Critical Review:
The Effectiveness of Constraint-Induced Language Therapy in a Distributive Format

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This paper presents a critical review of current research regarding the effectiveness of a modified treatment schedule for Constraint-Induced Language Therapy (CILT) for individuals with aphasia. In the literature discussed, the treatment schedules were modified to be more distributive and less intensive, likely leading to an increase in the use of this treatment in real world settings. Two papers intentionally examined the effects of a modified treatment schedule, and two papers reported incidental findings. Overall, the studies demonstrated positive, but variable improvements in language use and function. It is recommended that CILT in a distributive format can be cautiously incorporated into clinical practice, as further research is needed to confirm and elaborate on its effectiveness.

Introduction

Constraint-Induced Language Therapy (CILT), also known as Constraint-Induced Aphasia Therapy (CIAT), was developed from the principles of Constraint-Induced Movement Therapy in physical rehabilitation. The core principles of CILT include: the systematic constraint of nonverbal communication modalities, gradually shaping the verbal utterances to be more expanded over time, and massed practice of these techniques, (Maul, Conner, Kempler, Radvanski, & Goral, 2014). Numerous studies have reported the effectiveness of CILT, and it is one of the few specific treatment programs to be recommended in aphasia guidelines, (Nickels & Osborne, 2016). However, it is difficult to know to what degree the treatment's effectiveness is related to the constraint of nonverbal communication, vs. the intensity of the treatment. Several studies suggest that intensive treatment, regardless of the specific approach, may be more effective than distributive treatment for individuals with aphasia, (Maul, et al. 2014). Unfortunately, the treatment regimen of three hours per day for ten days is problematic for clinicians and clients in the real world. In a large scale questionnaire of 167 Speech Language Pathologists, Page and Wallace (2014), found that over 60% believed people with aphasia would be unlikely to adhere to this regimen, and over 70% reported their facilities lacked the resources to provide CILT. Their main concerns were regarding the intensity of treatment; for both logistical reasons, (scheduling and cost), as well as client endurance and attendance.

Recently, researchers have begun to alter the protocol of CILT to measure its effectiveness and to determine if an altered version of CILT is more likely to be used by currently practicing clinicians, while maintaining its positive treatment effects. These alterations may involve the focus of treatment, the delivery of treatment, and the treatment schedule. An evaluation of the existing literature regarding an altered treatment schedule would be valuable to determine the effectiveness of CILT in a distributive format.

Objectives

The purpose of this study is to critically review the current literature that focuses on a distributive treatment schedule of CILT, and determine if a less intense treatment schedule is still effective for individuals with aphasia.

Methods

Search Strategy

Computerized databases including: Google Scholar, CINAHL, Medline, Pubmed, and Western Library Catalogue, as well as reference lists of previously examined articles, were searched using the following search terms: (Constraint Induced Language Therapy) OR (Constraint Induced Aphasia Therapy) AND (modified intensity) OR (modified schedule) OR (effective) OR (outcome*) AND (mass* and distribut* practice) OR (Speech Language Patholog*). No limiters were placed on the search.

Selection Criteria

Articles written in English after CILT's inception in 2001 were selected. Only articles that included an altered treatment schedule that was more distributive than the original regimen of three hours per day for ten days were included. Studies that examined fewer treatment hours, but not over a longer period of time, (for example, one hour per day for ten days, or three hours per day for five days), were excluded.

Data Collection

A search of the current literature yielded four studies that met the aforementioned criteria. These include: a nonrandomized clinical trial, two single subject multiple baseline designs, and a randomized clinical trial.

Out of these four studies, two intentionally examined the effects of altered treatment intensity and two reported these findings incidentally.

Results

Intentional Findings:

Mozeiko, et al. (2015), completed a nonrandomized clinical trial to compare CILT outcomes for four participants receiving a standard intensity dosage, (30 hours over ten days), and four receiving a more distributive dosage, (30 hours over ten weeks). The participants were individuals with chronic aphasia; allocated based on individual availability. Gold standard standardized assessments and commonly employed discourse measures were taken pretreatment and posttreatment, as well as four weeks following completion of treatment to measure maintenance. In addition, discourse probes were administered throughout treatment at a rate of every six hours to monitor change over time. The selected discourse measures could assess change in individuals with fluent and nonfluent aphasia.
The authors found overall that all participants in both groups demonstrated improvement in either the discourse measures, the standardized assessment, or both. More consistent gains on the standardized assessments were seen in the intensive group. Similarly, maintenance of functional communication improvements was noted in more members of the intensive group. The authors attributed this apparent slight advantage for the higher intensity group to personal characteristics of group members, specifically, severity of aphasia and coexistence of apraxia of speech. The authors argued that their results provided evidence for the effectiveness of the distributive treatment, as three of the four participants made gains on at least one outcome measure following treatment. The authors also asserted that the best candidates for CILT were those with moderate to severe aphasia and no coexisting apraxia of speech.
Appropriate statistical analysis was used for this study. The design of this study was not ideal for measuring change, and was susceptible to the effects of participants' personal factors. The inclusion of individuals with apraxia of speech in their sample negatively affected the validity of the results. Despite this, the study provides compelling evidence for the effectiveness of a modified CILT schedule.

Nickels and Osborne, (2016), conducted a single subject multiple baseline design that investigated the effectiveness of CILT when carried out by trained volunteers in a less constrained and less intensive format. There were four individuals with chronic aphasia that participated in this study. All had previously received inpatient and outpatient therapy and had been discharged due to a plateau in improvement. The trained volunteers were undergraduate psychology students who received the training and support typically given to speech language pathology volunteers. The protocol was modified to not constrain the use of alternative modalities of communication if the participants chose to use them, in fact, the participants were sporadically reminded of the option to use other methods of communication at any time. In addition, participants were given homework tasks, following the CIATplus protocol, (Meinzer, Djundja, Barthel, Elbert, & Rockstroth, 2005). Finally, the schedule was modified to involve 90 minute sessions twice a week for four weeks, resulting in a less intense treatment with fewer total treatment hours.
Baseline measures were taken twice before treatment, and participants were assessed following the four weeks of treatment. To increase experimental control, the authors measured: items treated in therapy, a matched set of untreated items, and a control task that was unlikely to be effected by treatment. Both standardized measures and impairment focused outcome measures were used to determine change.
The authors found that three of the four participants demonstrated significant improvements for the items treated in therapy. No significant improvements were observed in any participants for the untreated stimuli or the language tasks, in other words, there was no evidence of generalization for lexical retrieval. The authors argued that the lack of generalization was not likely due to the modified treatment. Interestingly, two of the participants demonstrated increases in elaboration of responses and frequency of engagement in communication activities, even though this was not identified pretreatment as an area to measure improvement.
Appropriate statistical analysis was used in this study; including accounting for effects of treatment in overall improvement. The design of this study was appropriate for the target population of individuals with aphasia, as it is a relatively small population. The importance and results of this study are compelling for the effectiveness of CILT in a distributive format, but the validity is suggestive, due to the potential confounding of variables when trying to isolate the effects of modified intensity.

Incidental Findings:

Maul, et al., (2014) conducted a single subject multiple baseline design examining the effectiveness of a CILT treatment that was modified to focus on verb production rather than noun production. It does not appear that the authors intentionally altered the schedule of the treatment for this study, as they did not mention a rationale and still referred to the treatment as intensive. However, the treatment regimen used in this study took place three to four days per week for one month, (7.5 hours per week, for 30 hours total). The participants were four women with chronic nonfluent aphasia; their ages ranged from

38 to 60 years. None of the participants had dysarthria or apraxia of speech. Pre and post measures of targeted and untargeted verb retrieval and gold standard language measures were completed.

The authors reported two of the four participants demonstrated a direct treatment effect, specifically, they produced more of the practiced set of verbs during the action description task. The other two participants were less impaired, and did not meaningfully increase the proportion of verbs during treatment, possibly due to a baseline ceiling effect. None of the participants had significant improvements in sequence description of the verbs, or responding to wh-questions regarding a pictured verb. One form of generalization in the action description task was observed: an increase in the proportion of grammatical sentences, both in syntactic and morphological correctness. One of the mildly impaired participants who did not demonstrate improvement in other areas showed significant improvement in this area.

Appropriate statistical analysis was used in this study. The participant sample is not representative of the general aphasia population, and the author's participant selection process was not described. Overall the improvement of the participants was slightly positive, but variable. The results were suggestive of the benefits of a modified treatment schedule, however, it is difficult to determine to what degree the modified schedule effected the overall treatment, as the authors did not appear to take this variable into account, and any results are likely confounded by other treatment changes that were made.

Sickert, et al., (2014) completed a randomized clinical trial that investigated if CILT with a modified therapy schedule would be effective for individuals with sub-acute aphasia as compared to standard aphasia therapy of the same intensity and duration. The study involved 100 individuals with aphasia in the sub-acute stage. Individuals with dysarthria and apraxia of speech were excluded. Each patient received two hours of respective therapies over a 15 day period while an inpatient, and then received therapy at a similar intensity and format, (averaging two hours per week), while an outpatient for one year. This continued treatment better constitutes a distributive treatment schedule for the purposes of this review. A baseline was measured before treatment, and progress was measured after the inpatient treatment period. Gold standard tests of language comprehension, sentence repetition, written language, naming, language function, and spontaneous speech were used. Participants were also tested at eight weeks and one year post-treatment, however, only 26 participants, (15 of which were in the CILT group) attended these follow up visits to determine the effects of the outpatient treatment. Although the focus of this study was the short term improvement following the inpatient treatment period, for the purposes of this review, the results of the eight week and one year post treatment follow up will be examined.

The authors found similar improvement between treatment groups following the inpatient intervention period. Although statistical analyses were appropriate, the authors' interpretations were unclear. Results revealed significant improvement on one but not all language comprehension measures for both groups, although the improvements were observed on different measures. Significant increases for both groups were found for repetition, written language, and naming, but not for language function or spontaneous speech.

Strengths of this study were the design and relatively large sample size. Limitations included lack of detail regarding intervention schedule, blinding, and loss to follow up of participants. It is difficult to determine how much of the follow up analysis reflects the original therapy, and how much reflects the outpatient therapy. These issues effect the general validity of this study. While the results of this study are suggestive of the effectiveness of CILT in a more distributive format, the validity of the study is equivocal, and does not independently make a strong case for the modified treatment schedule.

Discussion

This critical review evaluated Constraint-Induced Language Therapy (CILT), in a distributive format. A total of four studies, including two that directly examined a modified treatment schedule, and two that reported incidental findings were reviewed. All of the studies provided at least suggestive evidence of the effectiveness of CILT in a distributive format for individuals with aphasia.

The primary issue for the existing literature is the limited number of studies on this topic, and the lack of strong studies in particular. Currently, CILT is rarely implemented in real world settings due to the impracticality of the intensive design, even though its utility has been demonstrated. Examining the effectiveness of a distributive regimen of CILT is a tremendously important question due to the real world implications of the results for both clinicians and clients. An investigation into this topic allows for the strongest study design, the randomized control trial, to directly compare the effects of a traditional CILT schedule with those of a more distributive format with the same number of total treatment hours. Presently, only the study by Mozeiko et al. (2015) makes this direct comparison, but it has limitations in its design. Furthermore, Nickels and Osborne, (2016), and Maul et al. (2014), both reported improvements in their participants that they did not set out to measure before the study. While this may be acceptable for preliminary research, there is a need for

future studies to determine all measurable outcomes prior to providing treatment, in order to improve the validity of the research.

Another trend in the existing literature is the propensity of studies to investigate multiple variables simultaneously. This significantly limits the interpretation of results, as it is difficult to determine to what degree each variable influenced the outcomes. Three of the four studies confounded results by examining more variables than just the alteration of the treatment schedule, including: the use of volunteers, modification to the treatment itself, (such as decreasing the constraint, focusing on verb production, adding writing or homework tasks), and fewer total treatment hours. Only the study by Mozeiko et al. (2015), isolated the variable of treatment schedule modification without adding any other changes to the design. The two studies that reported incidental findings further complicated this issue by not intending to investigate the effects of an altered treatment schedule, but rather, happened to alter this component in their design. This highlights the need for researchers to be diligent in their study design and methods, otherwise the results cannot reliably be attributed to any specific factors.

Several of these studies made clinical applicability a priority. Their aim was to examine the effect of altering variables that real world clinicians feel limit their application of CILT. Two of the studies made this a particular focus. Nickels and Osborne (2016), and Sickert et al. (2014), designed their studies to examine the effectiveness of a treatment that would be feasible to implement for a busy speech language pathologist. Unfortunately, as mentioned above, this led to the confounding of multiple variables. However, their intentions were noble, as they recognized the limited usefulness of CILT in its original format, and sought ways to alter it outside of treatment schedule alone.

A final theme throughout the literature was the issue of participant exclusion criteria. One of the studies included participants with co-occurring apraxia of speech and dysarthria, two did not, and one did not report. The studies suggested that CILT does not have as positive or reliable of treatment effects for individuals with co-occurring motor speech impairments, likely due to the additional stress on the motor planning or neuromuscular system. Additionally, several studies found that the treatment works best for individuals with moderate to severe aphasia, as individuals with mild aphasia demonstrated less improvement, (potentially due to a baseline ceiling effect). Further research is needed to determine the effectiveness of CILT for specific types of aphasia, particularly, fluent and nonfluent. Only the study by Maul, et al. (2014), selected participants with only nonfluent aphasia, the other studies either did not specify or did not factor this into their results. In order to recommend best uses of CILT, researchers should examine the type of aphasia as a key factor.

Overall, the four examined studies found positive, but variable results for the effectiveness of CILT in a distributive format. Common themes throughout the literature included: a need for further, stronger research, issues with the confounding of variables, a focus on real world applicability, and problematic participant exclusion criteria.

Wallace and Page (2014) found that the majority of Speech Language Pathologists they surveyed would not implement CILT in its traditional format. This is likely reflective of most Speech Language Pathologists in practice. If more clinicians were aware of the positive potential of a distributive format of CILT, then perhaps they would be more likely to add this treatment regimen to their practice, as it alleviates the inherent difficulties of funding, attendance, and time constraints caused by the original intensive schedule.

Clinical Implications

The use of CILT in a distributive format for real world clinicians can be recommended with caution. If a Speech Language Pathologist and their clients have the means and ability to carry out CILT in its original format, this would likely be best, due to the large amount of research that demonstrates its effectiveness. However, this is not the reality for most clinicians. Therefore, a modified version of CILT could be watchfully implemented.

The existing research has shown that a distributive form of CILT is best for individuals who have moderate to severe aphasia with no coexisting motor speech impairments. Further research is required to determine what types of aphasia respond best to this treatment.

CILT may be most effective for individuals with goals targeting lexical retrieval, as it requires a participant to produce specific nouns, adjectives, and verbs, while constraining any nonverbal output.

It is worth considering coupling CILT with other forms of therapy that have better generalization, as this has been shown to be a challenge with this treatment. It is not recommended that CILT be combined with supported conversation therapy, as this implements contradictory methods of using as much nonverbal communication as possible. As always, clinicians should monitor each individual client's progress, taking baseline measurements and frequent treatment probes, and should adjust treatment regimens as required.

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