The Effects of Animal-Assisted Therapy on the Recovery of Individuals with Unilateral Spatial Neglect

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The purpose of the study was to examine the effects of limb-activating strategy using either a rote activity or a meaningful activity (animal-assisted therapy) in the treatment of an individual with unilateral spatial neglect. An ABCA single-subject design was used. The participant was a 61 year old male who was eight years post-stroke. A test battery (Baking Tray Task, Star Cancellation Test and Line Bisection Test) was used to assess the participant's level of neglect during baseline and intervention phases. Results indicated that the participant's Baking Tray Task score showed improvements from baseline during both the meaningful and rote activity phases. The Line Bisection score showed improvements from baseline during both intervention phases, but the meaningful activity phase showed a greater improvement. The Star Cancellation Test showed minimal changes between baseline and both intervention phases. These findings suggest that the limb-activating strategy, used in combination with either a rote activity or meaningful activity, shows some improvement in the recovery of unilateral spatial neglect. However, further research is needed to get a better understanding of the impact of using limb activation strategy with meaningful activities on the recovery of individuals with unilateral spatial neglect.

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Unilateral Spatial Neglect

Cerebrovascular accidents (CVAs), more commonly known as strokes, are the third leading cause of death and a leading cause of disability in the U.S. (National Institute of Neurological Disorders and Stroke, 2010). Unilateral spatial neglect (USN) can occur as a result of a stroke and is when a person with a brain lesion neglects the visual field space contralateral to the lesion (Heilman, Watson, & Valenstein, 2003). It has been found that about 43% of people with a right brain-lesion have USN (Ringman, Saver, Woolson, Clarke & Adams, 2004). Specifically, lesions of the inferior parietal lobe, dorsolateral frontal lobe, cingulate gyrus, neostriatum, thalamus and posterior limb of the internal capsule have been indicated as more likely to cause neglect (Heilman et al., 2003). This type of impairment can have a devastating effect on a person's abilities to independently perform functional activities such as eating, dressing, and grooming (Gillen, Tennen, & McKee, 2005).

Different treatment modalities have been investigated over the years for helping a person to recover the ability to attend to the neglected side. Visual occlusion is one such treatment that involves placing a patch over half of each glasses lens on the non-neglected visual field, forcing the patient to attend to the neglected visual field side (Freeman, 2001). Scanning training is another popular treatment modality. It trains the person to scan the entire environment, including the left side that they most often neglect, in an organized fashion (Gillen, 2009). The limb-activating strategy (LAS) is another treatment in which movement on the opposite side of the body of the brain lesion, e.g. the arm, is encouraged. This has been shown to help activate the side of the brain with the lesion and improve USN (Gillen, 2009). In addition, using activities that are meaningful to all types of clients has been found to be more effective for therapeutic outcomes than using activities such as rote exercise (Trombly, 1995). Therefore, it is important

to consider what may be functionally motivating to the client to help encourage and promote motivation during therapy (Timmermans et al., 2009).

While the treatment modalities mentioned above have been found to have some effect on improving USN, it is important to continue to investigate the efficacy of new treatment modalities that might be more meaningful or motivating to the client. For example, for many people, animals (particularly pets) play a crucial role in their lives and being able to take care of a pet or just being around a pet can have many health benefits (Jorgenson, 1997). As an occupational therapist it is important to take into consideration what type of activities or factors may be particularly motivating to a client as this may lead to positive outcomes.

Background

Occupational therapists work to help a person be as functionally independent as possible, therefore, it is important for occupational therapy practioners to be aware of conditions that interfere with optimal functioning, such as USN. Studies have found that USN is often a difficult impairment to treat and progress is often slow (Gillen et al., 2005). However, several treatment modalities have shown promising results in the rehabilitation of USN. Some of these treatment modalities include visual occlusion, scanning training, and the LAS.

Unilateral Spatial Neglect

USN presents as “the failure to report, respond, or orient to novel or meaningful stimuli presented to the side opposite a brain lesion, when this failure cannot be attribute to either sensory or motor defects” (p. 296, Heilman et al., 2003). Although USN can occur from lesions in either hemisphere, it is most often a result of right brain damage. Therefore, the person has difficulty attending to either the left half of his/her body and/or spatial field. This decreased attention to the left side can have a profound impact on a person’s ability to effectively and

safely navigate within the environment and/or independently engage in daily activities (Niemeier, 1998).

Unilateral Spatial Neglect Treatments

Visual occlusion. A variety of studies have been done to investigate the effectiveness of interventions for USN. Beis, Andre, Baumgarten, and Challier (1999) conducted a randomized study examining whether two different types of eye patching methods would affect the eye movement and the function in everyday life tasks of people with left USN. They split the participant pool into three groups: right half-field patch group (n = 7), right monocular patch group (n = 7) and a control group (n = 8). They found that the group wearing the right half-field patch had the greatest improvement when evaluated with the Functional Independence Measure (FIM; Beis et al., 1999). The generalizability of the study, though, was limited: the age range was modest, the number of participants was small and individuals may feel uncomfortable wearing those types of glasses, impacting compliance (Beis et al., 1999).

Arai, Ohi, Sasaki, Nobuto, and Tanaka (1997) conducted a study of ten patients in a rehabilitation department with left USN. They investigated whether participants would improve with the wearing of hemispatial sunglasses, where the right side of each lens was shaded. For this specific study, the side that was shaded only allowed 8% of visible light to pass, while 90% of visible light came through on the non-shaded side of the lens (Arai et al., 1997). Arai et al. (1997) found mixed improvement in the participants' USN. Fewer than 50% of the participants showed improvement in the line bisection task, line cancellation and figure copying. Further investigation for this type of treatment modality would be of benefit since it appears that using hemispatial sunglasses does not have a beneficial effect for all patients.

Scanning training. Scanning training is a frequently used intervention for those with USN (Gillen, 2009). Paul (1996) studied the effects of using a computer software program to train a person to use visual scanning movements of the eye. This pretest-posttest case study had three participants who received three 45-minute sessions for four weeks. During each session they engaged in visual tracking tasks on the computer screen. Results found a steady improvement in the letter cancellation and line bisection test among all three participants. The author concludes that the visual scanning training may have created a near transfer effect amongst the participants (Paul, 1996).

Luukkainen-Markkula, Tarkka, Pitkänen, Sivenius, and Hämäläinen (2009) studied the effects of using either arm activation or visual scanning training in a randomized study. The study consisted of twelve participants who were randomly assigned to either the arm activation group or visual scanning training group. The intervention ran for a total of three weeks, in which the arm activation group received a total of 20-30 hours of left arm activation training and the visual scanning group received a total of 10 hours of scanning training. Over the course of the three week period, each participant received a total of 48 hours of therapy (occupational therapy and physical therapy). Results of the Behavioral Inattention Test's conventional subtests (BIT C) found that the training effect for both the arm activation and visual scanning groups showed a significant improvement in visual neglect, $p \leq .001$(Luukkainen et al., 2009).

Niemeier (1998) investigated the efficacy of the Lighthouse Strategy (LS) as a scanning technique. The LS involved teaching the person to imagine being a lighthouse and to scan all the way to the left and right of the horizon. The study consisted of a treatment group (n = 16) and a control group (n = 15; Niemeier, 1998). Throughout the study, both groups received inpatient rehabilitation services, but the treatment group also received training using the LS. Assessments

for inattention were completed at admission and discharge using the Sheltering Arms Functional Autonomy Rating Scale (FARS; Niemeier, 1998). The treatment group was also assessed with the Mesulam Verbal Cancellation Test (MVCT). Results found that the treatment group showed a significant improvement in attention on the FARS when compared to the control group, $p > 0.007$ (Niemeier, 1998). Also, a significant reduction in errors of omission on the MVCT for the treatment group was found when comparing admission to discharge scores, $p > 0.002$ (Niemeier, 1998).

Limb-activating strategy. The LAS has been found to be an effective treatment intervention for those with USN (Gillen, 2009). In a meta-analysis, Lin (1996) investigated the kind of effects that hemispheric activation (lateralized task approach, controlled sensory stimulation approach and limb activating approach) had on USN. Lin (1996) found a moderate effect size, ESr = .77, for the group design studies, indicating an improvement in neglect. A large effect size, ESr = .89, was found for the single-subject design studies, also indicating an improvement in neglect. These results show a strong support for the use of the interventions for USN rehabilitation.

Robertson, North, and Geggie (1992) did a case study on three people with left USN. Treatment for the first participant included perceptual anchoring and left arm activation. Perceptual anchoring involved teaching the participant to visually find his left arm and place it to the left of the activity before beginning. Treatment for the second case included perceptual anchoring and an avoidance conditioning procedure. The avoidance conditioning procedure consisted of placing a neglect alert device to the left of her left arm. The time span in which the buzzer would make noise varied from four to eighteen seconds (Robertson et al., 1992). The participant was required to frequently activate the switch that was placed to the left of her left

arm in order to prevent the device from buzzing. Finally, the third case received cueing to initiate left arm activation to activate the switch so the neglect alert device would not buzz and was not given instructions for perceptual anchoring. Results found that each subject showed an improvement in USN in at least one evaluation assessment (line bisection, star cancellation, rating of mobility function, etc.), but not all evaluation assessments showed improvement (Robertson et al., 1992). The generalizability of the study, though, was limited: the number of participants was small and transferability long term is unknown (Robertson et al., 1992). In addition, a treatment modality that is more personally meaningful may yield better long term results.

Bailey, Riddoch, and Crome (2002) studied whether visual neglect would improve with the use of a scanning and cueing protocol or with contralesional limb activation. In this single-subject experimental design the participants were between the ages of 65 and 85 and were from a stroke rehabilitation unit. Bailey et al. (2002) found that the two subjects who received limb activation and three of the five subjects who received scanning and cueing showed a significant improvement in level of neglect, $p < .05$.

Meaningful Activities

Meaningfulness is something that people find to be a valuable part of their lives and is often related to cultural or familial experiences they have had throughout their life (Trombly, 1995). Connecting with a client and identifying activities that are meaningful is an important aspect of occupational therapy that a therapist needs to consider for each new patient (Trombly, 1995). Tham, Borell, and Gustavsson (2000) conducted a phenomological study with four women with unilateral neglect. The participants were interviewed several times throughout the study. During weeks three through seven the participants were taught awareness of their

disabilities through engaging in occupations that they found meaningful (Tham et al., 2000). Tham et al. (2000) found that people were able to learn compensatory strategies of scanning to the left if the person was interested in finding the particular item located on their neglected side. This study showed the importance of incorporating meaningful activities into the therapy interventions for people with USN as a way to promote learning. However, more research is needed to help continue to identify ways in which meaningfulness can be incorporated into therapy and the potential effectiveness that it has on therapy outcomes (Trombly, 1995).

Animal-Assisted Therapy

Animal-assisted therapy (AAT) is a treatment modality that has not been investigated specifically for those with USN. AAT involves various types of animals that are present during treatment sessions with the clients (Delta Society – Animal Assisted Therapy Overview, 2009). Animals must participate in The Delta Society's Pet Partner program, which involves training and screening by a certified evaluator before the animals are allowed to work with properly trained therapists and their clients (Delta Society – Pet Partners Program, 2009).

Animals' impact on recovery has been documented as far back as the early 1900's when Florence Nightingale wrote about the benefits that she believed animals brought to the recovery of ill patients (Nightingale, 1910). Improvements have been found in a person's physiological, psychological and emotional well-being, as well as an increase in social interactions, during therapy sessions with animals (Jorgenson, 1997). The use of an animal during therapy can make the therapy activity more meaningful to a client who is a pet owner (Velde, Cipriani, & Fisher, 2005). For example, rather than having patients with hemiplegia scan to the left to look for cones or bean bags, the therapist could incorporate an animal into the session and have patients

do something that they would do with their own pet, such as brushing or throwing a ball to improve strength, balance and mobility (Stanley-Hermanns & Miller, 2002).

Macauley (2006) investigated the use of AAT for people with aphasia. Macauley found that the clients who received AAT and the clients who did not receive AAT during their speech therapy sessions both met the goals set by the therapist. However, on the client-satisfaction survey, the clients who received AAT reported more enjoyment of the therapy session and felt more motivated and less stressed when the canine was present. The non-judgmental presence of the dog may have helped make the client feel more at ease when practicing talking or reading aloud (Macauley, 2006).

When selecting treatment modalities, it is important for occupational therapists to consider the emotional and physiological effect they will have on the client. Odendaal (2000) studied human-dog interaction and the effects it had on blood pressure and neurochemical levels. This researcher wanted to see if there were any positive physiological changes between healthy human (n = 18) and dog (n = 18) interaction. The researcher assessed blood pressure, β-endorphin, oxytocin, prolactin, β-phenylethylamine, dopamine and cortisol levels to see if there were any positive effects after the interaction (Odendaal, 2000). He found that there was a statistically significant difference, $p < .01$, between the oxytocin levels in experimental (human-dog interaction) and control groups (quiet book reading). In the experimental groups, oxytocin levels increased more significantly, which is indicative of social attachment and bonding. Odendaal (2000) concluded that human-dog interaction incorporated into therapy can physiologically benefit clients, especially if they had about ten minutes to establish a relationship or bond with the dog that was present during the session.

Munoz Lasa and Franchignoni (2008) suggested that AAT in physical rehabilitation should be studied further to determine efficacy. They believed that the use of AAT can provide "patients with a promising, complementary and natural means to improve both their functioning and quality of life" (p. 100). It is important for occupational therapists to continue to research and establish the validity of AAT as a treatment modality that will work to increase a client's motivation during therapy sessions. No study has investigated AAT for assisting in the recovery from USN, therefore, the purpose of this study will be to investigate whether those with USN will have an improvement in their level of neglect through the use of the LAS combined with the meaningful activity of AAT with a canine as compared to using the LAS solely with a rote activity.

Method

This study consisted of a single-subject A1-B-C-A2 sequence with one participant. This design allowed the participant to act as his own control and eliminated the option of having the participant receive no treatment interventions as is found in other experimental design studies (Deitz, 2006). A single-subject also allowed "flexibility to observe change under ongoing treatment conditions" (Portney & Watkins, 2009, p. 236) which is an important aspect for occupational therapy and developing evidence-based research.

Participant

Convenience sampling was used in selecting a participant for this study. Inclusion criteria for this study were: (1) at least one year post CVA, (2) scoring below cut-off scores on two of the three subtests of the test battery (distributing the "buns" unevenly between the two sides of the tray with a ratio of 7:9 or worse for the Baking Tray Task (BTT); cancelling fewer than 51/54 stars for the Star Cancellation Test (SCT); bisecting all three lines an average of more

than 1cm from the center on the Line Bisection Test (LBT)) (3) ability to speak and understand English, (4) full understanding of the research and ability to sign a consent form for participation, (5) no allergies to or fear of dogs, and (6) an interest in working with dogs during treatment sessions, shown by scoring a 3 or higher on the Likert scale (See Appendix A for Likert scale assessing interest in working with dogs). One client from the onsite clinic met the inclusion criteria for the study, BTT = 8:8, SCT = 44/54, LBT = 1.54cm, and Likert score = 3. He was a 61 year old male, who was eight years post right CVA with limited gross grasp and activation of his left upper extremity.

Instrumentation

The BTT, SCT, and LBT are frequently used clinical tests for USN (Bailey, Riddoch, & Crome, 2004). Previous studies have found that together these three tests are valid and reliable in screening for USN. These three screening tools were used as the test battery to assess the effects that the therapy interventions had on the participant's level of USN throughout the various phases of the study. In order to prevent an order effect, the subtests of the test battery were presented randomly to the participant each time. The researcher also followed a checklist for each subtest in order to maintain consistency during the administration of the tests (See Appendix B for checklists)

Baking tray task. The BTT consisted of 16 cubes that were 3.5cm in size and a large board that was 75 x 100cm with an edge height of 3.5cm. The researcher explained to participant that he was to place the cubes ("representing buns to be baked") on the board ("baking tray") and spread them out evenly across the entire board. This test was designed to test a person's extrapersonal space and those who have USN will often line the cubes up on the right half of the board, neglecting the left half of their visual field space (Tham & Tegner, 1996). This test has

been found to be a simple, yet sensitive test for USN (Tham & Tegner, 1996). The BTT has also been found to have excellent test-retest reliability, $p < .001$, 95% CI [.81, .92] (Bailey et al., 2004). The test was scored by dividing the number of blocks placed on the left by the number of blocks placed on the right side of the board.

Star cancellation test. The SCT is a subtest of the Behavioural Inattention Test (Wilson, Cockburn, & Halligan, 1987) and has shown good test-retest reliability, $p < .001$, 95% CI [.83, .93] (Bailey et al., 2004). The paper has 54 small stars that are interspersed among other distracting items on the paper. The goal was to have participants cross out as many stars as they saw on the paper. Scoring was done by counting the number of stars the participant crossed out, in which, lower scores indicate more neglect or inattention.

Line bisection test. The LBT is another subtest of the Behavioural Inattention Test that has been found to have good test-retest reliability, $p < .001$, 95% CI [.94, .98] (Bailey et al., 2004). The paper had three lines that were each 20.5cm in length. A person with USN often has difficulty in making the line bisection at the midpoint and will tend to skew toward the right edge of the page. Scoring was done by measuring how many centimeters from the middle the participant made the line and averaging the distance between the three lines.

Procedure

Approval to conduct this study was granted from the university's Institutional Review Board (IRB). Once approval was granted from the IRB, the researcher forwarded information about the study to the clinic coordinator and clinical instructors at the University of Puget Sound's Occupational Therapy Clinic. Potential participants were contacted by a neutral source to see if they were interested in participating in the study. Three interested participants were then contacted by the researcher to set up a screening session. One participant met the inclusion

criteria and was invited to participate in the study. He was also asked for demographic information: age, date, length of time since CVA, medical history, current medications and medical precautions (See Appendix C for demographic data collection form.). The researcher then scheduled session dates two times a week for 30-45 minutes each. All sessions took place at the university's occupational therapy clinic.

The first phase (A1) and last phase (A2) of this study were the baseline and return to baseline phases, in which the participant was not given any treatment, but was simply tested using the test battery. For all phases, each session ended by having the participant complete the test battery, in which subtests were administered randomly, in order to eliminate an order effect.

Limb activating strategy with a rote activity. The (B) phase of the study consisted of having the participant use the LAS with a rote activity. The participant attended for a total of three sessions (two times a week for 30-45 minutes each). During the session the participant was asked to wipe a table, and/or throw, toss or drop beanbags, into a container that was far enough away to provide the "just right challenge." Since the participant was unable to use his left arm, the researcher had the participant bear weight on the left arm while using the right arm to throw the beanbag.

Limb activating strategy with a meaningful activity (AAT). The (C) phase of the study consisted of three sessions (two times a week for 30-45 minutes each) of the participant using the LAS combined with a meaningful activity (AAT with a canine). During each therapy session the therapist encouraged the participant to engage his left arm in a functional task with the canine. The participant worked on hand over hand assist while brushing the canine with his left hand and bearing weight on his left arm while throwing a toy for the canine using his right

arm. At the end of the session, the therapist administered the test battery to the participant to assess the effectiveness of the intervention on his level of USN.

Data Analysis

The data from each test of the test battery were graphed for the participant. Visual analysis is an appropriate data analysis method for single-subject designs and was used to detect any differences in the test scores from one phase to another (Kazdin, 1982). With visual analysis the researcher looked for any trend line and/or level changes in performance across the four different phases. A change in level is indicated when a shift in performance occurs between the ending of one phase and the beginning of the next phase, whereas a change in trend occurs when a "systematic increase or decrease" (p. 235) takes place across the various phases (Kazdin, 1982) Three different graphs for the participant were created, one for each outcome measure, and trends in the graphs, determined through the split middle method, were sought to determine any change in direction of the data across the phases (Kazdin, 1982).

Results

The study was a total of seven weeks with four sessions for the initial baseline phase and three sessions for both intervention phases and the return to baseline phase. Descriptive statistics (means and ranges) of scores for each subtest of the test battery across the various phases are shown in Table 1. Scores closer to 1.0 for the BTT, 54 for the SCT and 0.0 for the LBT indicate no presence of USN. This study sought to answer, (1) how the effect of the LAS with a rote activity compared to no treatment, (2) how the effect of the LAS with animal assisted therapy compared to no treatment, (3) if there was a difference in effect when comparing the rote activity to the animal assisted therapy phase, and (4) was there any carryover effect to the return to baseline phase.

Baseline vs. Limb-Activating Strategy with Rote Activities

The participant's results are shown in Figures 1, 2 and 3. The participant's BTT scores between the A1 and B phase show a level increase with a mean score increase of 0.32 (32%), as well as a trend line change. The participant's SCT scores between A1 and B phase show essentially no change in level with a mean score increase of 1.83 (3.4%) and a slight change in trend. Finally, the participant's LBT scores between the A1 and B phase show a slight change in level with a mean score decrease of 0.41 and a slight change in trend.

Baseline vs. Limb-Activating Strategy with Animal Assisted Therapy

The participant's BTT scores between the A1 and C phase show a level increase with a mean score increase of 0.25 (25%) and a trend line change. The participant's SCT scores between the A1 and C phase show a slight change in level with a mean score increase of 4.83 (8.9%) and a very slight change in trend. Finally, the participant's LBT scores between the A1 and C phase show a change in level with a mean score decrease of 1.04 and no change in trend.

Rote Activities vs. Animal Assisted Therapy

The participant's BTT scores between the B and C phase show a slight change in level with mean score increase of 0.07 (7%) and a slight change in the trend line. The participant's SCT scores between the B and C phase show a slight change in level with a slight mean score increase of 3.00 (5.6%) and a slight change in trend. Finally, the participant's LBT scores between the B and C phase show a change in level with a mean score decrease of 0.63 and no change in trend.

Return to Baseline (A2)

The results of the participant's scores for all three subtests in the return to baseline phase (A2) show that carryover occurred, as demonstrated by scores from the AAT phase (C) showing no change in level or trend in the return to baseline (A2).

Observations

Qualitative observations of the participant's performance were made throughout the course of the study. Specifically, the researcher observed that during the initial baseline phase (A) the participant approached the BTT in a disorganized fashion when laying out the blocks across the tray. However, upon implementation of the LAS, the participant became more organized by lining up the blocks one column at a time.

Discussion

The purpose of this study was to investigate the effects of a meaningful activity (AAT) on the recovery of an individual with USN. Overall, the implementation of the LAS appeared to be a key component in the improvement of the participant's scores across both intervention phases. Initially, during baseline, the participant had a decline in his BTT scores; however, upon implementation of the LAS with both the rote activity and AAT phases, ceiling scores were reached and maintained into the return baseline phase (A2). The performance on the SCT did not appear to be greatly affected by the implementation of the LAS, in which the scores initially started high and remained high throughout the four different phases, leaving little room for improvement. Finally, the performance on the LBT showed similar results as the BTT, in which the scores improved upon implementation of the LAS with both the rote activity and animal assisted therapy. However, it should be noted that the participant showed more improvement in the LBT scores during the AAT phase when compared to the rote activity phase, and that this improvement was carried over into the return to baseline phase.

These results indicate that the participant showed improvements in scores in some subtests with both LAS phases, with some additional improvement noted in the AAT phase. Several studies (Lin, 1996; Robertson et al., 1992; Bailey et al., 2002) found similar improvements when using the LAS as an intervention technique. Specifically, Bailey et al. (2002) found that upon the implementation of the LAS with various activities that were functional and goal oriented, participants' level of USN appeared to improve.

Another important finding from this study was that the LAS can be successfully used with individuals who have a low level of motor control in the arm contralateral to the brain lesion and who are several years post-stroke. This adds important information to the literature, since other studies (Bailey et al., 2002 and Robertson et al., 1992) using the LAS with participants with USN saw improvements in individuals who were within one year post-stroke.

Overall, it is important to continue to consider the meaningfulness of an activity during therapy sessions. This current study has found that AAT is a valid modality to use in combination with the LAS to make it more meaningful. Other studies have also found AAT to be a valid modality during therapy sessions. A study using AAT during a speech therapy session found that participants did equally well with and without the presence of the dog, however, participants reported that they enjoyed their therapy sessions more and felt more at ease when the dog was present (Macauley, 2006). Meaningful activities may be more effective at making the client comfortable and making the therapy session enjoyable compared to rote activities. This was found to be evident during the current study, when the participant stated that he enjoyed the AAT activities much more than the rote activities because he was able to interact with the dog as opposed to working with inanimate objects, which he found to be less motivating. In addition, the participant stated that he would like to get a similar adapted hand brush as the one that was

used to brush the dog, so he could use his affected hand to brush his dog at home. This provides more support that AAT is a valid treatment modality in helping to motivate individuals to not only be motivated during therapy sessions, but to also continue to implement the activity at home and therefore, potentially continue to improve USN beyond therapy sessions.

Implications for Occupational Therapy

In the 1995 Eleanor Clarke Slagle lecture, Trombly (1995) stated that "meaningful occupation-as-means seems to motivate the person to persevere in his efforts long enough to achieve a therapeutic benefit" (p. 960). This study has strived to investigate this effect though implementation of a meaningful activity (LAS with AAT) during occupational therapy sessions. As occupational therapists, it is important to consider clients' needs and what they find to be meaningful. The LAS has been found to be a useful strategy for helping people to improve their level of USN. Implementing this strategy with functional activities during occupational therapy sessions can be easily done and can even be implemented if individuals have limited use of their affected arm. Therefore, the incorporation of meaningful activities and/or everyday occupations with the LAS is important the effectiveness of carryover beyond therapy sessions. Learning to incorporate meaningful activities into therapy sessions with the LAS is something that occupational therapists should continue to explore when attempting to come up with ways to help people with USN connect meaning to looking to the neglected side.

Limitations

A limitation to this study was the small sample size. This makes it difficult to generalize the results to a larger population of individuals with USN. The short time frame that was available for conducting the study limited the number of data points to three per phase, which made it difficult to identify a change in progress across the different phases of the study. In

addition, the study sessions were conducted before his regularly scheduled occupational therapy session on Mondays and after his therapy on Wednesdays. This could have influenced his ability to concentrate and fatigue level. Finally, the participant's scores on the SCT may have been a limitation. Initially, during the baseline phase, his scores were already close to the ceiling in performance, therefore, leaving little room for improvement.

Future Research

In a phenomological study by Tham et al. (2000), participants reported that they were more motivated to look to the neglected side if there was something on that side that they were interested in finding. This leads to the primary implication for future research which is that further studies are needed to continue to investigate the effectiveness of meaningful activities on the recovery of USN. A thorough literature search was conducted regarding the use of the LAS in combination with AAT as an intervention strategy for the recovery of USN, and the researcher did not locate any studies that had been done. Therefore, further studies investigating the effectiveness of this intervention are needed. Specifically future research should be conducted with a larger and more diverse population of participants. A longer study length and examining outcomes beyond table top activities would also provide valuable information.

Conclusion

This study sought to investigate the effects of the LAS in combination with a meaningful activity (AAT) in the recovery of an individual with unilateral spatial neglect. The results of this study indicate that the LAS in combination with the use of a meaningful activity (AAT) during therapy showed some improvements in some, but not all, subtests when compared to the LAS in combination with the use of a rote activity and when compared to baseline. However, more extensive research is needed to verify these effects and whether the effect of the LAS in

combination with a meaningful activity will continue to carry over for a longer period of time beyond therapy sessions.

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Appendix A

Likert Scale for Interest in Working with Dogs During Treatment Sessions

Please circle the number that indicates how interested you would be in working with a dog during your treatment sessions:

Not interested at all	Not very interested	Neutral	Somewhat Interested	Very Interested
1	2	3	4	5

Appendix B

Test Battery Administration Checklists

BAKING TRAY TASK

1. Position the participant sitting at a table.
2. Place the baking tray centered in front of the participant.
3. Place the cubes to the right of the baking tray.
4. The researcher will say to the participant, place the blocks as symmetrically as possible as if they were cookies being placed on a cookie tray to be put in the oven.
5. The researcher will then say to the participant, "please let me know when you are done."
6. The researcher will step behind the participant and wait for the participant to indicate that they are done.

BEHAVIOURAL INATTENTION TEST (Wilson et al., 1987)

Star Cancellation Test

1. Position the participant sitting at a table in a quiet area.
2. Researcher sits directly across from the participant.
3. Place the test sheet centered in front of the participant.
4. The researcher will read the directions to the participant: "This page contains stars of different sizes. Look at the page carefully – this is a small star. Every time you see a small star, cross it out like this. (Illustrate by crossing out the two small stars immediately above the centralizing arrow on the stimulus sheet.) I would like you to go through this page and cross out all the small stars without missing any of them."
5. The researcher will hand the participant a red pen.

Line Bisection Test

1. Position the participant sitting at a table in a quiet area.
2. Researcher sits directly across from the participant.
3. Place the test sheet centered in front of the participant.
4. The researcher will read the directions to the participant: "There are three lines on this page. (Point each out clearly by running the top of a pen or pencil along each line.) Take each line and divide it where you consider the centre of the line to be. (The subject is not permitted to use a pen or any other object to estimate the mid-point.)"
5. The researcher will hand the participant a red pen.

Appendix C

Demographic Sheet

Date: _____

Participant # _____

Age: _____

Length since stroke: _____

Medical History_____
_____
_____
_____
_____

Medical Precautions _____
_____
_____
_____
_____

Current Medications_____
_____
_____
_____
_____

Table 1

Mean and Range Scores from the Test Battery

	BTT		SCT		LBT	
Phase	*M*	Range	*M*	Range	*M*	Range
A1	0.68	0.33-1.00	46.50	43-52	1.77	1.42-2.67
B	1.00	1.00-1.00	48.33	43-53	1.36	1.08-1.58
C	0.93	0.78-1.00	51.33	48-53	0.73	0.33-1.47
A2	1.00	1.00-1.00	52.00	51-53	0.92	0.40-1.37

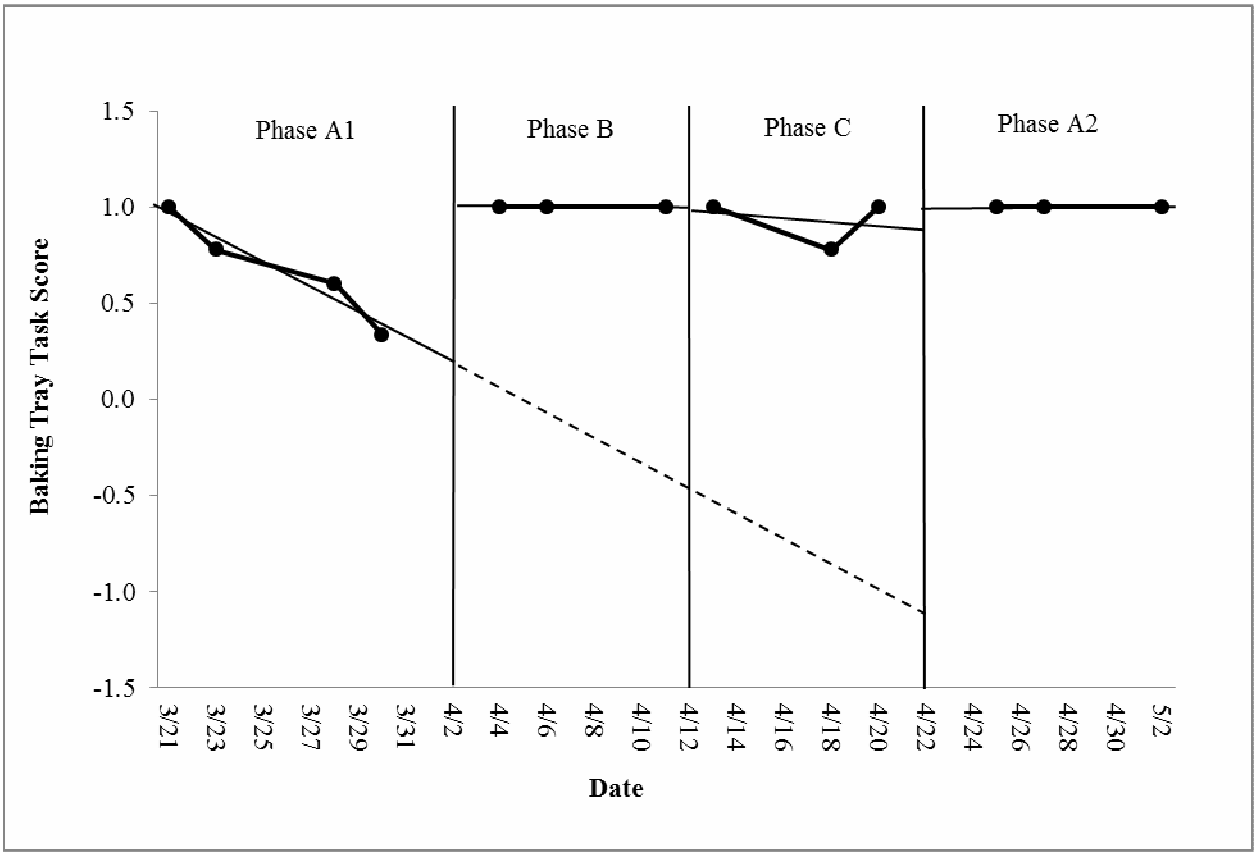

Figure 1. Baking Tray Task results. Scores were determined by dividing the number of blocks placed on the left by the number of blocks placed on the right side of the board, with 1.0 equaling the greatest possible score.

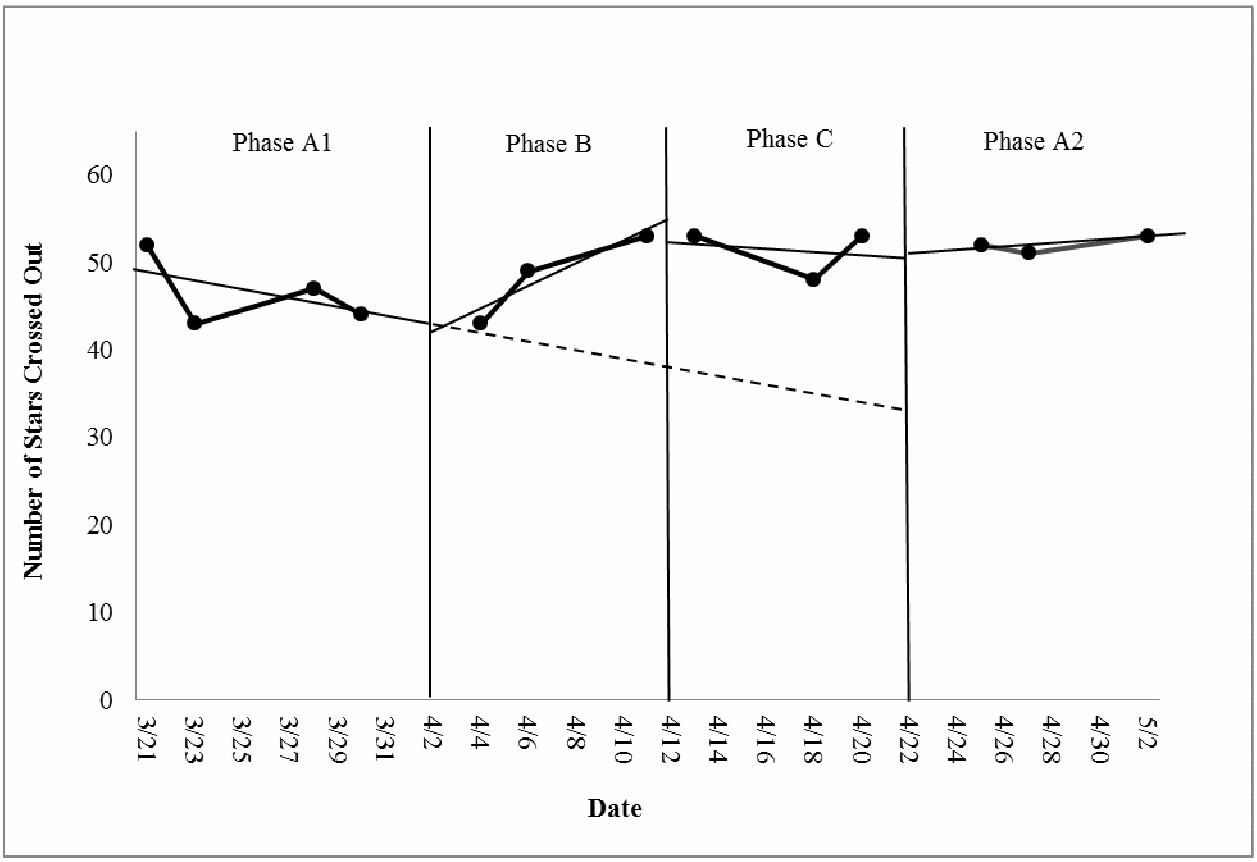

Figure 2. Star Cancellation Test results. Scores were determined by counting the number of stars the participant crossed out, in which, lower scores indicate more neglect or inattention. Highest score possible equals 54.

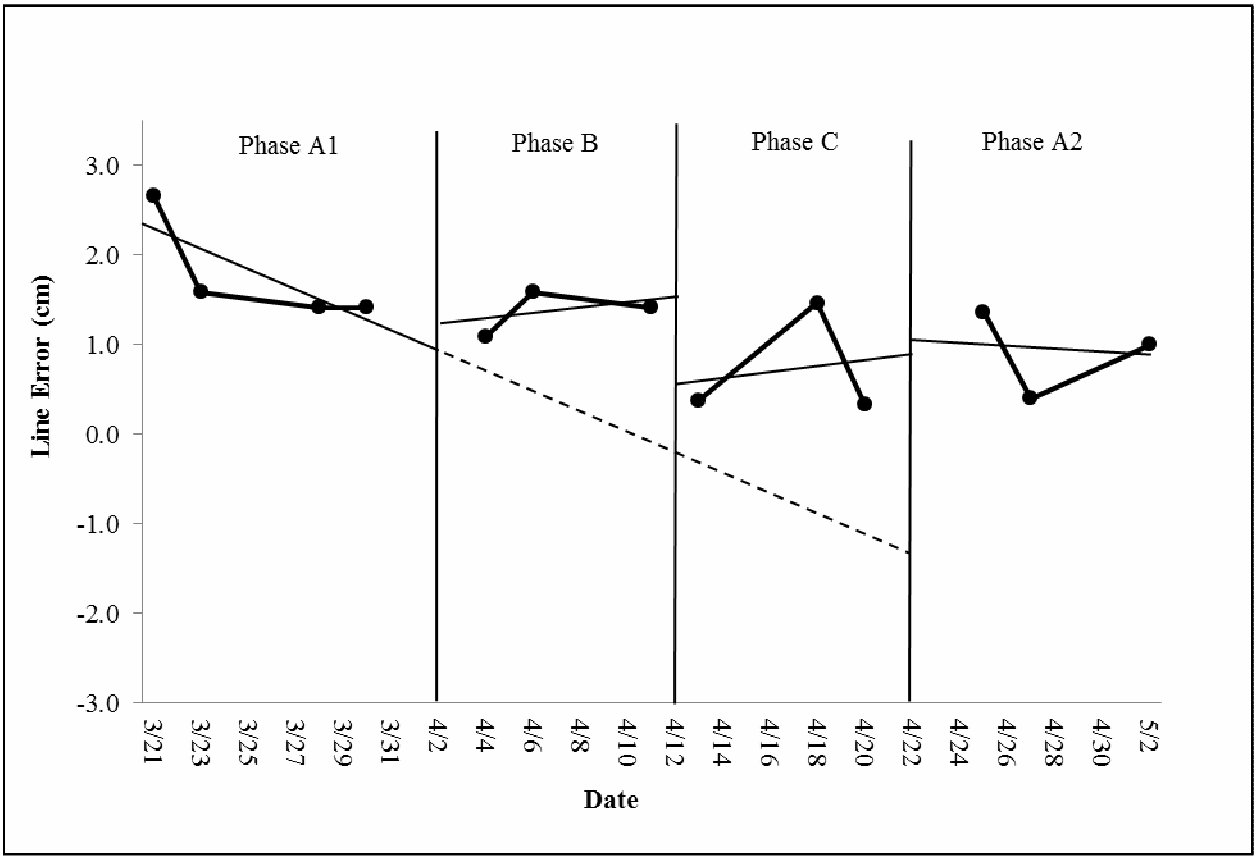

Figure 3. Line Bisection Test results. Scores were determined by measuring how many centimeters from the middle the participant made the line and averaging the distance between the three lines, with a score of 0 equaling midline.