



# A Two-Session Hierarchy for Shaping Successive Approximations of Speech in Selective Mutism: Pilot Study of Mobile Apps and Mechanisms of Behavior Change

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Selective mutism (SM) is an anxiety disorder marked by withdrawal of speech in particular social situations. Treatment is often difficult, requiring attention to several characteristics particular to the disorder. Therapeutic tools and activities such as games and mobile applications (apps) may be particularly advantageous to behavioral therapy for SM. A 2-session hierarchy for shaping successive approximations of speech in SM was piloted with 15 children, 5 to 17 years old, who were randomly assigned to shaping while using mobile apps, other therapeutic tools/activities, and reinforcement alone. Very strong treatment gains were observed: 13 of 15 (88.7%) children completed the hierarchy during the first session and 14 (93.3%) did so during the second session, with the final child completing all but the final step (i.e., to ask and respond to at least 5 open-

ended questions). Moreover, all 15 children spoke to the clinician within 59 minutes of treatment ( $M = 17$  minutes), and 14 (93.3%) children held five, 5-minute conversations with additional unknown adults during the second session. This occurred regardless of the inclusion of therapeutic tools/activities, although preliminary patterns of responding were observed such that children shaped while using mobile apps tended to show less self-reported and physiologically measured anxious distress. The utility of therapeutic activities and mobile apps when treating SM is discussed as well as areas for future research.

*Keywords:* selective mutism; treatment; mobile app; technology; mHealth

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Selective mutism (SM) is an anxiety disorder marked by a consistent failure to speak in certain social situations during which speech is expected (e.g., at school), despite speaking in others (e.g., at home). This often results in significant impairment in academic and/or social achievement (American Psychiatric Association [APA], 2013). SM typically develops at a young age (i.e., 2.7 to 4.1 years) and its associated early impairment may inhibit social and scholastic development as children age (Cohan, Price, & Stein, 2006; Garcia, Freeman, Francis, Miller, & Leonard, 2004; Viana, Beidel, & Rabian, 2009). As such, early identification and effective, efficient intervention for children who develop SM is critical.

The treatment of SM is often difficult and there are several factors that inform the behavioral conceptualization of SM and contribute to the development and maintenance of the disorder that should be targeted as a part of treatment. These include positive and negative reinforcement for not speaking in certain settings (see Mowrer's two-factor theory; Mowrer, 1947), children's resistance to treatment (Krysanski, 2003), and potentially, the child's reputation or identity as "the kid who does not talk" (Bunnell & Beidel, 2013). Further, as proposed by Bunnell and Beidel, "adult attention/pleas to speak often develop a paradoxical behavioral response from the child (i.e., as the adults plead with the child to speak, that attention may reinforce lack of speech)" (p. 292). Finally, children with SM often experience elevated levels of social anxiety, which may increase distress and reluctance to engage in treatment that requires exposure to feared stimuli—in this case, speaking in uncomfortable situations (see Viana et al., 2009, for a review). Meta-analytic results support behavioral intervention as the most effective approach for treating SM (Zakszeski & DuPaul, 2016), but the unique application of intervention strategies has not been well demonstrated or documented in the already sparse treatment research literature.

Successful behavioral treatment of SM includes a combination of several approaches, approximately tailored to each child with the goal of producing verbal output. The first of these often includes contingency management, where rewards are contingent upon compliance with directions from the therapist and/or caregivers (e.g., to produce verbalizations). Over time, rewards become contingent upon reaching treatment benchmarks of increasing difficulty (e.g., speaking at louder volumes and verbalizing words rather than sounds). This may be likened to rewarding successive approximations of speech, or shaping, although speaking to unfamiliar people is the "new behavior" being learned in this process. The next step is stimulus fading, or progressively introducing additional persons or settings as the child speaks to someone with whom (s)he is comfortable speaking. Continued practice and exposure to speaking with others can then be used to generalize and maintain speaking behaviors. Therapeutic tools and activities (e.g., audio/video recorders, flash cards, radios, and interactive games) that promote verbal output are commonly used as an adjunct to therapy, and can be helpful in expediting and maximizing treatment outcomes (see Bunnell, Procci, Beidel, & Bowers, 2016, for review).

Technology-based resources (e.g., smartphones, tablets) may be particularly advantageous in the behavioral treatment of SM because they provide

numerous free-to-use and inexpensive apps that can be used to promote verbal output, and because children with SM are familiar with, and regularly use them (Manivannan & Fails, 2015). Thus far, two case studies have examined the utility of mobile apps in the treatment of SM (i.e., Bunnell & Beidel, 2013; Bunnell et al., 2015). The first study resulted in the successful treatment of a 17-year-old girl with SM who was previously unresponsive to pharmacological treatment and play therapy. Following limited treatment gains using exposure therapy for social anxiety (i.e., based on an extinction paradigm), the treatment plan was reconceptualized and the authors began rewarding successive approximations of speech (i.e., shifted the focus toward encouraging verbal output) while using mobile apps and a shaping hierarchy. The patient was speaking in a conversational tone and using complete sentences by the end of the first treatment session (Bunnell & Beidel, 2013). The second study replicated these findings in four children with SM. All children spoke audibly to an unfamiliar adult (i.e., the clinician) within 40 minutes of the first treatment session. All children also spoke audibly to the clinician and at least one other unfamiliar adult ( $M = 13$  adults) during the first 14 minutes of the second treatment session (Bunnell et al., 2015). Children in both studies reported minimal anxiety levels during sessions that included the use of mobile apps.

The rapid *initial* treatment gains observed in these studies are highly encouraging, particularly because children in both studies had not spoken to unfamiliar adults or peers before treatment. However, the studies are limited by a lack of comparison to children treated using an identical shaping protocol without using mobile apps, as well as a lack of examination of mechanisms of behavior change (i.e., it is unknown *why* such rapid treatment gains occurred). It is plausible that mobile apps replace children's anxiety with positive emotions (e.g., having fun), thus enabling them to more fully engage in the shaping process (Bunnell & Beidel, 2013; Bunnell et al., 2015). In other words, that mobile apps facilitated reciprocal inhibition, the process that underlies systematic desensitization (Wolpe, 1954, 1958, 1961; Wolpe & Lazarus, 1966), allowing for faster treatment gains.

Systematic desensitization involves the elimination of an "unadaptive" response (e.g., anxiety) using an interfering competing response. This counterconditioning paradigm (Jones, 1924) postulates that a conditioned stimulus' ability to elicit a conditioned response is lost if the conditioned stimulus is paired with a new stimulus that elicits a response *incompatible* with the original conditioned response. Importantly, the incompatible response

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