 9;0 years	6;09 (1;05) years	6;09 (1;05) years	CWS, compared to CWNS, exhibited significantly lower efficiency of the orienting network
Eggers et al. (2013)	Inhibitory control assessed via a Go/NoGo task	30 (6)	30 (6)	4;10 - 10;00 years	7;05 (1;05) years	7;05 (1;05) years	CWS, compared to CWNS, exhibited lower inhibitory control via more false alarms and premature responses, lower reaction time for false responses, less ability to adapt response style after experience responses errors

Study	Method of temperament / emotion assessment	Participants		Age	Findings		
		N	Age				
		Total CWS (n girls)	Total CWNS (n girls)	Overall Range	Mean (SD)		
		CWS		CWNS			
Embrechts et al. (1998)	Children's Behavior Questionnaire	38 (N/A)	38 (N/A)	3 - 7 years	N/A	N/A	CWS, compared to CWNS, exhibited higher activity level and impulsivity but lower attentional focusing, inhibitory control
Felsenfeld et al. (2010)	Multiple parental report measures (e.g., Child behavior checklist)	826	19,072	5:00 - 7:00 years	N/A	N/A	CWS, compared to CWNS, received parental ratings of more problematic attention abilities
Howell et al. (2004)	Behavioral Style Questionnaire (BSQ)	10 (3)	10 (3)	3:7 - 7:2 years	5;10 (1.36) years	5;4 (1.16) years	CWS, compared to CWNS, more active and negative as well as less adaptable and persistent
Johnson et al. (2010)	Behavioral observation of emotion during disappointing gift procedure	16 (5)	16 (5)	3:0 - 5;9 years	46.69 (8.55) months	48.44 (8.89) months	CWS, compared to CWNS, exhibited more negative emotional expressions after receiving an undesirable gift
Johnson et al. (2012)	Reaction time and accuracy during two tasks of shifting and focusing attention	12 (0)	12 (0)	3:0 - 5;11 years	58.00 (6.78) months	58.83 (9.20) months	No significant between-group differences in reaction time or accuracy
Karrass et al. (2006)	Behavior Style Questionnaire	65 (22%)	56 (41%)	3:0 - 5;11 years	48.89 (9.56) months	48.9 (8.58) months	CWS, compared to CWNS, were more emotionally reactive and less able to regulate their emotions and attention
Lewis and Golberg (1997)	Parent Childhood Temperament Questionnaire for 3-7 Year-Olds	11 (2)	11 (2)	35 - 58 months	46.55 (N/A) months	46.36 (N/A) months	CWS, compared to CWNS, are less negative and more adaptable
Nitrourou et al.(2013)	Behavior observation during emotion eliciting experimental paradigm	18 (4)	18 (4)	3:0 - 5;11 years	51.67 (9.71) months	53.61 (9.49) months	CWS, compared to CWNS, exhibited more negative emotion and self-speech. Within-group: CWS exhibited lower stuttering frequency during narrative tasks when they diverted their attention from a preceding emotion-inducing non-speech task
Ortega and Ambrose (2011)	Salivary samples collected four times daily	9 (3)	N/A	6 - 11 years	Males: 9.2 (N/A); Females: 9.5 (N/A) years	N/A	CWS, compared to published references established for normal children, exhibited significantly lower, though

Study	Method of temperament / emotion assessment	Participants				Findings	
		N	Age	CWS			
				Total CWS (n girls)	Mean (SD)		
				Overall Range			
Reilly et al. (2013)	30-item Short Temperament Scale for Children	181 (N/A)	1438 (N/A)	2 - 4 years	N/A	N/A	within normal limits salivary cortisol responses within normal limits salivary cortisol responses
Schwenk et al. (2007)	Behavioral observation of attention and adaptation to background stimuli	18 (8)	18 (8)	3;0 - 5;11 years	47.1 (8.7) months	51.1 (9.9) months	No between-group differences in temperament and social-emotional development
Van der Merwe et al. (2011)	Salivary cortisol and child- and parent-based tests of anxiety	7 (2)	7 (2)	N/A	4;1 (N/A) years	Matched	CWS, compared to CWNS, less able to ignore irrelevant background stimuli
Walden et al. (2012)	Behavioral observation of emotion and emotion regulation and Children's Behavior Questionnaire	19 (6)	22 (13)	37 - 60 months	46.5 (N/A) months	49.3 (N/A) months	No significant between-group differences in trait and state anxiety
							For CWS, stuttering frequency was higher when high emotional arousal was accompanied by low emotion regulation

Note: All reported values for chronological age are as reported in the original study.