

**Critical Review:
Effectiveness of PROMPT when used to treat speech impairment**

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The following review explores the effectiveness of PROMPT therapy with individuals who have a speech impairment. The previous research investigating PROMPT treatment has included case studies and single-subject designs. PROMPT therapy was used to treat acquired apraxia of speech, phonological disorders and speech impairment with cerebral palsy in these studies. Based on the evidence in this review, it is suggested that PROMPT therapy can be effective for those individuals who have motorically-based speech impairments. The results of this review should be interpreted with caution due to the inherent limitations in the methodology and analysis used in the reviewed studies and the lack of research evidence for this topic.

Introduction

The Prompts for Restructuring Oral and Muscular Phonetic Targets (PROMPT) system was introduced by Chumpelik (1984) and further developed by Square-Storer and Hayden (1989). PROMPT is an articulatory-kinematic approach to improve movement and/or positioning of the articulators to promote better speech production (Peach, 2004). The clinician applies a combination of auditory, visual, tactile and kinesthetic cues on the client's face and neck to provide sensory input regarding the place of articulatory contact, extent of mandibular opening, presence and manner of articulation and/or coarticulation (Wambaugh, 2002). The cues are focused on classes of speech movement and are applied to many levels of speech production, from sound level to sentence level (Peach, 2004). The timing of movements between positions and amount of tension required for each position are prompted by the clinician. The client progressively learns how to control the speech-motor system by moving through the linguistic hierarchy (Hayden & Square, 1994).

Objective

The primary objective of this paper is to critically evaluate and analyze the literature available regarding the effectiveness of PROMPT therapy with speech impairment. The secondary objective is to provide an evidence based recommendation for the application of the PROMPT system of therapy for specific client populations in the clinical setting.

Methods

Search Strategy

The articles were located using a computerized database search, including Scopus and PubMed. The following search terms were used:

[(articulation) OR (articulation impairment) OR (articulation disorder) OR (articulation delay) OR (motor speech) OR (motor speech impairment) OR (motor speech disorder) OR (motor speech delay) OR (speech impairment) OR (speech impairment) OR (speech disorder) OR (speech delay)] AND [(PROMPT) OR (PROMPT system) OR (PROMPT therapy) OR (PROMPT treatment)]

The search was limited to articles written in the English language and articles written in the last twenty five years.

Selection Criteria

Studies selected for inclusion in the critical review explored the effect of PROMPT therapy with speech impairment. The studies had to include data from at least one subject. There were no restrictions related to subject demographics.

Data Collection

The literature search yielded six articles that utilized case study and single subject multiple baseline design.

Results

Effect of PROMPT with Developmental Phonological Disorder

A study by Dodd and Bradford (2000), explored the efficacy of three different therapy methods for three boys, aged three to five years, who had two different types of moderate to severe phonological impairment: consistent non-developmental phonological disorder and inconsistent phonological disorder. The three types of therapy investigated were: phonological contrast approach, core vocabulary approach and PROMPT. The phonological contrast approach teaches phonological-based rules about the contrastive use of phonemes and the core vocabulary approach focuses on consistency of production for a small set of words rather than correct production. Using data from the Goldman-Fristoe Test of Articulation (GFTA) (Goldman & Fristoe, 1986), the 25 Word Test for Inconsistency (Dodd, 1995), phonological analysis, spontaneous speech samples and the Test for Auditory Comprehension of Language-Revised (TACL-R) (Carrow-Wollfolk, 1985), the researchers determined which type of therapy was most successful for the children. The results revealed that the phonologically-based phonological contrast approach was most successful for the child with consistent non-developmental phonological disorder and the core vocabulary approach produced results for the two boys with inconsistent phonological disorder. The PROMPT therapy did not produce improvement in any of the children. The researchers determined that therapy providing information about phonetic placement is not effective for children with phonological speech disorders.

Effect of PROMPT with Acquired Apraxia of Speech with Aphasia

There were four studies found to hold the conclusion that PROMPT is an effective therapy for adult clients with acquired apraxia of speech with aphasia. Square, Chumpelik and Adams (1985) described a client with severe apraxia of speech with moderate Broca's aphasia who achieved 90-100% accuracy with phrase production and similar success with minimal word pairs. Intelligibility improved as measured by the Assessment of Intelligibility of Dysarthric Speech (Yorkston & Beukelman, 1981) after the individual participated in PROMPT therapy. No improvements were reported with a simultaneous comparison treatment, integral stimulation. Investigators did not report generalization but the subject showed declining performance after a five month period, indicating

little maintenance. Square, Chumpelik, Morningstar and Adams (1986) evaluated the PROMPT therapy method with repetition and integral stimulation therapy in three adult participants with acquired apraxia of speech and Broca's aphasia. The authors concluded that PROMPT therapy was the most effective in assisting with accurate production of functional utterances (98-100%), production of phonemic contrasts (90-100% accuracy) and bisyllabic words (75-100% accuracy). In another paper investigating the effectiveness of PROMPT, Freed, Marshall and Frazier (1997) found that a severely apraxic-aphasic adult participant exhibited accurate production of words and phrases (e.g., 100%) during treatment and preserved production of words and phrases (e.g., 78.2%) after PROMPT treatment. Recently, Bose, Square, Schlosser and van Lieshout (2001) explored PROMPT treatment with an adult participant with moderate apraxia of speech and Broca's aphasia. The authors found improved production of imperative sentences (e.g., 75%) and active declarative sentences (e.g., 55%), but not of interrogative sentences (e.g., 24%). These were the first researchers to attempt to investigate PROMPT therapy with speech movements in utterances of varying complexity and different sentence types.

Effect of PROMPT with Cerebral Palsy

The most recent investigation examining the use of the PROMPT treatment method comes from Ward, Leitao and Strauss (2009a; 2009b) who studied the use of the treatment with children who had cerebral palsy with a speech impairment. The authors targeted functional vocabulary for the six participants. There were two levels of intervention provided, a first at the participants' priority level in the PROMPT hierarchy, and the second a level higher in the PROMPT hierarchy. The investigators found positive results in phase one of the treatment for all participants and improvements on speech production in phase two for five of the participants. Improvements were measured pre- and post-treatment with the Children's Speech Intelligibility Measure (CSIM) (Wilcox & Morris, 1999) and an evaluation of percentage of consonants correct from a speech sample. Weekly, investigators measured improvement in motor speech movement patterns and perceptual accuracy on trained and untrained word sets. All participants showed some improvement on untrained word sets indicating generalization of treatment.

Critical Review

The papers in the present review were determined to have some statistical and methodological weaknesses when examined. For example, two of the studies, Square et al. (1986) and Ward, Leitao and Strauss (2009a; 2009b) were very brief and did not provide enough information to review thoroughly. Others did not statistically analyze the data in a way that could assist in gaining a better quantitative perspective of the results. Some methodologies were not presented in a way that others could use to replicate the results in order to report and confirm external validity. The following will critically review the research examining the effectiveness of PROMPT treatment for speech impairments.

A majority of studies reviewed employed a single-subject design. Single subject designs take measurements longitudinally from a single client in order to determine whether treatment is associated with improved performance or outcome (Dollaghan, 2007). There are different types of single-subject designs; those which involve active manipulations in an effort to demonstrate experimental control provide greater evidence than those that measure only observational changes (Dollaghan, 2007). Bose et al. (2001), Dodd and Bradford (2000), and Ward, Leitao and Strauss (2009a) all used multiple baseline design with a controlled comparison (e.g., alternating treatments or comparison across participants or behaviours). Square et al. (1985, 1986) and Freed, Marshall and Frazier (1997) did not report sufficient baseline data in their research. The Square et al. (1985, 1986) articles were uncontrolled, observational designs that reflect a case study, these types of studies can cause problems as it is difficult to pull inferences about cause and effect because there are so many potential associations (Dollaghan, 2007).

Treatment effects between treatment and control or alternating treatment are compared in single subject designs by visually analyzing longitudinal data points during alternating phases. This allows the researcher to subjectively note noticeable improvement (Dollaghan, 2007; Horner et al., 2005). This is a problem because different observers have varying ideas about what a significant change will look like. In order to objectively analyze treatment effects, researchers can employ statistical analyses and gain a quantifiable perspective of the data.

None of the papers reviewed attempted to quantify the data in order to calculate effect size.

When conducting single subject baseline studies, the baseline data should remain stable or move in a direction that is opposite to what is expected during the treatment phase (Dollaghan, 2007). The researchers, Square et al. (1985, 1986), did not report sufficient baseline data to determine if this criteria was met. The data should also be measured repeatedly to increase confidence that the differences are reliable (Dollaghan, 2007). Freed, Marshall and Frazier (1997) only conducted three baseline probes in a single 50-minute session before PROMPT treatment started which did not control for variable day-to-day accuracy, and they continued to collect baseline data in a sequence throughout the treatment phase of the investigation. This did not allow them to determine the participant's true baseline performance. All other researchers were determined to have collected the appropriate baseline measures.

Criterion referenced measures of the treatment targets are the best quality measures because they can be administered repeatedly in order to track change over time compared to standardized measures that can only be administered at specific intervals to avoid invalidating norms and are insensitive to change of minute treatment effects (Dollaghan, 2007). Bose et al. (2001) used probes in order to measure progress during treatment and maintenance phases; the probing procedures included phrase generation following a description of situation. With this type of system, the authors did not test all of the sentence types that they were targeting in treatment. In the Dodd and Bradford (2000) article, the authors tested for generalization during treatment with phonologically impaired children informally using matched treated and untreated core vocabulary probe items. The authors also tested the children after each treatment phase with the 25 Word Test of Inconsistency. All other researchers used informal intelligibility measures throughout treatment or probed with untrained items to test generalization. Some authors (Bose et al., 2001, Freed, Marshall & Frazier, 1997; Ward, Leitao & Strauss, 2009b) used criterion referenced measures to check maintenance after treatment.

External validity is limited in single subject designs. It is used to determine if results will generalize or hold true outside of the study they originate from

(Dollaghan, 2007). Research must be examined in terms of representativeness of the population and representativeness of the procedures (Dollaghan, 2007). Very few of the papers reviewed indicate clear, concrete external validity. Most investigations in communication disorders use populations from a purely 'clinic' sample vs. a 'community' sample, which makes it difficult to have a representative sample (Dollaghan, 2007). Another factor is how the authors describe methods. In order to be able to replicate procedures, and therefore augment external validity, researchers must give a systematic and accurate description of the methods and application of the treatment. Bose et al. (2001) did provide a thorough description of the methods and application of the PROMPT therapy in their investigation of an apractic-aphasic adult. Dodd and Bradford (2000) provided some details regarding the generality of PROMPT treatment and they provided some information on how they chose goals for each of the phonologically impaired children. The first Square et al. (1985) article was brief in nature and did not provide procedures, but the follow-up report, Square et al. (1986) did give some procedural guidance, that was later followed by Freed, Marshall and Frazier (1997). The present review found that the literature was lacking in this area, some important details were missing from many of the reports that would give others the ability to fully replicate the procedures in order to confirm external validity.

Discussion

The level of support for the use of PROMPT therapy with all clients who have speech impairment is lacking and clinicians cannot assume that treatment will provide positive effects for all clients. Few participants have been studied with the use of PROMPT, but the single case designs do provide empirical support for its effects with specific populations and severity of clients.

On review of the literature, a recommendation for the use of PROMPT treatment with apractic-aphasic adults can be warranted. The first two studies that exhibited success with PROMPT cueing to effectively facilitate verbal productions in adults with apraxia and aphasia were encouraging, but problematic. The first study (Square et al., 1985) used an uncontrolled simultaneous treatment design to compare PROMPT therapy to another type of intervention. In the second study (Square et al.,

1986) the authors used a small number of treatment words and phrases so it was difficult to determine if PROMPT can build a functional core vocabulary. Freed, Marshall and Frazier (1997) used the same method as Square et al., 1986) and their client achieved a large functional vocabulary and also specified maintenance, indicating that PROMPT can indeed build a functional vocabulary. In Bose et al. (2001), their evidence was weakened because of the lack of change in interrogatives but improvement on the other two types of sentences further compounded evidence for the use of PROMPT with apractic-aphasics. Further research in this area is needed, including a replication of methods, data regarding generalization and maintenance, data on social validity, and information on the effects of PROMPT with apractic-aphasics with mild deficits. A recommendation for the use of PROMPT therapy with phonologically impaired children is not justified. It is doubtful that therapy that teaches children motor production will impact the speech of children with phonological disorders (Dodd & Bradford, 2000). This was only studied once and further research may or may not agree. The use of PROMPT as a treatment method for children with cerebral palsy who have a speech impairment looks to be useful. The children with cerebral palsy have motor impairments and appear to benefit from a motor program that teaches movements for speech production (Ward, Leitao & Strauss 2009a, 2009b). This recommendation should be taken with caution as this research is the first of its kind on children with cerebral palsy.

Conclusion

The present review examined research studies related to the effects of PROMPT treatment in selected communication disorders. The results of this critical review suggest that PROMPT is probably effective for treating specific motorically-based speech impairments such as acquired apraxia of speech and cerebral palsy. Future studies are required to determine if PROMPT may be effective in additional motoric communication disorders such as spastic dysarthria, childhood articulation disorder or developmental stuttering. Future researchers should attempt to replicate the methods recommended in this review in order to increase validity and reliability of treatment effectiveness and establish efficacy of PROMPT. New research should attempt to use optimal methodologies, such as controlled experimental designs that will increase

the level of confidence that PROMPT affects behavioural change. Future studies also should use statistical analyses in order to validate effects. Research is needed to determine both specific effects and the generality of findings of PROMPT therapy.

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