NSCI 420 Article:

Cognitive Rehabilation Program for an Older Population with Subjective Memory Complaints

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Abstract

Cognitive rehabilitation is a cognitive intervention that aims to improve everyday life by using cognitive tools and/or external aids. This intervention is geared towards a population with mild cognitive impairments (MCI). An objective of this study are to look at the preliminary data generated from the French-Canadian version of the program, SYNAPSE. This intervention was initially developed in the States for an MCI population and was shown to be efficacious. Then it was translated to French and adapted for a population with subjective memory complaints (SMC). Further goals are to attempt to characterize participants, determine if there is an inter-site difference, to observe acceptability and possible effects of the program on the local population. The outcome of the study is that participants at the Douglas site improved on objective measures of verbal memory and visual attention. Subjects report less memory complaints and more use of cognitive and external strategies. Groups from the two sites did diverge on a number of characteristics. Participants did note that they were content with the services that they obtained and would return if the need arose.

Introduction

Alzheimer's disease (AD) is a progressive neurodegenerative disease with yet any cures that causes a great burden on the individual and his/her caretaker. In recent years, there has been a shift in how the disease is perceived. The progressive aspect of neurodegeneration has gained more consideration and it has now become possible to identify earlier stages of it. The disease is now subdivided in the initial preclinal stage, the mild cognitive impairment stage and finally the dementia stage (Dubois et al., 2016). The MCI stage has gotten more attention and it is now possible to identify the disease before the first clinical symptom of dementia occurs (Dubois et al., 2016). However, the preclinical stage is more elusive. It is a new concept within the litterature with no obvious way to define it. Nonetheless, it has been known that there are means to alter the rate of advancement of AD through modifiable risk factors (Sacuiu, 2016). This change in the disease has been shown to be more efficacious in the early stages of AD as compared to the dementia stage (Bahar-Fuchs et al., 2013, Kasper et al., 2015).

Cognitive rehabilitation is the most effective approach at conveying knowledge to affected individuals that they can translate into applicable skills (Kasper et al., 2015, Gagnon and Masson, 2017, Huckans et al., 2013). The goal being that this type of intervention improves their daily life and helps compensate for memory issues. The method of doing so is by teaching techniques and strategies that are more versatile than just teaching repetition of a task. The idea is to provide easy and flexible solutions that individuals with mild cognitive impairments or subjective memory complaints can adopt.

The program was initially developed in the United States for a population with mild cognitive impairment (Twamley et al., 2012, Huckans et al., 2013, Storzbach et al., 2016). SYNAPSE, a

cognitive rehabilitation program, is intended for a population with subjective memory complaints, a likely preclinical stage of AD (Sperling et al., 2011). Subjective memory complaints have become the accepted term for the preclinical stage. However, being in the preclinical stage does not imply a guarantied conversion to MCI and the to dementia (Sperling et al., 2011). It simply means that there is an increased risk of progressing in that direction.

The objective of this current research is to validate it in a French-Canadian population in two Quebec health centers. The study also seeks to characterize its participants and dropouts to refine the program to better help further groups. This is a continuation of a previous preliminary investigation (Masson et al., 2016).

Materials and Methods

Participants

The targeted population are outpatients with SMC over the age of 50. Individuals needed to have MMSE scores above or equal to 24. In this article, five cohorts of participants are included. Three of the cohorts were at the Douglas Mental Health Institute and two at the CISSS Montérégie-Ouest location. Between all the cohorts, three participants were excluded due to not meeting the inclusion criterion regarding their MMSE score. Furthermore, thirteen participants dropped out from the study. Their reasons varied from a lack of motivation, to a mismatch between the program and their goals, to the physical difficulty of attending the program every week. Completers are defined as having attended more than 60% of the weekly meetings and done the post evaluations. In Table 8, you will find a more complete breakdown of the study, organized by cohorts and the participants

within them.

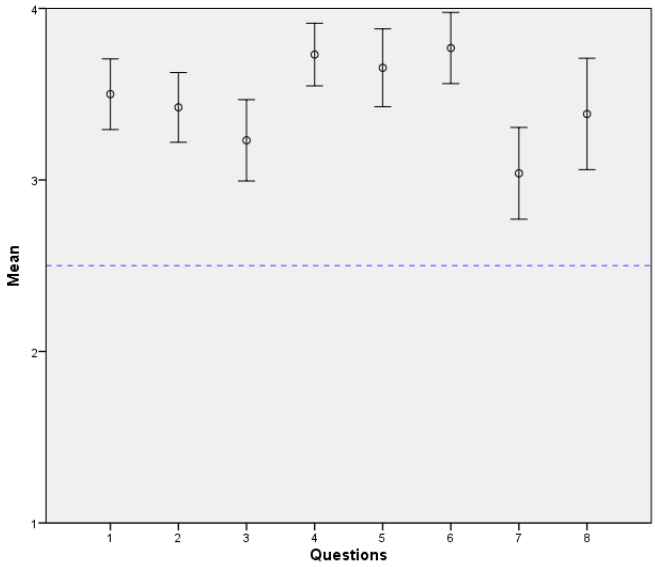
Organization

Participants are sent subjective forms to fill out before the beginning of the program. These forms touch upon memory complaints, strategies, motivation to change, level of anxiety as well as depression. Next, there is the administration of objective evaluations and the completion of a demographic form, all of which are done one-on-one. These task test their cognition in different modalities such as verbal memory, visuospatial memory, psychomotor task, working memory and others. Then they follow the program for a period of 10 weeks. After that period they fill out the same subjective questionnaires, minus the one on initial motivation, and come in again for objective evaluations (see Table 1).

Statistical Analysis

Statistical analyses were performed with SPSS, version 23.0. The statistical test used to compare independent samples is the Mann-Whitney U-test. This test was used for example in the comparison of between dropouts and completers, and between Valleyfield and the Douglas. For repeated measures, the paired Wilcoxon test is used. P values only report if an effect exist but in order to quantify it, an effect size is necessary (Sullivan and Feinn, 2012). Also, in some cases the sample sizes are too small to hope to glean information from the p-value. The effect size ranges from small=$0.2 - 0.5$, medium=$0.5 - 0.8$, large=$0.8 - 1.3$ and very large=> 1.3 (Cohen, 1992).

Figure 1: CSQ Form



Results

Feasibility and Acceptability

Between the five cohorts, there are a total of 44 subjects that were recruited. Two individuals were excluded because they had too low MMSE scores. Out of the remaining 42 individuals, 29 completed (69%) the program and 13 withdrew. Of the 13 who did not complete the program and pass the post evaluations, 4 attended at least 6 out of the 10 sessions while the other 9 attended less than 3 sessions. The reasons given by the individuals who dropped out are that the program was different from their expectation and a lack of motivation. Most individuals that dropped out either declined to complete the post evaluations or failed to respond to our inquiries.

The individuals that completed the program were asked to fill out the CSQ form. For all the questions, the mean answer always denotes a favorable response regarding the services they obtained (see Figure 1).

A similar pattern emerges in the acceptability questionnaire (QOI) (Gagnon and Masson, 2017).

The average response indicates that the participants that finished the cognitive rehabilitation program have at least moderately attained their objective (QOI_2: $\mu = 2.37$; see Table 7). Also, they report that without the program they envision that could accomplish their objective at most a little bit (QOI_3: $\mu = 0.70$; see Table 7). Questions about the various aspects of the program, such as format of the group and number of pauses, were almost all answered in the positive. Only one person out of the 27 completers noted a dissatisfaction with the format of the group, two individuals found the number of meetings to be excessive and one person would have preferred an hour meeting. Everybody indicated a satisfaction with the number of pauses, the content of the course and the group leaders.

Adherence

Attendance was taken down by the group leaders. Among the participants that completed the study, the attendance rate is of $91.55\% \pm 9.55$.

The level of motivation is either self-assessed by the participants or it is done by the group leader. The self evaluation of motivation is done with the URICA questionnaire, which is given before the program, and with the QOI, which is given after the program. The URICA score of dropouts is 7.96 ± 3.87 and of completers is 8.41 ± 3.44. There is no significant different between both groups initial motivation ($p > 0.05$, d=0.12). In the QOI, participants indicated that their level of motivation to participate in the program was high, that their level of participation in class and motivation to do exercises at home was moderate to high (see Table 7).

The outside perspective of the participant's motivation is given by the GEM questionnaire. According to the questionnaire, dropouts ($\mu = 1.77, \sigma = 1.46$) have a significantly lower score

than completers($\mu = 3.63, \sigma = 0.53$) and this difference has a very large effect size ($p = 0.026 < 0.05, d = 1.69$).

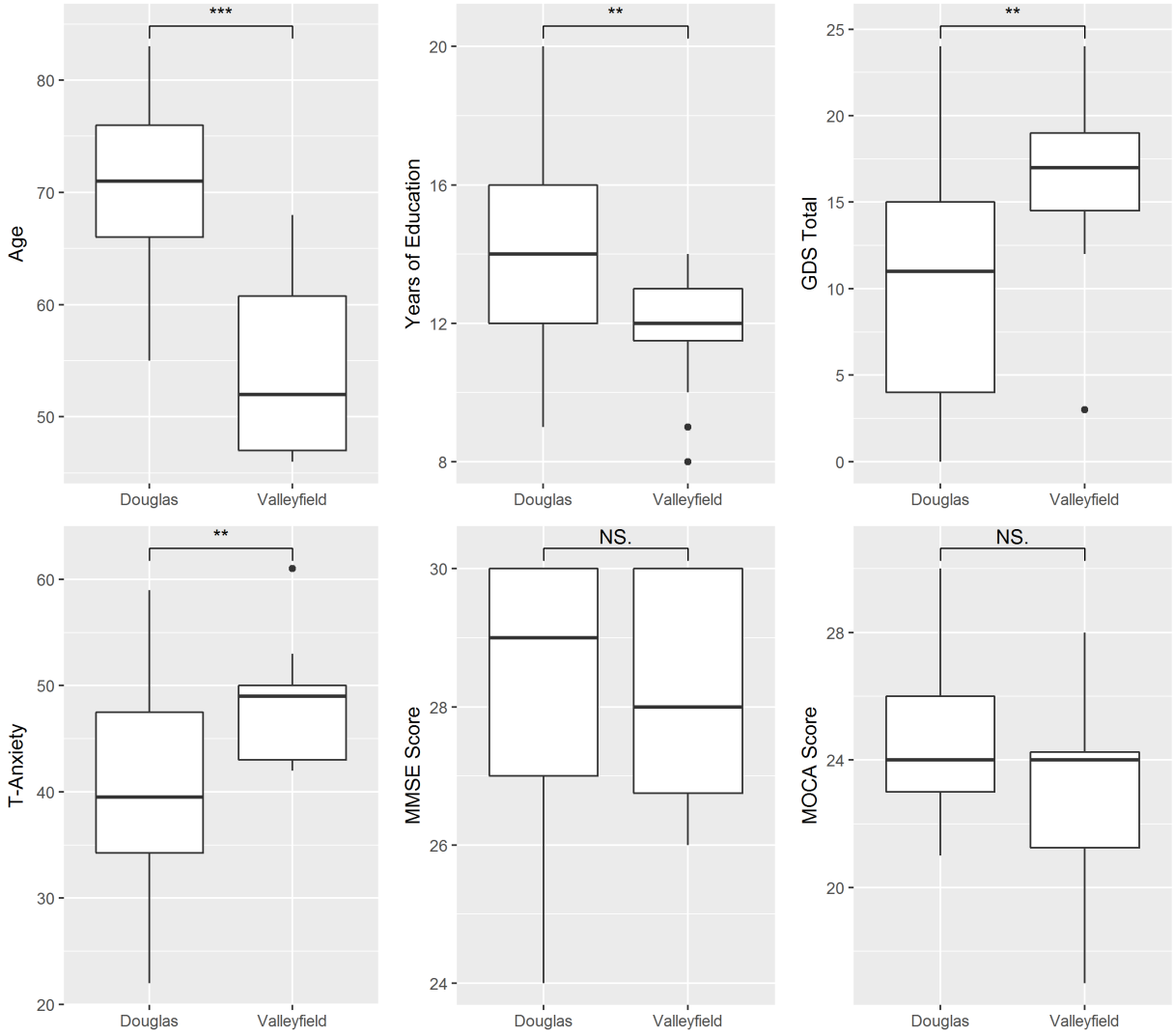
Site Comparison

Since the data from this study comes from two sites, it is necessary to initially know if it is similar enough to merge together. To accomplish this, it is necessary to look at key variables: age, education, MOCA, MMSE. There is a significant difference between the mean age of the participants with regards to location of the study and this effect is very large ($p < .001, d = 2.05$). The participants at the CISSS Valleyfield Center ($\mu = 53.83, \sigma = 8.00$) are younger than participants from the Douglas Mental Health Institute ($\mu = 69.80, \sigma = 7.59$). There are also significant differences in the level of depression, education, anxiety and performance on certain aspects of the Cogstate between these two population (see Figure 2). Because of this divergence of the sites in multiple regards, it is best to proceed with the pre-post analysis site by site rather than erroneously combining them. Also, due to the small sample size at the Valleyfield location (N=12), more emphasis is placed on the effect size (Sullivan and Feinn, 2012).

Objective Measures at Baseline

The objective measures that were taken at baseline for all individuals are the MMSE, MOCA and Cogstate. No participant of the study had a MMSE score lower than 24 out of 30 as that is an exclusionary criterion. The components of the MMSE for which most individuals had difficulty with are the delayed verbal memory task (average score on the question=74%) at the Douglas and the working memory task (75%) at the Valleyfield location. As shown in Figure 2, there is no

Figure 2: Site Comparison



significant difference between the two sites in terms of MMSE score. At the Douglas, scores on the MMSE between dropouts ($\mu = 28.13, \sigma = 2.10$) and completers ($\mu = 28.19, \sigma = 1.63$) are not significantly different and the effect size is negligible ($p = 0.93 > 0.05, d < 0.05$). At the Valleyfield location, there is also no significant difference on the MMSE scores between dropouts ($\mu = 27.50, \sigma = 1.92$) and completers ($\mu = 28.50, \sigma = 1.51$) though there is a medium sized effect ($p = 0.368 > 0.05, d = 0.58$).

For the MOCA, the components that were the least well answered are the delayed verbal mem-

ory task at the Douglas (45%) and the visuospatial cube drawing tasks at Valleyfield (8%). A considerable number of participants scored under the cut-off value of 26 (66%). As shown in Figure 2, there is no significant difference between the two sites in terms of MOCA score. At the Douglas, scores on the MOCA between dropouts ($\mu = 24.00, \sigma = 2.14$) and completers ($\mu = 25.10, \sigma = 2.77$) are not significantly different and there is a small effect size ($p = 0.251 > 0.05, d = 0.44$). At the Valleyfield site, scores on the MOCA between dropouts ($\mu = 24.50, \sigma = 2.52$) and completers ($\mu = 22.00, \sigma = 3.30$) are not significantly different but the effect size is large ($p = 0.368 > 0.05, d = 0.85$).

Looking at the Cogstate battery with Douglas participants, there are no subscales that have a statistically significant difference though there is one that has medium effect. In regard to the number of errors on the visual association task, dropouts score $\mu = 115$ while completers score $\mu = 141$, there is a medium effect size associated with this observation ($d = 0.64$). The modalities that did not show a variation between groups are the speed detection in the card task, the number of errors in the identification task, the number of errors in the One Card task, the errors in the One-Back task, the number of errors in the immediate and delayed maze as well as the number of correct answers in the immediate and delayed list recall. With Valleyfield participants, dropouts ($\mu = 2.73, \sigma = 0.09$) have a significantly higher number of errors in the identification card task than completers ($\mu = 2.58, \sigma = 0.10$) and the effect size is very large ($p = 0.048 < 0.05, d = 1.49$).

Subjective Measures at Baseline

The subjective measures at baseline are composed of the QAM, GDS, STAI and CPSA. For starters, the QAM is divide sections that pertain to memory complaints of different modalities: for faces, objects, conversations and others. Questions that were rated the highest indicate a more frequently occuring issues. With Douglas participants, dropouts score lower than completers on the sections pertaining to distractions (section 3: $\mu_{drop} = 2.35, \mu_{complete} = 3.19; d = 0.94$), the sections pertaining to people (section 4:$\mu_{drop} = 2.12, \mu_{complete} = 2.65; d = 0.90$), the sections pertaining to trigger factors (section 10: $\mu_{drop} = 3.10, \mu_{complete} = 3.95; d = 0.91$) and across the whole questionnaire ($\mu_{drop} = 2.43, \mu_{complete} = 3.10; d = 1.02$). All these differences have large effect sizes. With Valleyfield participants, the effect sizes associated with the QAM subscales are negligible. There is no significant difference between dropouts and completers on every section of the questionnaire.

Next, the self reported clinical symptoms of anxiety and depression are considered. At both location, there is no difference dropouts and completers; and the effect sizes are negligible. Looking at the anxiety scale, 10 individuals at the Douglas and 6 at Valleyfield have scores after the cut-off value of 40 in the state-scale. However, it is suggested that in an older population the cut-off be at 55 (Kvaal et al., 2005). In that case, only one participant at Valleyfield falls into the anxious range. However, at both locations, there is no difference between dropouts and completers in regards to both STAI and GDS scores (see Table 6). Important to note is that even the lowest average on the GDS between sites represents a score that is on the boundary between normality and mild depression (see Table 5).

The strategies that participants initially report using most often are writing in a calendar to

keep track of activities, followed by noting down things to remember and placing objects at the same place. Also, there is no significant difference between dropouts and completers in their use of strategies at both locations. Nor are there significant differences and notable effect sizes at both sites between the self report level of problems in the CPSA of dropouts and completers.

Prediction Model

In an attempt to better understand our dropout population, a binary logistic regression was done. The outcome variable was binary, do participants dropout, yes or no. Participants that were excluded from the program were also excluded from this prediction analysis. The regression was only done with data from the Douglas site because as previously mentioned the two groups are not equivalent and because the Valleyfield site does not have enough data do perform a regression on it.

The selection of independent variables was done by observing which variable in the previous sections, Objective Measures at Baseline and Subjective Measures at Baseline, were significantly different between dropouts and completers or of medium effect size. The variables that were used are: QAM section 3 average, section 4 average, section 10 average and error in the visual association task in Cogstate. The method used in the binomial regression is a backward stepwise model as all the variables used already showed association with the outcome. The model found did not improve upon the accuracy of the null hypothesis (80%), of always assuming that people will complete. However, the variable that came out of the regression is the average score of section 3, distractors, on the QAM ($p = 0.062 > 0.05, OR = 6.22$).

Pre-Post Comparison

Moving on to pre-post evaluations, only participants with pre and post evals were used (29 subjects). Eight of them are from Valleyfield while the rest are from the Douglas (N=21). The Wilcoxon Signed-Rank test was used to compare key values, obtained both before and after the program, to determine if there is a significant change and find out the size of the effect. This test is used because of the small sample size and the assumption that the distribution is non-normal. Hence, these tests will be performed on Cogstate , QAM, GDS, STAI and CPSA data.

Douglas

To start off, the objective measure of memory in this study (Cogstate) yielded a few significant changes. The aspects of memory that were improved, as compared to baseline, are visual attention and verbal memory. The visual attention improvement comes from a decrease in identification error in the card task ($p = 0.003 < 0.05, d = 0.46$). And the verbal memory improvement is seen in an increase of correct answers in the immediate and delayed shopping list recalls ($p = 0.008 < 0.05, d = 0.42$; $p = 0.037 < 0.05, d = 0.33$ respectively).

The subjective memory complaints did decrease in certain sections of the QAM and in the CPSA. From baseline, there is a significant decrease in attention slips from $\mu_{pre} = 3.21$ to $\mu_{post} = 2.66$ (QAM section 3) and that, with a medium effect ($p = 0.005 < 0.05, d = 0.65$). Also in the QAM, there is a decrease in reported memory issues involving remembering people (section 4), from $\mu_{pre} = 2.64$ to $\mu_{post} = 2.41 (p = 0.012 < 0.05, d = 0.33)$ with a small effect size. The memory complaint component of the CPSA decreased from baseline $\mu_{pre} = 27.15$ to $\mu_{post} = 22.25$ ($p = 0.035 < 0.05, d = 0.40$) with a small effect size. There was a significant increase in the

strategy component of the CPSA, $\mu_{pre} = 35.20$ to $\mu_{post} = 41.00$ ($p = 0.024 < 0.05, d = 0.57$) with a medium effect size. For the subjective clinical symptoms, anxiety and depression, there are no significant changes and only negligible effect sizes.

Valleyfield

A particular interest is given to effect sizes that are medium and higher ($d > 0.50$) due to the small number of participants that completed the program at the Valleyfield site (N=4). Regarding objective cognitive measures, though there are improvement in the mean scores, there is no effect size above the range previously mentioned . The same phenomenon exists with the QAM and CPSA. Thus, we cannot reject the null hypothesis that there is no change pre-post treatment in those categories. For the subjective clinical symptoms, there are large effect size in the decrease of the anxiety state and trait subscales ($d = 1.01$ and $d = 1.42$). The change for the state subscale are from $\mu_{State-pre} = 39.60$ to $\mu_{State-post} = 31.80$ and $\mu_{Trait-pre} = 47.40$ to $\mu_{Trait-post} = 37.20$ for the trait subscale. The effect for the depression scale is negligible (GDS).

Discussion

The goals of this study to are to look at the preliminary data generated from the French-Canadian version of SYNAPSE, attempt to characterize participants, determine if there is an inter-site difference, to observe acceptability and possible effects of the program on the local population. The SYNAPSE program observed a completion rate of 69% which is acceptable. When dealing with psychiatric research, it is typical to have a high rate of dropouts (Yalom, 1966). Participants that completed the study favorably indicated that the program answered their needs and that they would

come back if they needed help once more. Congruently with the reasons given by dropouts, the GEM indicates that dropouts have less motivation and interact less in the groups than completers. As the GEM is done towards the end of the program, it is more likely that at that time point that individuals who would drop out have already done so. Thus, the GEM may be slightly biased by the fact that the people filling it in are the group leaders. However, like in schools, low engagement and interaction with the course content correlates with higher rates of dropouts (Kennelly and Monrad, 2007).

Population

The majority of participants in this cognitive rehabilitation program were below the normal MOCA cut-off range. This is inline with the knowledge that the MOCA is more sensitive to mild cognitive impairments and preclinical stages of AD as compared to the MMSE (Nasreddine et al., 2005). However, both test have high specificity which is lower the odds of false-negatives. In this case, what is important to note is that the cognitive measurements confirm that we are dealing with a population with some cognitive issues. Furthermore, many participants from both groups range in the GDS as at least mildly depressed. This is in line with depression being comorbid with cognitive impairments (Reischies and Neu, 2000). A recent study suggests that subjective cognitive decline, also SMC, accounts less for cognitive performance than in the level of depression (Zlatar et al., 2017).

Sites

The determination of whether the two sites were different yielded positive results. There are a lot of differences between the two sites. However, interestingly, there were no significant differences between their objective cognitive scores, as measured by the MMSE and the MOCA. Some key differences at baseline are that participants from the Douglas are older, more educated, less depressed and less anxious than their counterparts at Valleyfield. Also, their difficulties are different and as such what they take out of the program is different, hence the separate evaluations. An example of their difference is that participants at Valleyfield struggled in the visuospatial cube drawing task with only one person out of 12 succeeding at it. By contrast, 24 people out of 32 from the Douglas passed that question.

Characterization

In order to characterize our participants, comparison between dropouts and completers were made with baseline values. There was no difference in an objective measure between these two groups that was conserved while segregating participants from the Douglas and Valleyfield. In one case dropouts were better at a visuospatial task, visual association in Cogstate, Douglas. While in the other, dropouts were worse on a visual attention task, identification card task in Cogstate, Valleyfield. The resurgent element is a lack of consistency in differences. Taking a look at subjective measures at the Douglas, the comparison shows that dropouts have less complaints in certain modalities than completers and this with large effect sizes. The modalities are being distracted, forgetting people and their names, and triggers lowering their cognitive functions. This lower level of complaints could either be that they indeed do have less issues than completers or that they

lack insight into their situation. Bringing together the subjective and objective measure could help clarify the situation. When looking at participants from the Douglas, dropouts do tend to perform better on the visuospatial association task than completers. This better performance could foreseeable be due in part to a lower level of distraction, which is one of the things they complain less about. In short, it is not certain that dropouts have less issues, but their objective measures go in line with their subjective evaluation.

The logistic regression did not grant a significant equation to predict the likelihood of completing/dropping out more accurate than always predicting the most popular outcome. However, the variables that were the most correlated with the experimental outcome were in the QAM. With new cohorts, this equation may be refined and could eventually help create either another exclusion criterion or could be used to better tailor the program to be more inclusive.

Improvements

There seems to be a maintenance of divergence between the two sites in term of which measures changed pre-post treatment.

The Douglas site had improvements in objective and subjective measures. They had significant improvements in terms of their visual attention and verbal memory. These two components could be explained by the teachings in the program though to be able to attribute this amelioration to SYNAPSE, there needs to be a control group to compare to. Albeit, subjects do report using more and new strategies than at baseline, as such this hypothesis becomes more likely. Two sections of the QAM that were initially higher for completers than dropouts decreased post treatment. The sections are for distractions (section 3) and issues remembering people (section 4). There is an

overall increase in performance and decrease in reported complaints.

On the other hand, the Valleyfield site had only showed improvements with large enough effect sizes in the anxiety scales. The issue here is the very small sample size. In addition to that, some missing data decreased the available pool of information furthermore because of list wise deletion. The noteworthy effect sizes linked to the change in anxiety may have become observable because of the initially high levels of anxiety within those subjects (see Fig 2). In short, participants were more anxious and depressed and therefore had more potential to decrease their score on the scale.

Limitations

To be able to quantify the potency of SYNAPSE, it becomes necessary to redesign the experiment. The use of a randomized controlled trial with a control group that would have a sham intervention would allow the quantification of the strength of the program. Without a control group, it is impossible to say for certain that the observed effect is due to the given treatment, there are too many unaccounted variables. However, this study continues to produce encouraging data. The next step is to validate it.

A major limitation in this study was missing data. Very often participants failed to fill out questionnaires. Most of the time the mistakes were caught, but in some cases where the data came from the off-site location it became harder to obtain the information.

As previously mentioned, the two sites are not very homogenous. Some issues are the small sample size from the Valleyfield site and the different population of individuals that they can recruit. These points could be counter-balanced with a bigger sample size. As an example, with the addition of new cohorts at the Douglas, some distribution of the data becomes normalized (Masson

et al., 2016).

Future Experimentation

In addition to having a randomized control trial, it would be interesting to add time points after the end of the program and re-evaluate the subjects. This would allow for us to know how long the effects of the treatment last as well as which strategies that people adopt the most/least. Furthermore, doing a review after a few months would be useful in reconsolidating the content that they learned.

The incorporation of a more complete module on physical activity and the collection of physiological measures that are known modifiable risk factors for AD, such as blood pressure, would help round up SYNAPSE and its possible effects (Geda et al., 2010, van Vliet Peter, 2012). This could lead to greater improvements within the participants cognition but again, that information can only be acquired with the use of a control group.

A worthwhile step for the program is to further incorporate partners and caregivers in the program. The goal of cognitive rehabilitation is to equip individuals that need support and teach them how to use those tools in day to day life. Our data shows that many of them have an increased difficulty in remembering multiple things at the same time. The knowledge they acquire in this program could be just that, a lot of things to remember. By bringing in people close to our participants, those people could help make the learning process more relevant and add an element of stability to their acquisition process.

References

Bahar-Fuchs, A., Clare, L., and Woods, B. (2013). Cognitive training and cognitive rehabilitation for mild to moderate alzheimer's disease and vascular dementia. *Cochrane Database Syst Rev*, (6):CD003260.

Cohen, J. (1992). Statistical power analysis. *Current directions in psychological science*, 1(3):98–101.

Dubois, B. et al. (2016). Preclinical alzheimer's disease: Definition, natural history, and diagnostic criteria. *Alzheimer's & Dementia*, 12(3):292–323.

Gagnon, G. and Masson, M. (2017). *Primary Care Mental Health in Older People – A Global Perspective*, chapter Psychosocial rehabilitation and the importance of a multidisciplinary approach. Unpublished.

Geda, Y. E., Roberts, R. O., Knopman, D. S., Christianson, T. J. H., Pankratz, V. S., Ivnik, R. J., Boeve, B. F., Tangalos, E. G., Petersen, R. C., and Rocca, W. A. (2010). Physical exercise, aging, and mild cognitive impairment. *Archives of Neurology*, 67(1).

Huckans, M., Hutson, L., Twamley, E., Jak, A., Kaye, J., and Storzbach, D. (2013). Efficacy of cognitive rehabilitation therapies for mild cognitive impairment (MCI) in older adults: Working toward a theoretical model and evidence-based interventions. *Neuropsychology Review*, 23(1):63.

Kasper, E., Ochmann, S., Hoffmann, W., Schneider, W., Cavedo, E., Hampel, H., and Teipel, S.

(2015). Cognitive rehabilitation in early stage alzheimer's disease. *The Journal of Prevention of Alzheimer's Disease*, pages 142–152.

Kennelly, L. and Monrad, M. (2007). Approaches to dropout prevention: Heeding early warning signs with appropriate interventions. *American Institutes for Research*.

Kvaal, K., Ulstein, I., Nordhus, I. H., and Engedal, K. (2005). The spielberger state-trait anxiety inventory (STAI): the state scale in detecting mental disorders in geriatric patients. *International Journal of Geriatric Psychiatry*, 20(7):629–634.

Masson, M., Huckans, M., Twamley, E., and Gagnon, G. (2016). A feasibility study of a group-based compensatory cognitive rehabilitation therapy for individuals with subjective memory complaints. *Neuropsychological Rehabilitation*.

Nasreddine, Z. S., Phillips, N. A., Bédirian, V., Charbonneau, S., Whitehead, V., Collin, I., Cummings, J. L., and Chertkow, H. (2005). The montreal cognitive assessment, moca: a brief screening tool for mild cognitive impairment. *Journal of the American Geriatrics Society*, 53(4):695–699.

Reischies, F. M. and Neu, P. (2000). Comorbidity of mild cognitive disorder and depression–a neuropsychological analysis. *European archives of psychiatry and clinical neuroscience*, 250(4):186–193.

Sacuiu, S. (2016). *Handbook of Clinical Neurology*, volume 138, chapter Chapter 8 - Dementias, pages 123–151. Neuroepidemiology.

Sperling, R. A. et al. (2011). Toward defining the preclinical stages of alzheimer's disease: rec-

ommendations from the national institute on aging-alzheimer's association workgroups on diagnostic guidelines for alzheimer's disease. *Alzheimers Dement*, 7(3):280–292.

Storzbach, D., Twamley, E. W., Roost, M. S., Golshan, S., Williams, R. M., O'Neil, M., Jak, A. J., Turner, A. P., Kowalski, H. M., Pagulayan, K. F., and Huckans, M. (2016). Compensatory Cognitive Training for Operation Enduring Freedom/Operation Iraqi Freedom/Operation New Dawn Veterans With Mild Traumatic Brain Injury. *J Head Trauma Rehabil*.

Sullivan, G. M. and Feinn, R. (2012). Using effect size—or why thePValue is not enough. *Journal of Graduate Medical Education*, 4(3):279–282.

Twamley, E. W., Vella, L., Burton, C. Z., Heaton, R. K., and Jeste, D. V. (2012). Compensatory cognitive training for psychosis. *The Journal of Clinical Psychiatry*, 73(09):1212–1219.

van Vliet Peter (2012). Cholesterol and late-life cognitive decline. *Journal of Alzheimer's Disease*, 30(s2):S147–S162.

Yalom, I. D. (1966). A study of group therapy dropouts. *Archives of General Psychiatry*, 14(4):393.

Zlatar, Z. Z., Muniz, M., Galasko, D., and Salmon, D. P. (2017). Subjective cognitive decline correlates with depression symptoms and not with concurrent objective cognition in a clinic-based sample of older adults. *The Journals of Gerontology. Series B, Psychological Sciences and Social Sciences*.

Figures

Table 1: Evaluations

Names	PRE	POST
Formulaire demographique	+	
MMSE	+	
MOCA	+	
CogState	+	+
VAS	+	+
QAM	+	+
GDS	+	+
STAI	+	+
CPSA	+	+
ASRS	+	+
URICA	+	
GEM		+
CSQ		+
Questionnaire d'atteinte de l'objectif initial		+

Table 2: Study Status by Cohort

Cohort Number	Excluded	Dropouts	Completers	Total
01	1.00	4.00	4.00	9.00
02	0.00	3.00	4.00	7.00
03	1.00	2.00	13.00	16.00
04	0.00	2.00	3.00	5.00
05	0.00	2.00	5.00	7.00

Table 3: Demographic Information by Cohort

Cohort Number	Age	Education	MMSE	MOCA
01	69.00	13.00	27.75	24.88
02	70.71	14.43	29.14	24.29
03	69.80	14.53	27.47	24.87
04	55.80	11.20	28.80	22.60
05	52.43	12.29	27.71	23.00

Table 4: Demographic Information by Site

	Age	Education	MMSE		MOCA	
Site	avg	avg	avg	sd	avg	sd
Douglas	69.80	14.10	27.93	2.15	24.73	2.60
Valleyfield	53.83	11.83	28.17	1.64	22.83	3.19

Table 5: Subjective Measures By Site

Site	GDS	S-STAI	T-STAI	CPSA-Problems	CPSA-Strats
Douglas	10.07	35.86	39.92	25.96	36.44
Valleyfield	16.09	44.20	48.78	37.09	40.67

Table 6: Subjective Measures by Site and Experiment Status

Site	Experiment Status	GDS	S-Anxiety	T-Anxiety	CPSA-Problems	CPSA-Strats
Douglas	Dropouts	8.71	30.86	36.17	22.14	38.67
Douglas	Completers	10.52	37.52	41.05	27.24	35.81
Valleyfield	Dropouts	16.33	41.50	51.00	37.33	37.33
Valleyfield	Completers	16.00	44.88	48.14	37.00	42.33

Table 7: CSQ and QOI

Questionnaire	Question	Mean	SD
CSQ	1	3.36	0.73
	2	3.44	0.51
	3	3.18	0.61
	4	3.74	0.45
	5	3.63	0.56
	6	3.78	0.51
	7	3.04	0.65
	8	3.38	0.80
QOI	2	2.37	0.93
	3	0.70	0.78
	4	4.12	0.82
	5	3.63	0.88
	6	3.42	1.06
	7	6.88	1.96

Table 8: Complete Demographic Information by Cohort

Cohort	ID	Age	Sex	Education	MMSE	MOCA
1	160101	56	Female	12	29	26
	160102	74	Female	9	26	22
	160103	55	Female	19	30	27
	160104	67	Female	12	26	26
	160106	82	Female	11	25	21
	160107	59	Female	16	28	26
	160108	82	Male	10	29	25
	160109	77	Female	15	29	26
2	160201	71	Male	12	29	22
	160202	72	Female	12	30	24
	160203	69	Female	16	30	29
	160204	70	Female	10	27	21
	160205	67	Female	18	30	22
	160206	73	Male	20	30	26
	160207	73	Female	13	28	26
3	160301	62	Female	12	30	23
	160303	65	Female	15	30	30
	160304	77	Female	14	28	23
	160305	83	Male	18	27	23
	160306	76	Male	18	25	24
	160307	64	Male	16	29	24
	160308	71	Female	12	28	29
	160309	77	Male	14	24	22
	160311	66	Female	14	29	25
	160313	66	Female	16	28	23
	160314	79	Female	16	30	29
	160315	66	Female	14	27	23
	160316	63	Female	14	29	29
	160317	73	Male	13	27	23
4	160401	46	Female	10	26	24
	160402	64	Female	12	30	28
	160403	47	Female	14	30	19
	160404	54	Female	12	28	17
	160405	68	Female	8	30	25
5	160501	47	Male	12	26	22
	160502	47	Female	13	29	26
	160503	50	Female	12	28	24
	160504	63	Female	9	26	22
	160505	54	Female	13	30	24
	160506	60	Female	14	28	24
	160507	46	Female	13	27	19