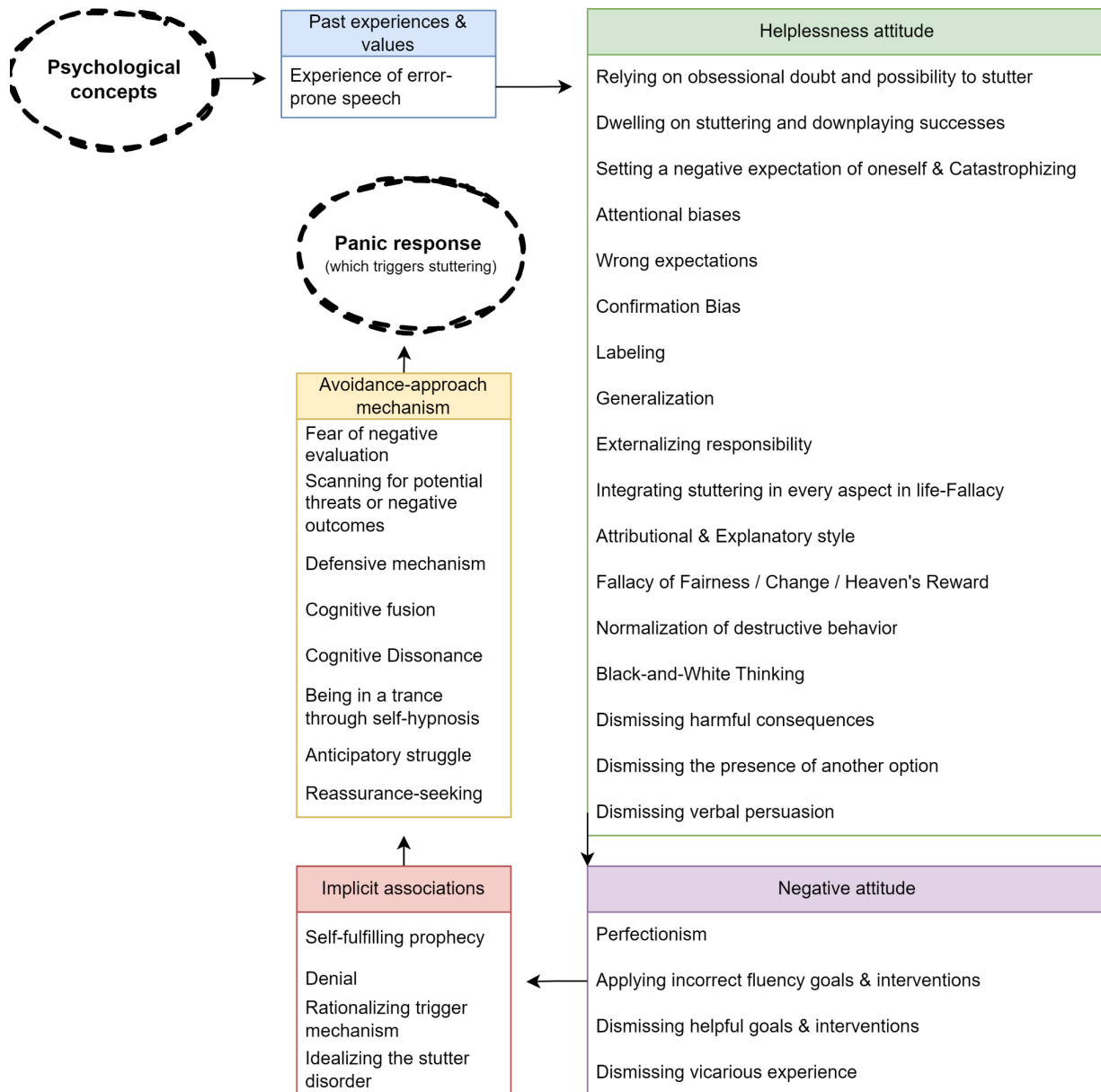


Trigger mechanism of stuttering

Making progress towards stuttering recovery



Past experiences & values:

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Self-fulfilling Prophecy:

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Helplessness: (similar terminologies: Conditioned defeat / Defeatism mentality)

Learned helplessness leads to:

- habitually choose to do nothing
- look to others to do it for them
- feel themselves incapable of doing anything to deal with their stuttering
- express skepticism over the therapist's ability to come effectively to grips with the problem
- become convinced that their stuttering cannot be significantly improved
- have strong tendency to indulge in self-pity and complain about how fate has held them back or done them in
- don't assume responsibility for controlling and changing their mindset and attitude, remedial activities and mindful self-monitoring
- assess the severity of the conflict to inhibit motor execution
- become more fearful of triggers, and overly dependent on compensatory strategies and avoidance-behaviors - for the unique role in the timing (synchronization), coordination and emotional aspects during stuttering
- show a variety of symptoms that threaten their mental and physical well-being
- are less likely to change unhealthy patterns of behavior
- tend to be poor at problem-solving and cognitive restructuring
- are not inclined to learn or engage in new, potentially effective behaviors
- encourages punished responses (instrumental coping behaviors, anxious efforts and voluntary avoidance) in response to threat. This leads us to feel threatened by our own unwanted responses leading to avoiding voluntary self-control
- manifests as skepticism about therapy effectiveness
- contributes to feelings of hopelessness, and low self-worth
- makes it more difficult for cultivating a growth mindset, and reframing setbacks as learning opportunities
- PWS don't aim to be immunized against the perception that events are uncontrollable by increasing their awareness of previous experiences, when they were able to affect the desired outcome

Positive effect of dealing with learned helplessness:

- we are more likely to attribute failure to a lack of effort
- we approach threatening situations with the belief that we can control them
- we focus more on the skills we have, rather than the skills we lack
- it becomes difficult for us to lose faith in our own ability after a failure
- we don't view difficult tasks as personal threats or shy away from them
- we don't underestimate the ability to complete tasks

- we don't discourage growth, skill development or motor learning

Dismissing associative learning:

Dismissing speech motor learning when they successfully execute feared words, rather than:

- with a sense of personal accomplishment that they resolved the trigger mechanism in that moment
- developing strong self efficacy beliefs due to the attainment of a sense of personal mastery. The stronger the self-efficacy or mastery expectations, the more active the efforts
- Not being outcome independent: feeling successful regardless of the outcome. The doing is more important than the result. I may have failed achieving my goal, but I gave it my best shot. There's a difference between telling yourself, "One outcome is great and the other is a disaster" [terrifying] and "Both outcomes are fine, though one might be better" [reassuring]
- Feeling the need to use associative learning to develop memories of words (or situations) that they have previously stuttered on which, when coupled with perceived negative consequences for stuttering, makes the speaker highly sensitive to upcoming moments of stuttering via their speech monitoring system

Dismissing verbal persuasion:

- Verbal encouragement by parents or clinicians (or a role model) (such as, 'slow down') bolsters their clients' self efficacy through the suggestion that they can effectively cope with a situation perceived to be threatening

Setting a negative expectation of oneself & Catastrophizing:

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Attentional biases: (focusing on information that aligns with their existing beliefs while ignoring positive beliefs / consequences / evidence / the bigger picture)

- The need to pay more attention to fluency

Dwelling on stuttering and downplaying successes:

- Exhibiting more negative emotions when exposed to negative stimuli. Expressing less positive emotions in response to positive stimuli

Negative Attitude:

- It promotes fear of failure, And, it discourages reward processing and incentive learning, such as: (1) Punishing for spontaneous self correction: "Not a great job that you fixed that bumpy word all by yourself" (2) Ignoring self evaluation: "Were there any bumps there?" (3) Not acknowledging: "That was smooth" (positive reinforcement / operant conditioning) (4) Not requesting self-correction "See if you can say that without the bump".

Defensive mechanism:

- anxious individuals (1) perceive more threatening cues in their environment (vigilance) and then quickly shifting their attention away from that stimulus (avoidance), and (2) tend to prioritize attentional processing of negative stimuli

Scanning for potential threats or negative outcomes:

- Giving attention to tracking or checking on the result of the movement that takes place, rather than only giving attention to the parameters of movement that are established before the action where sensory information is used prior to the initial decision for action but is ignored while action is in progress. Scanning for listener's frowning, disinterest, or boredom. Thinking that stuttering makes them less competent or less likable - undermining their confidence.

Obsessional doubt and possibility to stutter:

- Which is based on a good story, not on sense information or a sequence of events; We make the trigger more vivid, personal and meaningful - resulting in making the sensation of loss of control more real or giving it more credibility. Viewing triggers as real/powerful rather than for what they are (just meaningless passing thoughts or feelings)

Externalizing Responsibility:

- Not feeling responsible for self-control in the successful management of stuttering. Blaming things that they cannot control, rather than addressing internal locus of control. For example, attributing stuttering to: global causes, structural brain differences, neurology, temperament traits, genetics, being inherently shy or socially anxious, risk factors, persistence - rather than blaming one's lack of effort to address the trigger mechanism. Blaming speech planning for right-wards lateralisation (while in actuality the language is mostly left lateralized in both PWS and fluent speakers over frontal, temporal and parietal regions without significant differences between groups during silent inner speech production). Rather than considering each unique genetic: Some genetics contribute to avoidance-behaviors, or those that contribute to speech, or language, execution, planning, sensitivity to environmental and psychological stimuli, auditory processing, sensorimotor processing, unduly perfectionistic traits, a protection mechanism, etc etc. The list continues. but, it's dangerous to lump all genetics into one big category and then attribute stuttering to some generic 'global factor', rather than considering the unique elements that really lead to overreliance on the trigger mechanism.

Explanatory style:

- people with a pessimistic explanatory style tend to see negative events as permanent ("it will never change"), personal ("it's my fault"), and pervasive ("I can't do anything correctly")

Attributional style:

- attributing stuttering to global causes rather than addressing the trigger mechanism

Relying on compensatory strategies Fallacy:

- Needing positive (confident) feelings/thoughts. The need to believe that your strategy works (otherwise we prioritize the trigger mechanism). Viewing anticipation as helpful (e.g., scanning for anticipation to control stuttering). Feeling the need to rely on the sensation of loss of control - in order to execute speech movements. The need for interval-based (or other maladaptive) timing mechanisms over beat-based timing mechanisms - to execute motor programs. PWS initiate the motor program before preparation of the motor plan

Incorrect fluency goals:

Misusing helpful self-change interventions:

- When identical procedures are presented to the client with different rationales, it results in different understanding, responses, and learning. When a person who stutters (in stuttering therapy) is told to speak slowly so that (a) he can better attend to and analyze what he does in speaking, or (b) he can better cope with neurological spasms, or (c) he can better control his hostile reaction to the listener - depending on a, b or c, very different incentive learning takes place

Dismissing helpful goals:

Dismissing helpful self-change interventions:

- Dismissing the power of suggestion. Dismissing the need for natural, spontaneous, effortless and normal, uncaring and subconscious speech production. PWS might not implement the following tools to represent the internal timing cue: (1) Visualize that they are speaking chorally whereby they execute motor movements on the timing of the group's speech rhythm, (2) use the "stress" in a phrase as the internal timing cue, (3) focus on prosody as the internal speech timing cue, (4) use a cognitive condition as a timing cue: (a) whenever my articulatory starting position is set, I start initiating motor programs (b) or after taking a breath I initiate motor programs, (c) or immediately on the exhale, (5) predict the timing of upcoming events. Rather than (what many PWS seem to do) (a) integrating feedback-perception and secondary behaviors into the internal core timing cue (for example, eye blinking and hand-movements in an attempt to affect the motor execution timing), (b) or integrating anticipation in the timing cue

Dismissing 'imitating recovered individuals':

- They fail to immerse themselves in the trial-and-error experience of recovered individuals, which is: a conscious decision to change, deliberate conscious or cognitive effort was required such as maintaining a perception as a normal speaker, and the recovered individuals believed that they played some active role in their own recovery. Not viewing 'addressing the trigger mechanism' as a characteristic that is assumed to be essential for normal fluency. Feeling no desire to forget that you used to stutter - especially during difficult speaking situations. Feeling no need to think: There's nothing hindering me. The flow is easy and perfectly normal. It doesn't matter what kind of a situation I'm in. Today I can talk with male, female, child, whatever. I don't have any difficult speaking situations. As far as speech goes . . . I feel like I can carry on a conversation with just about anyone. Talking to people is easy. I've really gotten so thoroughly over that, that I really can't point out any particular times where I'm concerned about whether or not I am going to stutter, or whether or not the quality of

my speech is good. I literally don't give it a second thought. It's hard to remember exactly what stuttering sounded like. I really never think about my speech. I'm not even on guard anymore. I feel very good about how I sound. The hardest part of talking has nothing to do with stuttering. The most difficult part of talking is to not talk so much. It's knowing when to be quiet. If you get me started, you can't shut me up. It feels so good to be able to talk and not stutter. I'm happy that I don't have a stutter problem anymore. I perceive my speech as fluent, relaxed, and easy or free flowing. Naturally fluent speech is produced by speakers who feel, think, and behave like normally speaking individuals when they talk. It is not so much about refining motor skills, rather it's about altering your entrenched belief that stuttering "just happens" to you and is beyond your control. Achieving naturally fluent speech patterns and all the psychological domains of normal speaking might be possible for you. Focusing on erasing the self-concept of a "stutterer" and the feeling that stuttering is still there, just waiting to resurface. Feeling the need for defensive behaviors beyond freezing, such as exhibiting more escape behaviors and conferring a long-term protective or adaptive state that promotes increased cognitive flexibility.

Dismissing vicarious experience:

- through vicarious experiences and social comparison, recovered individuals make inferences about how others resolve the trigger mechanism and activate associative motor learning. By observing others achieve success with sustained effort and attention to the task at hand, individuals may generate beliefs about their own personal goal attainment. In recovered individuals, self-efficacy increases by modeling, such as, "If they can do it, I can do it as well"

Reassurance-seeking:

- PWS scan for threat/anticipation because they perceive this act as 'new information-seeking' and reassurance-seeking

Perfectionism:

- The need to excessively (1) reduce errors/disfluencies, or (2) speak important words more carefully, clearly, accurately or appropriately

Control Fallacy:

- Failing to see that stuttering is the outcome and that we cannot control the outcome; Failing to see that stuttering is triggered by underlying psychological concepts that we can control. The need to get rid of triggers (or change them), rather than mindfully accepting them. Dismissing the positive attitude: 'I will communicate to the best of my ability'. Feeling the need to convince yourself that anticipation is not real, rather than (1) accepting such intrusive thoughts/feelings mindfully, curiously, non-judgmentally and with compassion. Research has shown relapse is more likely among those who exhibit an external locus of control

Fallacy of Fairness:

- Rationalizing not addressing the trigger mechanism because non-stutterers also don't do it - otherwise it is not fair

Fallacy of Change:

- Expecting the experts to change your speech, rather than you yourself changing your trigger mechanism

Fallacy of Heaven's Reward:

- Expecting cosmic justice where they believe that their struggle with stuttering has a higher purpose: "God made me this way, otherwise I'd be too powerful"

Anticipatory struggle:

- Believing that speech is difficult

Avoidance-approach mechanism:

- you instinctively do not want to produce the word (i.e., do not want to stutter), when you are given a cue of the imminent requirement to produce anticipated words

Integrating stuttering in every aspect in life-fallacy:

- Integrating (and reinforcing) the trigger mechanism when increasing self-esteem, speaking confidently, communicating effectively, and advocating meaningfully with the aim of improving quality of life, rather than addressing the trigger mechanism and rather than unlinking the trigger mechanism from those elements. Aiming to reduce fear of stuttering but without addressing the underlying trigger mechanism of the primary deficit in stuttering

Idealizing compensatory strategies and avoidance-behaviors:

- Thinking: 'Compensatory strategies or avoidance-behaviors are enough - to hide my stuttering or pass as fluent'

Generalization:

- Through generalization, many stimuli acquire the capability of triggering anxiety that results in stuttering;
- Seeing every stutter as evidence of failure.
- Prioritizing generalized techniques, rather than an individualized approach based off of your own experience and opinions (such as, overcoming situational triggers rather than changing speech-related behaviors)
- not transferring the belief to other contexts in terms of application of the skills to similar or dissimilar tasks. If you experience a successful execution of feared words, you do not instill a generalized sense of self efficacy to transfer to activities with similar task requirements. PWS don't increase self-efficacy by viewing challenges as things that are supposed to be mastered rather than threats to avoid
- PWS generally don't think in terms of: if recovered individuals and non-stutterers can do associative speech motor learning, or address the trigger mechanism, I can do it too

Normalization:

- believing that certain destructive behaviors are acceptable because we perceive "being a stutterer" as a moral act

Black-and-White Thinking:

- Viewing stuttering in extremes, rather than recognizing it as a spectrum. Thinking: I'll either stutter or speak fluently, rather than viewing the trigger mechanism as a spectrum

Confirmation Bias:

- interpret information in a way that confirms one's preexisting beliefs. Perceiving ambiguous information as threatening (e.g., a listener's neutral facial expression may be misinterpreted as a sign of disinterest or boredom), and neglecting positive social cues; "signs of having been discredited". Implementing secondaries intensifies the impression of "getting stuck".

Implicit Associations:

- associations between concepts with certain responses

Labeling:

- Forming a mental representation of the self as seen by others in which one views himself as anxious or incompetent
- The way we define "stutterer"
- Labeling mild stuttering as a disorder - resulting in identifying strongly with the trigger mechanism.
- We might not stutter if we would completely forget that we are a person who stutters. So, in a way, 'perceiving ourselves or labeling ourselves as a person who stutters' makes us remember that we are a person who stutters, reinforcing the trigger-response mechanism
- perceive themselves to be abnormally error-prone, rather than accepting that their language and speech production capacity is mildly impaired
- Viewing stuttering as an identity, rather than a behavior

Wrong expectations:

- Interpreting blocks or a tense voice as signs of potential relapse and it gives the impression of not being able to get the sound out
- PWS might expect that, should our fluency improve, the self-image would automatically follow and get better. However, that's not at all a foregone conclusion.
- Believing that recovered individuals by luck of the draw automatically normalized neural differences - rather than attributing it to a psychological construct-trigger mechanism - that they might have resolved.
- Not believing in late recovery - However, it may be worthwhile to consider that late recovery is relatively rare, but does occur, and that the importance of late recovery lies in active cognitive and behavioural changes.
- Believing that recovered individuals still sound unnatural or are perceptually different. However, research findings show two different groups of recovered individuals, the latter group consisting of recovered individuals who reported no tendency to stutter - were not perceptually different and just as natural sounding as normal speakers.
- Not believing that you play some active role in your own recovery

- Interpreting blocks or a tense voice as signs of potential relapse and it gives the impression of not being able to get the sound out
- Perceiving all tension as a threat. However: not all tension is necessarily inherently harmful. Some tension is actually normal. It provides the energy we need to tackle new challenges. Without it, life would be dreary and aimless

Fear of negative evaluation:

- believing that others will judge them negatively due to stuttering & feeling pressured to speak fluently, and overestimating its consequences.
- Underestimating our capacity to speak and overestimating the anxiety from social constructs
- Criticism or negative evaluation as inherently painful to one's self-worth

Being in a trance through self-hypnosis:

- alluding to the idea of stuttering "always being there" in some capacity [enduring presence], even when experiencing fluent speech, thereby amplifying anticipation of future stuttering occurrences.
- similar to a hypnotist who is suggesting to someone in a trance - to grab a glass of water off the table that weighs a ton. The person in a trance tries, but is unable to lift the glass, as some muscles try to lift the glass while other muscles resist it - because of the impression that the glass weighs a ton. This is similar to how people who stutter are under the impression that a feared word is difficult, or labeling oneself as a person who stutters leads to a stutter mindset (or stutter state) subconsciously believing that "stuttering is always there" in some capacity - which leads to the onset of a trigger mechanism - resulting in cognitively centering and identifying with one's stutter experiences
- Labeling stuttering as a disorder might create a general, looming expectation that they will stutter. Leading to subconsciously telling yourself that you won't be able to control (or lower) the variable release threshold (or unlearn classical conditioning).
- Believing that one's feedforward system is unreliable unless they use unnecessary compensatory strategies
- Not speaking in the way that they imagine controlling their feedforward system (an image in which they already put complete faith in the feedforward system)
- subconscious image of yourself as a stutterer: if the stuttering stops for a long enough time, it is as if the subconscious becomes 'worried'; it receives a message that the status quo is changing. The subconscious then tries to restore the status quo by increasing base-level tension. This higher base-level tension has a twofold effect: renewed stuttering, plus a disruption of the newly acquired fluent behavior. As a result the PWS resumes his stuttering and the subconscious is 'reassured'
- PWS may find it difficult to really come to terms with his new fluency achieved. If we speak fluently, we likely think: "But this isn't me!". Because our mind/body wants to subconsciously get back to that incorrect self-image of ourselves stuttering. Then the mind/body might use all the tricks there is, such as, physiological arousal, or bringing us further from reality and more into stutter problem land
- A reliance on judgements of physiological arousal (stress and anxiety) to decide whether

or not to initiate speech. The need to excessively use interoception: the ability to perceive each subtle bodily changes (e.g., cardiovascular and other physiological changes)

- The psychological transition from stutterer to a more fluent speaker may have been too much (breaking away from the 'stutterer's mentality' is a long-term process requiring a sense of purpose and willpower)
- Perceiving change (or improvement) as a threat: Change involves unfamiliarity and uncertainty, the underlying question being: 'Will I be able to cope with the new situation?' Fear of freedom or fear of the unknown, such as "I'd rather stay here, in a world that I know. Yes, I stutter, but I can cope to some extent." PWS don't ask themselves a very basic question: Do you REALLY want to stop stuttering?
- Identifying, generalizing and comparing your own stuttering with other people who stutter (that persisted) - in order to immerse oneself totally in the world of the person who stutters (imitation phenomenon). Resulting in copying his mannerisms, way of moving and speaking, and finding out about his life circumstances - his family, where he lived etc etc. This leads to taking on that person's personality and experiencing the same emotions that he would have felt (this technique is called Stanislavski technique). A trigger mechanism, accompanied by emotions, secondary symptoms and the cognitive concepts to view this as quite traumatic, might precipitate a phasic drop in synaptic dopamine, which would then impair basal ganglia functioning, and could then result in the production of real blocks
- Looking from an animistic view: 1) referring to "my stuttering" as if it is a living entity located somewhere in the body, acting independently, appearing on its own 2) acting as if there is an outside force that makes you stutter; 3) referring to "words get stuck in my throat" as if words are small objects, not sounds resulting from muscle movement. For example: "My jaw got stuck" rather than "I stopped moving my jaw" during a block

Dismissing harmful consequences:

- Not reflecting on the harm 'the trigger mechanism' could cause to the self and loved ones.

Dismissing the presence of another option:

- Research found that individuals who were aware of a second option (who engaged in the exact same speech task) were less frustrated and performed better. Example of another option: addressing the trigger mechanism.

Denial:

- PWS might be in denial that they subconsciously need, desire or rely on the trigger mechanism.
- denying that a trigger mechanism decreases performance on forward memory span, inhibition and attention, and executive function.
- denying that some aspects of stuttering are your own doing

Idealization of the disorder:

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Cognitive Dissonance:

- discomfort due to conflicting beliefs, values, identities, or behaviors. Inconsistencies between decision-making, motivations, or expectations—action-based cognitions—and difficulty resolving those conflicts interfere with goal-directed actions

Rationalizing the trigger mechanism

- Learning that in certain social situations certain verbalizations are likely to be punished rather than rewarded - now, a conditioned reflex develops that inhibits them from producing those verbalizations in situations where punishment is likely to result
- Conforming to what is socially acceptable: We might elicit hurtful responses from those who accept the way they speak and stutter openly
- Dismissing how we speak fluently when choral reading
- The need to assume that you might stutter for the argument that you identify as a PWS
- **Missing out:** Thinking about what you are missing out on: “I’m not capable of verbalizing complicated emotions in ways that many peers can”. Comparing your stuttered speech to that of non-stutterer’s speech, while having feelings of missing out; you perceive that fluent speakers have easier communication and social interactions, and thus, this comparison can create a sense of loss or exclusion, as you might feel limited in expressing yourself.
- If PWS fail to improve fluency and it causes frustration, it may cause an unjustified sense of failure in clinicians or family. This experience can contribute to clinicians’ perceptions that they are “bad” at stuttering therapy. Leading SLPs to promote misguided therapeutic objectives. Such as, dismissing the trigger mechanism
- Feeling guilty of achieving stuttering remission, and so they reinforce a sense of imposter syndrome, feeling like attaining freedom but without closure.
- Believing that your new way of speaking makes your speech not understandable enough to listeners
- Doing what the prediction says by giving arguments like 'because of my bad experience' and 'because of my stutter problem'
- Increased awareness that others notice our speech as atypical
- Listeners judging us
- Parental disapproval of normal disfluency
- Non-stuttering people perceive PWS to be more anxious, introverted, nervous, nonassertive, shy, less competent and less educated. These negative perceptions of stuttering, and the stigma around it, may lead to negative employment outcomes for people who stutter
- Listeners reactions (disruptive communication, secondary gains, teasing/bullying)
- **Manipulative stuttering:** using stuttering to gain sympathy, avoid responsibilities, or to manipulate how others perceive them - especially when they feel vulnerable or misunderstood (like, when they have social performance limitations & difficulties with

social or speaking performance)

- Realizing that fluent individuals demonstrate more physiological and emotional reactions to stuttered speech, including increased skin conductance, lower mean heart rate, and more negative emotional reactions (due to negative stereotypes, uneasiness and uncertainty about how to respond to stuttered speech, and mistaking stuttering for signs of mental or emotional instability)
- Fear of negative evaluation
- Addressing the trigger mechanism requires overloading of higher-level cortical areas such as pre-SMA. The need to speak more automatically on auto-pilot makes it more difficult to activate incentive (or reinforcement) learning to address the trigger mechanism. Research findings suggest that cognitive and higher-order functions could be involved in mediating recovery
- Social persuasion: media and SLPs discouraging stuttering recovery
- Not welcoming any level of discomfort and instead trying to aim for feeling perfectly comfortable. What leads to emotional disturbance is the idea that it is awful and catastrophic when things are not the way one would very much like them to be
- Linking speech performance to self-esteem: seeing ourselves as inherently flawed or broken (low self-worth) if we stutter more
- Believing something is wrong with the body, rather than blaming the psychological concept that trigger stuttering
- You always have the last word/comeback about why you will never achieve stuttering remission or a state closer to early onset stuttering
- Thinking that it's unethical for you to achieve stuttering remission. For example, because you remember speech therapies warning you that aiming for more fluency results in more stuttering and more trauma (rather than viewing this as choral reading where one prioritizes fluency over speech accuracy which can be effectively combined with 'not caring about stuttering if stuttering occurs')

Panic response

Impairing executive functions

Impairing inhibitory control:

- the ability to ignore irrelevant information or suppress a dominant response, and elicit a more appropriate response. Those who have strong inhibition skills, can better resist the tendency to act on their first impulse and suppress distracting information to remain focused on a task - which is required for fluent speech production

Impairing working memory:

- temporarily storing information (short-term memory) and then manipulating it during a conversation: people hold in mind information they have already heard and then relate that to what they are hearing now, while also considering their own response. It's required for fluent speech in terms of auditory-perceptual processing and phonological

encoding. Impaired resource allocation ability leading to the struggle to plan or execute speech/language and attempt to manage fluency breaks resulting in overutilizing limited executive function resources (e.g., attention), to compensate for impaired fluency processes. (1) Shorter memory spans for phonologically dissimilar words, (2) being less affected by the phonological and semantic qualities of the words, (3) reduced verbal short-term memory capacity associated with difficulties with phonological or semantic processing, (4) more phonological errors, producing words less accurately and more slowly, and thus impairing phonological working memory, (5) recall accuracy being significantly lower, (6) recall significantly fewer words, and thus addressing reduced memory capacity

Impairing cognitive flexibility/shifting:

- builds on inhibition and working memory to enable flexible switching from one perspective, representation, or rule to another e.g., switching gears or approaches when something is not working, changing their thinking when new information comes along to challenge their current perspective, and shifting from one topic to another in conversation. Cognitive flexibility/shifting is required for fluent speech production: (1) managing errors/disfluencies by adjusting their response, and continuing speaking without losing focus, (2) improvised speech: adjusting to these spontaneous changes without hesitation or speech interruptions, (3) managing cognitive conflict caused by triggers (this includes the avoidance-approach conflict that triggers stuttering), (4) adapting to negative listener reactions, and (5) reduced ability to switch focus from stuttering.
- Impairment then leads to:
 - reflecting an increase in cognitive control, sensitivity to threat and errors, error awareness and motivational significance of errors - which could then signify subjective/emotional evaluation of making an error
 - reflecting an increase in negative reactivity, lower positive reactivity, and lower self-regulation
 - reflecting distinct physiological patterns in emotion reactivity and social anxiety
 - affecting stimulus evaluation, and response selection and inhibition
 - increasing a higher number of false alarms, tradeoff between speech accuracy and task performance, being prone to more negative emotional reactions to their own stuttering