

4-30-2017

Translating the Mini-Mental State Exam into American Sign Language:

Jesslyn Taylor
King's University College

Follow this and additional works at: https://ir.lib.uwo.ca/psychK_uht



Part of the [Psychology Commons](#)

Recommended Citation

Taylor, Jesslyn, "Translating the Mini-Mental State Exam into American Sign Language:" (2017). *Undergraduate Honors Theses*. 65.
https://ir.lib.uwo.ca/psychK_uht/65

This Dissertation/Thesis is brought to you for free and open access by the Psychology at Scholarship@Western. It has been accepted for inclusion in Undergraduate Honors Theses by an authorized administrator of Scholarship@Western. For more information, please contact tadam@uwo.ca, wlsadmin@uwo.ca.

Translating the Mini-Mental State Exam into American Sign Language:

A pilot study

by

Jesslyn Taylor

Honours Thesis

Department of Psychology

King's University College at Western University

London, Canada

April 2017

Thesis Advisor: Dr. Cathy Chovaz

Acknowledgements

The author expresses sincere appreciation of Dr. Cathy Chovaz and Angela Core, without whom this paper would not have been possible. They have dedicated hours upon hours of their time to develop the Mini-Mental State Exam: American Sign Language version, which forms the very base this study is built on.

As well, sincere love and appreciation is extended to family and friends who played an essential supporting role throughout this project.

Abstract

The present pilot study looks at translating a commonly used cognitive assessment—the Mini-Mental State Exam—into American Sign Language. The test was videotaped and administered by a clinician with the assistance of a sign language interpreter. Participants were 15 Deaf adults ($M\ age = 66.60, SD = 16.65$), 11 females and 4 males. This pilot study provides recommendations for future revision of the Mini-Mental State Exam: American Sign Language version based on the correct response ratio results.

Translating the Mini-Mental State Exam into American Sign Language:
A pilot study

This study focuses on mental health and Deafness, specifically on whether the diagnostic tools currently used can be improved upon. This is an important topic in our society today as it impacts many individuals' lives in very significant ways. For example, many Deaf individuals are misdiagnosed as having a mental illness when they in fact do not, or as not having a mental illness when they do. This is a result of the tendency of clinicians to pathologize Deafness. This tendency leads to very serious problems as it means individuals who have a mental illness are not getting the care they need (du Feu & Chovaz, 2014).

The Mini-Mental State Exam has virtually never been translated over to a sign language. As well, the Mini-Mental State Exam is a very commonly used tool with many practical uses in emergency rooms, clinical practice, and in-patient wards. As such, having an accessible version of this assessment is vital to ensuring that Deaf populations receive proper assessment and care. The purpose of this pilot study is to find out how the Mini-Mental State Exam functions when developed into American Sign Language and to draw conclusions and make suggestions for the next edition based off of this study. If this assessment functions reliably when translated to a sign language, then it can be used to help clinicians and medical professionals make decisions about the cognitive status of patients (Brayne, 1998).

The field of mental health and Deafness is still considered an emerging field, and as such, there is much left to learn on the topic. Currently, the literature that is available leaves more questions than answers about what exactly mental health looks like in Deaf populations. Even though this is the case, the research that exists depicts an interesting story about the previous attempts to uncover the truth about mental health in Deaf populations. First, a review of the

literature on mental health and Deafness will be done, followed by a review on the current assessment tools and attempts to translate them into sign languages. This leads into the topic of what the Mini-Mental State Exam was developed for and how this impacted the development of the American Sign Language Version.

Mental Health in Deaf Populations

To begin the review of mental health and Deafness, an article discussing the portfolio of mental health for Deaf individuals is most relevant. In 2013, Diaz, Landsberger, Povlinski, Sheward, and Scully found that there was a different mental health portfolio for Deaf individuals, while stating that this did not necessarily mean they had more mental health issues. They studied outpatient groups for an 8-year span and found different prevalence rates for different types of disorders when hearing populations and Deaf populations were compared. For example, there was a higher prevalence rate for bipolar disorders in hearing populations, whereas in Deaf populations, there was a higher prevalence rate of impulse control disorders. As a result of the information from this study, it may be true that when studies claim Deaf populations have higher rates of mental illness they are studying the disorders that Deaf populations show higher prevalence rates in. However, this does not seem likely, as the next study states that mental illness rates are higher overall in Deaf populations.

In a study done by de Graaf and Bijl (2002), they looked at mental health and Deafness, but with very different results. The authors found that Deaf populations had higher rates of mental illness overall when compared to hearing populations. However, they did state that the differences have the potential to be over-estimated by other studies. In both of these studies, the authors state that there is more mental illness in Deaf populations, though the ways that the authors conclude mental illness exists differs vastly. In one, it is stated that higher levels of

mental illness in the Deaf population exist for all disorders (de Graaf & Bijl, 2002), and the other claims that higher levels of mental illness exist only for certain disorders (Diaz et al., 2013). This shows that there is much confusion around what mental health actually looks like in Deaf populations. The next study should bring some clarity to this discrepancy in the field of mental health and Deafness.

Landsberger and Diaz (2010) found higher prevalence rates for mental illness in Deaf populations than in hearing populations. However, the authors also brought up the fact of comorbidity being accountable for these rates of mental illness in Deaf populations. This means that the higher rates of mental illness do not necessarily come from more of the population having a disorder, but rather, the higher prevalence rates come from individuals that have multiple disorders at once. This could skew the prevalence rates into making it appear as though a greater proportion of the population has mental illness when this is not the case. The fact of comorbidity could explain the disparity that is seen when mental health and Deafness is examined. Of course, just knowing where mental health issues are present with certain populations is not enough; there is also a need to test for mental illness or abnormality on a person by person basis. Having assessment tools for mental health issues is an essential part of the conversation, which is covered in the next section.

Assessment Tools

One trial to translate a test over to Auslan (Australian Sign Language) found that it was still an effective and reliable measure when translated vs. the English version. Participants in this study were assessed using the Strengths and Difficulties questionnaire in both English and Auslan and the results were promising in terms of the translated version being used for Deaf populations. The authors found good internal reliability and good test-retest reliability. This

means that the Auslan version of the test functions in a way that is similar to the English version, bringing about the same results that are seen when the participants took the English version of the test. It can be reasoned from this test that other cognitive tests that are translated from a spoken language to a sign language would function similarly. This is important information as it shows that it is possible to translate an English test over to a sign language and still be comprehensive and accurate. As well, the authors discuss the benefits and need for more studies on diagnostic tools for Deaf and hard of hearing populations (Cornes & Brown, 2012).

Very recently, Atkinson, Denmark, Marshall, Mummery, and Woll (2015) developed a cognitive test directly in a sign language rather than translating one from a spoken language. This is an important distinction as sign languages and spoken languages have different norms and there can be some confusion when the questions do not translate properly. This group of researchers found that the test they developed directly in sign language, specifically BSL (British Sign Language), has good reliability, validity, and was able to detect cases of dementia in a sample. Along with these findings, they found that cases of dementia were more serious in Deaf populations versus hearing populations. The authors speak to this finding as being caused by a lack of resources and assessment tools for Deaf populations, which may explain why it seems as though there are more mental health issues in Deaf populations—perhaps the cases that are present, are just further progressed due to a lack of diagnosis and resources. This points to the necessity of having cognitive tests such as the Mini-Mental State Exam made accessible for Deaf populations.

In terms of making the Mini-Mental State Exam accessible, Dean, Feldman, Morere, and Mortona (2009) found that the English version of the Mini-Mental State Exam was problematic when administered to Deaf populations. Specifically, there were fewer correct responses on

questions when administering the English Mini-Mental State Exam to a Deaf population than when administering to a hearing population. This is problematic as it can lead to false conclusions such as diagnosing Deaf individuals with disorders they do not have, or assuming that cognitive state is lower overall in Deaf populations because of the higher frequency of incorrect responses. This leads to the conclusion that perhaps using the English version of the Mini-Mental State Exam is not a reliable or valid measure when used with Deaf populations which could be due to issues mentioned earlier about the discrepancy between hearing languages and sign languages. This study points to the importance of using accessible measures as it would yield more reliable results and lead to less misdiagnosis of mental illness in Deaf populations. Translating the Mini-Mental State Exam to American Sign Language might be an answer to this call for tests formatted for Deaf populations, as there are many differences between American Sign Language and English. These differences account for the proposed changes, discussed in the next section.

Confidence that translating the Mini-Mental State Exam into a sign language while preserving the integrity of the test is needed before proceeding. Pollard, DeMatteo, Lentz, and Rediess (2007) found that when they modelled a test after the Logical Memory subset of the Wechsler Memory Scale, the American Sign Language version functioned in much the same way that an English version of the same test could be expected to. This result was only found when the American Sign Language version was administered to fluent sign language users, which is similar to the English version only being effective when used with fluent English speakers; essentially, the patient that is being administered the test must first understand the language the test is in. This study shows promise for translating the Mini-Mental State Exam into American Sign Language as it can be generalized from the results that if the translation is culturally and

linguistically aware of the differences between spoken and sign languages, then the American Sign Language translated version should function similarly to the English version.

Description of the Mini-Mental State Exam

In order to understand the relevance of translating the Mini-Mental State Exam into a sign language, it is important to first understand why this assessment is so useful. To help explain this, Folstein, Folstein, and McHugh (1975) wrote a paper around why the Mini-Mental State Exam was developed and the circumstances surrounding this. Originally, the Mini-Mental State Exam was developed to be a short assessment that could be done with elderly populations, especially in cases of dementia, to measure cognitive abilities and mental functioning. At this time, it is important to note that the Mini-Mental State Exam was not developed to be a diagnostic tool, but rather as a simple assessment to help aid the clinician's understanding around a certain patient's condition or scores on diagnostic tools. The assessment consists of two sections measuring cognitions, with the first section being performed verbally and the second section being performed non-verbally. The first section has questions around orientation to time and place, memorization, calculation, and attention where patients can achieve a maximum of 21 points towards their total score. The second section involves recognition of objects, ability to follow instructions, making up a sentence, and drawing two interlocking pentagons where patients can achieve a maximum of 9 points towards their total score.

The specific outline of tasks in the first section is as follows: first there is questions about orientation to time and place; second, there is a registration task that involves the memorization of 3 words; third, there is a task about attention and calculation where patients either calculate serial 7's or spell world backwards; fourth, patients name a pencil and a watch; and fifth, patients repeat an idiom that the clinician says. In the second section, the tasks include reading and

following instructions, understanding and following spoken instructions, making up a sentence, and copying a picture.

Folstein, Folstein, and McHugh (1975) found that the Mini-Mental State Exam was a valid measure as it was consistent with the clinicians' diagnosis of cognitive difficulties. As well, the measure was able to detect improvements in the case of treatable difficulties like depression. The scores for dementia stayed consistent despite treatment, which is what is expected for an illness with no treatments available. The authors conclude that while the Mini-Mental State Exam is a valid measure and can provide insight for the clinician, it is in no way a diagnostic tool on its own. However, the insight that it provides could be vital for clinicians in providing care for their patients, whether hearing or Deaf.

There have been some criticisms after the test was developed, specifically in regards to the lack of instruction on administering the test and the lack of training for clinicians and medical personnel who use this test. Koder (2010) discusses this point and adds in that medical personnel do not receive the proper training for using this assessment and tend to rely on the results more heavily than they should as it is not a diagnostic tool. This does not point to issues with the assessment in terms of the test itself, but rather speaks to the issue that training is needed in what exactly the Mini-Mental State Exam is for and what it cannot do.

Development of the Mini-Mental State Exam: American Sign Language Version

One of the first changes that was made to the Mini-Mental State Exam was in terms of the way the question about orientation to time and place are asked. Generally, the questions on the English version start very broad and narrow down. However, in American Sign Language, the questions should start more narrow and broaden out as that is the way the language works in general conversation. For the three words the memorization and registration task uses, Dean,

Feldman, Morere, and Morton's (2009) suggestions were followed. They replaced the three words of apple, table, and penny with cat, tree, and house. The reasoning behind these changes is due to there being no sign for penny and the fact that the signs for cat, tree, and house are distinctive and would reduce the rates of incorrect responses due to potential confusion about unclear signs.

Serial 7's was chosen over having an option to do either Serial 7's or spelling world backwards to ensure that every individual would be performing the same tasks and the same cognitive domain would be measured. This calculation task was chosen over the task of spelling world backwards due to the fact that it is hard to explain that the individual is to spell a word backwards in sign language. As well, the individual would be given the first letter of the word when world was signed. In terms of the naming task, only the word pencil was changed as the sign for pencil and pen is the same. It was changed to glasses, which is an easily recognizable item just like watch. Lastly for the first section, the repetition task of "No ifs, ands, or buts" was changed to be the sign language equivalent of "train gone sorry". This is because the original version is an English idiom that is not used in American Sign Language and as such, culturally Deaf individuals will not understand the sentence, potentially leading to lower scores.

In terms of the changes made to the second section, the comprehension task of following three instructions was kept the same: I am going to give you a paper, I want you to take it in your right hand, fold it in half, and put it on the floor. The reading task was changed as it originally involved the individual closing their eyes, but when a Deaf person does this, they lose their only method of communication. Previously, this was accounted for by tapping the individual on the shoulder after they close their eyes to signal them to open them, but closing their eyes may make them uncomfortable or anxious. In these cases, clinicians would be tempted to coax the

individual to close their eyes, which may confound results (Dean et al., 2009). The next task of making up a sentence was kept the same, though the grammar is not evaluated by English standards, and rather, is evaluated by American Sign Language grammar structures. In order to do this, a fluent sign language interpreter is needed to tell the clinician if the sentence was grammatically correct. One concern with this was that interpreters are accustomed to making sense of communications and must be aware they are evaluating the structure rather than trying to make sense of the sentence in order to score it properly.

Some points that are in consideration overall include the fact that placement of signs is important, especially in regards to how the Serial 7's task is signed. This is important because if the task is not signed comprehensively, the individual taking the assessment may not fully understand what they are supposed to be doing. This could lead to lower scores overall and the conclusion that Deaf populations score lower in general, which may not be correct. As well, sign language is very contextual and generally the statements and questions asked are explained well. But, with this assessment, there is no room to explain what questions are coming up or why. This could lead to confusion from individuals taking the assessment, which may impact their scores. Overall, this translated assessment will be a useful learning tool in order to examine what works when assessing Deaf populations and what could use improvement.

Pilot Study

The purpose of the present study is to test whether the Mini-Mental State Exam translated into American Sign Language will result in better scores in culturally Deaf individuals when compared to an English version of the test. As well, this study will identify what items on the Mini-Mental State Exam: American Sign Language Version typically score lower overall to identify problem areas that could use improvement for future editions.

Methods

Participants

The present study had 15 Deaf participants aged 39-91 ($M\ age = 66.60$, $SD = 16.65$) with 11 females and 4 males. As well, 1 participant had an educational attainment level of less than high school; 7 participants had an educational attainment level of high school; and 7 participants had an educational level of some or completed university. As knowledge of sign language is an important part of this study, it was included as demographic information to see if the participant has known sign language their whole life or learned it when they were older. Majority of the participants knew a sign language as their first language—13 participants indicated American Sign Language as their first language. In terms of spoken languages, 2 participants indicated English as their first language. Participants were not compensated for their participation. Other inclusionary criteria included that the participants must know American Sign Language and be Deaf.

Sampling procedure. Participants were recruited from an assisted living facility for the Deaf and from the general community through different connections that the advisors for the study (Dr. Cathy Chovaz and Angela Core) had. When at the facility, all residents with the applicable inclusionary criteria were asked if they would like to participate in the study and given the chance to opt-in if they wished. Otherwise, the participants not living at an assisted living facility were emailed personally by Angela Core and asked if they would be interested in participating in the study. All testing was run in different private, quiet rooms with the clinician and interpreter both present when participants were in the room. The physical location of the room varied between London and Barrie based on where participants were physically located.

Materials

Laptop. A laptop was used to administer the Mini Mental State Exam: American Sign Language Version.

Mini Mental State Exam: ASL Score Sheet. A specified score sheet was used to record answers the participants gave to each question as well as total score. A copy of this score sheet is available in Appendix A.

Mini Mental State Exam: ASL Version. A copy of the Mini Mental State Exam: ASL Version is needed in order to administer the test to participants. This measure of cognitive state has 12 subscales that measure orientation to time and place, recognition, calculation, recall, naming, repetition, comprehension, reading, writing, drawing, and level of consciousness. A comprehensive overview of the changes made to the original Mini Mental State Exam to translate it into American Sign Language is available in the introduction under the heading *Development of the MMSE: ASL Version*. Refer to Appendix A for full range of tasks. Refer to Appendix B for a full script of the video.

Procedure

Participants were brought into a private, quiet room and asked to have a seat at the table with the computer on it. An interpreter was present at all points during the test administration. The consent form was explained to the participants and they signed their consent in American Sign Language before any testing took place. The consent form was read to the participants as reading is not always a strong skill for all Deaf individuals, and assurance that the participants had a full understanding of what they are agreeing to do was needed. Once the consent form was signed the demographic information of the participant (age, gender, education, primary language) was taken. Then, the participant's attention was directed to the laptop and the video

began playing. The video has a short section at the beginning that explains more about who is doing the research and why, as well as how the test is going to work. The participants were told they would be signed a question on the video and were asked to try their best to answer. If a question was missed because the participant is thinking about the answer for the previous question, the video was paused and the missed question replayed in order to give the participant a chance to answer. This is because an accurate picture of which questions might be problematic is sought, rather than which questions may have been missed due to video timing. Answers were signed by the participant to the interpreter and passed along verbally to the clinician who recorded them on the Mini-Mental State Exam: American Sign Language version specific score sheet. If a participant refused to answer a question, that section of the video was skipped to the next question and the section of the score sheet associated with the question was indicated as no answer.

The test was run through with this procedure until the comprehension section involving the paper was reached. At this point either the clinician or the interpreter passed the sheet of paper to the participant, once the task had been explained on the video. The next section that requires other specific actions from the clinician or interpreter was the drawing portion, in which the clinician or interpreter provided a pen or pencil, the drawing of the interlocking pentagrams, and a piece of paper to draw on to the participant. For the purpose of conserving paper and reducing waste, the first paper involved in the folding task was used as the blank paper for the drawing task. Throughout the test procedure, the clinician was evaluating the level of consciousness of the participant. This measure was recorded at the end of the video to ensure that the overall level of consciousness was accurately reported. Once participants reached the end of the video, they were given a debrief form and thanked for their time. Once the first participant

left, the next participant was brought into the room and the testing procedure began again. Once data collection was done for the day, the clinician scored each participant's sheet and summed the scores on each of the subscales to get an overall score. Each individual subscale score is kept as well.

One limitation that was encountered was the pool that participants were selected from. Because this is the beginning phase of the development of a new assessment tool, accessing a large pool of participants is not ideal. Instead, the larger pool of participants is to be accessed later on when revisions to the test are made. Participants are not being accessed both times in order to prevent practice effects influencing results. Assisted living facilities as well as connections that Dr. Cathy Chovaz and Angela Core have within the Deaf community were accessed for the participants for this study. This means that the rates of cognitive disturbance may be higher in the assisted living facilities, which may lead to more wrong answers overall, rather than just on specific items. This should not present an issue with the analysis however, as there will still be items that stand out as having more incorrect answers, though the statistical difference between consistently incorrect and consistently correct answers may be lower as a result.

Research Design

The present study is a descriptive pilot study to examine if the Mini-Mental State Exam: American Sign Language version would be an effective assessment tool in the Deaf community. For this purpose, all participants participated in taking one test—the Mini Mental State Exam: American Sign Language version—at one point in time only. Because there is only one test and one condition, random assignment is not used. There is no experimental manipulation used. Each item on the subscale is measured as a dichotomous categorical variable—it is either scored as

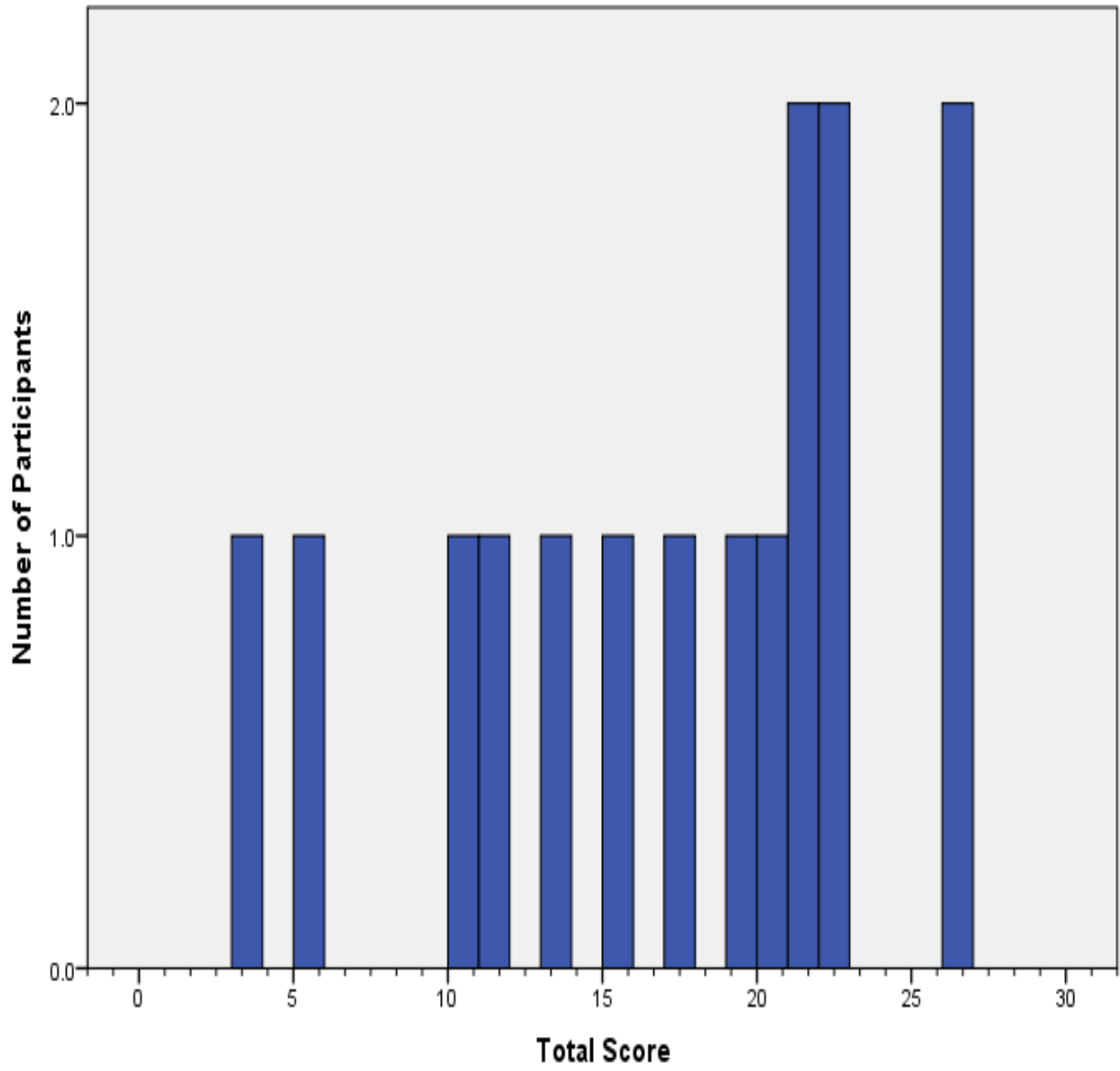
correct or incorrect. In terms of the demographic information, age is the only continuous variable, and all the others—schooling, gender, language—are categorical.

Results

This study looked at if the Mini-Mental State Exam could be developed into American Sign Language to be more accessible to Deaf populations and still be an effective measure for detecting cognitive impairment. For the purposes of this, the Mini-Mental State Exam: American Sign Language version was developed.

First, a reliability analysis was conducted on the 30-item scale. Cronbach's alpha was $\alpha = 0.92$, which was comparable to the original Mini-Mental State Exam's reliability range of $\alpha = 0.54-0.96$ (Folstein, Folstein & McHugh, 1975). A total cognitive impairment score (see Figure 1.1) was attained by summing the raw scores from each item across the 30 items ($M = 16.73$, $SD = 7.08$).

Figure 1.1
Distribution of Scores on the Mini-Mental State Exam: American Sign Language Version



Second, correlations were run on the demographic information collected including age, gender, education, language, level of consciousness, and total score. Three correlations were found to be significant. There was a strong negative correlation between education and age ($r = -.62, p = .015$). Additionally, there was a strong negative correlation between total score and age ($r = -.67, p = .006$). Conversely, there was a strong positive correlation between level of consciousness and total score ($r = .73, p = .002$).

The effectiveness of this measure was evaluated through a pattern of responses ratio concerning the number of correct response compared to the number of incorrect responses. Using the 85% correct response cut-off set out by Dean, Feldman, Moere, and Mortana in 2009, only 4 items out of 30 can be considered effective in assessing level of cognitive impairment (highlighted in yellow on Table 1.1).

Table 1.1 *Pattern of Responses—Correct Responses*

Cognitive Domain	Test Item	Number of Participants	Percentage of Cases
Orientation	Orientime1 (year)	10	66.7%
	Orientime2 (month)	10	66.7%
	Orientime3 (day of week)	6	40.0%
	Orientime4 (date)	11	73.3%
	Orientime5 (season)	11	73.3%
	Orienpl1 (name of building)	6	40.0%
	Orienpl2 (floor)	6	40.0%
	Orienpl3 (city)	9	60.0%
	Orienpl4 (province)	9	60.0%
	Orienpl5 (country)	7	46.7%
Registration	Regis1 (cat)	13	86.7%
	Regis2 (tree)	9	60.0%
	Regis3 (house)	11	73.3%
Calculation	Cacl1	3	20.0%
	Calc2	0	0.0%
	Calc3	0	0.0%
	Calc4	0	0.0%
	Calc5	0	0.0%
Recall	Recall1 (cat)	10	66.7%
	Recall2 (tree)	11	73.3%
	Recall3 (house)	9	60.0%
Language	Name1 (glasses)	13	86.7%
	Name2 (watch)	14	93.3%
	Rep1 (train gone sorry)	10	66.7%
	Comp1 (right hand)	12	80.0%
	Comp2 (fold in half)	13	86.7%
	Comp3 (place on floor)	10	66.7%
	Read1 (hands on head)	7	46.7%
	Writing1	12	80.0%
Visual-motor	Draw1	9	60.0%

Discussion

Main Findings

The present pilot study examined whether the Mini-Mental State Exam could be developed into American Sign Language to better assess Deaf populations, due to the problems identified when using the English version. Specifically, when the English version of the Mini-Mental State Exam is used to assess Deaf individuals, there are fewer correct responses than when the same assessment is done with a hearing population. When this new assessment tool is broken down by the percentage of correct answers, only 4 items out of the 30 items reach a high enough correct response rate to be considered effective at detecting cognitive impairment.

Specific Findings

The significant correlations found between the demographic information and total score generally followed what would be expected. The correlation between age and total score indicates that as individuals age, they are more likely to experience some level of cognitive impairment. This means that the older a participant was, the lower their score would be. As well, the correlation between level of consciousness and total score indicates that the lower the participant's level of consciousness, the lower their total score will be. This indicates that the less aware a participant is, potentially due to cognitive impairment, the worse they will do on the assessment. The last significant correlation was between age and education. This correlation indicated that the older a participant was, the lower their education is likely to be. This could be due to the fact that level of educational attainment has gone up over the years, and is emphasized as important in society today.

Next, Cronbach's Alpha for the Mini-Mental State Exam: American Sign Language version was found to be consistent with the Alpha seen for the original English version of the

assessment. This indicates that the items on the new assessment do measure the same concept: cognitive state. The fact that the Alpha was found to be consistent between the two assessment versions provides support that the American Sign Language version is on par with the English version in this regard. This is not consistent with results from the correct response ratio, as more than four items should be surpassing the 85% correct answer cut off point. This indicates items are all measuring cognitive state but perhaps are not yet communicated properly for a Deaf population.

The mean total score of the 30 item Mini-Mental State Exam: American Sign Language assessment was lower than the mean total score of the English version when given to a Deaf population (Dean et al., 2009). This could indicate that there are problematic items on the American Sign Language version, or this difference in scores could be attributed to characteristics of the test population (de Graaf & Bijl, 2002). When the Mini-Mental State Exam: American Sign Language assessment is examined on an item by item basis, a clearer picture of what specific issues arise with each item is available. When the correct response cut-off ratio of 85% is applied, only 4 items of out 30 items surpass this standard. The specific items above this standard include the registration task of signing cat, the naming task of recognizing watch and glasses, and the comprehension task of folding the paper in half.

More interestingly are the items that participants typically scored very low on. These included items from calculation, orientation to time and place, recall, and reading. The task used to assess calculation and attention was serial 7's. This task involves counting backwards from 100 by 7's. Consideration as to why this task has the lowest scoring items must look at how math is learned and why Deaf populations may be at a disadvantage during this learning process. Basic math is taught through the use of language to describe what is happening in an equation, in an

easy to understand way for hearing children (DeFlorio, 2013). But Deaf children do not acquire language in the same way and in some cases may be language delayed. As a result of not sharing the language and potentially struggling with language, Deaf children may experience more difficulty when being taught math based on language and this difficulty with math may carry on into adulthood.

The orientation to time and place items with the lowest scores were the items that asked participants the day of the week, the country they are in, the name of the building, and the floor they were on. For these items, the phrasing of the question may be the major issue resulting in the low scores. For example, in American Sign Language, when asking about the day of the week in a conversational tone it is common to incorporate a few options of what day it might be within the asking of the question. The standardization of the test did not allow for this interactive piece, and reconsideration of how the interactive components of American Sign Language may be incorporated is needed for later revisions. Naming of the country participants are in also had relatively low scores, as participants often answered the county instead. The other two problematic items in the orientation domain had to do with location, specifically the building and floor. This may be problematic because the building the participants were tested in was considered home to them and responded with home instead of the official name of the building—especially in the case of the Bob Rumball Home for the Deaf—or if there was only one floor in the building. While this was not something considered prior to testing, it brings attention to consideration of participants' unique experiences and the impact this may have on answers when no cognitive impairment is apparent.

The registration-recall items on the assessment functioned by participants being signed the three words and required to repeat them. This first repetition of the three words counted for

the registration portion of the task. Participants then completed serial 7's. After serial 7's, participants were asked to recall the three words. The first and last word (cat and house) scored highest during registration, but scored lowest during recall. The second item (tree) had the opposite effect, where participants scored low during registration and high during recall. Speculation for why this finding occurred focuses on semantic relatedness of the word list. Tree and house may be semantically related as having a treehouse is a common childhood memory. As well, houses generally have trees in the backyard or on the front lawn. Semantically related words in a registration task are more often recalled incorrectly than if the words were unrelated. This may explain why cat and house were more often correct, as the semantic relation between these two may be less than it is for tree and house. In terms of recall tasks, the correct response ratio for semantically related items is higher than if the items are not related, which could potentially explain why the correct response rate for cat is lower in recall than in recognition, and higher for tree (Tse, Li, & Altarriba, 2011).

The last task that had typically low scores was the reading task where participants were asked to read a sentence and perform the action it described—to put their hands on their head. There are a few possible reasons for why this item is problematic. Most often when participants were scored incorrect, it was due to participants simply signing the sentence and not completing the action requested. Because they are asked to read the sentence and do what it says, this may indicate a misunderstanding in terms of the instructions for what the task requires of them. Other considerations for why this task scored lower include possible unforeseen issues with vision, or illiteracy. This task is meant to measure language, but if a participant is not able to read or see well enough to read, it no longer measures language as a cognitive domain.

General Conclusions

There is much consideration needed in terms of the changes to develop the Mini-Mental State Exam: American Sign Language version into an effective assessment tool when examining cognitive state in Deaf populations. This pilot study found that participants achieved a lower total score than would be expected for a population without cognitive impairment. This indicates that either the population accessed had cognitive impairment or the Mini-Mental State Exam: American Sign Language version had problematic items. Specific items that may be problematic in a Deaf population included the serial 7's task, orientation to place and time items, and registration-recall items. Changes to these items could include replacing with another task that measures the same type of cognition, or rewording the item to be more accessible to a Deaf population.

Limitations

While these results are essential in terms of developing the next edition of the Mini-Mental State Exam: American Sign Language version, consideration must be given to the limitations encountered. One of these limitations was the population accessed. Because approximately half of all participants were accessed in an assisted living facility—the Bob Rumball Home for the Deaf—there is a chance that cognitive impairment is higher in the population tested to begin with. This could explain why the total scores on the American Sign Language version of the assessment were much lower than with another Deaf population and the English version of the assessment (Dean et al., 2009).

Another limitation is that the assessment must be standardized. American Sign Language is a very interactive language, especially between a Deaf person and interpreter. Unfortunately, the use of a standard video takes away from the interpreter being able to assist the participant in understanding the questions to the best of their ability, through changing body language, facial

expressions, or repeating signs where needed. This need for standardization severely limits the interpreter in doing their job in the ways they normally would.

Practical Implications

The Mini-Mental State Exam: English version is commonly used to assess level of cognitive impairment upon intake to emergency rooms or inpatient units. This assessment is used widely across different languages and cultures, including Deaf populations regardless of the problems identified in the literature. When the Mini-Mental State Exam: English version is used with Deaf populations, there is a high rate of false positive and false negative diagnoses—diagnosing a person with cognitive impairment they do not present symptoms of or failing to diagnose individuals with the cognitive impairment they do present symptoms of. The Mini-Mental State Exam: American Sign Language version is developed to replace the original Mini-Mental State Exam when assessing Deaf populations. Using the Mini-Mental State Exam: American Sign Language version would help lower the rate of false positive and false negative dementia diagnoses that result from using the Mini-Mental State Exam: English version with Deaf populations (Dean et al., 2009).

Future Research

Next steps for future research involve making necessary changes to the problematic items based on what the current pilot study found. First, a major overall change that can be made is adjusting the format used for administration of the assessment. Currently, the assessment is administered through a video that participants view and then sign their responses to the interpreter. Future research could examine how the use of a copy sign format impacts the total score achieved, as well as the correct response ratio for each item. Copy sign would involve a video directed at interpreters, to indicate which signs should be used to ask each question. The

interpreters would watch this video and copy the signs used to the participant, allowing for standardization of the different variations on how questions are asked and reducing the impact these variations may have on answers and results.

Second, there are changes on an item-by-item basis that can be implemented for the next study. These include replacing the serial 7's task, rewording the problematic orientation to time and place items, reconsidering the three words used for the registration-recall task, and ensuring that instructions to participants are clear on what is expected for the reading task. A similar task to replace serial 7's is spelling world backwards. This task measures the same cognitive domain as serial 7's as it is available on the Mini-Mental State Exam: English version as a second option if the participant refuses serial 7's. Although concerns have been raised about ensuring instructions are clear that participants are to spell world backwards, this can be overcome by careful consideration of the language used. Rewording of the orientation to time and place questions is also suggested for future research with the Mini-Mental State Exam: American Sign Language version. Specifically, the questions asking the day of the week or the season should be reworded to include options of what the answer could be, as is seen typically in conversation with American Sign Language. The orientation to place questions asking about the name of the building or the floor do not necessarily need to be reworded, though scoring needs to be expanded to include answers that are still correct though they may be outside of what is expected (i.e., home as an answer for the Bob Rumball Home for the Deaf).

Changes to the recognition-recall task could include finding a list of three comparable words that are not semantically related. This may remove the lower correct response ratio recognition score for tree, and the reversal of the correct response ratio for cat and house in the recall task. Lastly, the reading task could be problematic due to vision problems, or illiteracy.

This could be improved by ensuring the participant is literate and either does not require glasses or has their prescription glasses with them before starting the assessment. Past this, the instructions must be re-evaluated to ensure they are clear on what participants are being asked to do.

Final Conclusion

This pilot study examined if the newly developed Mini-Mental State Exam: American Sign Language version could be used effectively in a Deaf population. Findings were mixed, as certain items in the naming and comprehension domains functioned well for the population, but other items such as those in the calculation and orientation domains did not fare as well. As this is the pilot study for a new assessment, much can be done to revise these problematic items to ensure they are accessible for a Deaf population in future editions. Future research should focus on revision of the Mini-Mental State Exam: American Sign Language version, as well as testing within a population that is more generalizable to a general Deaf population.

References

- Atkinson, J., Denmark, T., Marshall, J., Mummery, C., & Woll, B. (2015). Detecting cognitive impairment and dementia in deaf people: The british sign language cognitive screening test. *Archives of Clinical Neuropsychology, 30*(7), 694-711.
- Brayne, C. (1998). The mini-mental state examination, will we be using it in 2001? *International Journal of Geriatric Psychiatry, 13*(5), 285-290.
- Cornes, Andrew J., and P. M. Brown. 2012. Mental health of australian deaf adolescents: An investigation using an auslan version of the strengths and difficulties questionnaire. *Deafness & Education International 14*, (3): 161-175.
- Dean, P. M., Feldman, D. M., Morere, D., & Mortona, D. (2009). Clinical evaluation of the mini-mental state exam with culturally deaf senior citizens. *Archives of Clinical Neuropsychology, 24*(8), 753-760.
- DeFlorio, L. L. (2013). *The influence of the home learning environment on preschool children's informal mathematical development: Variation by age and socioeconomic status* (Order No. AAI3498802). Available from PsycINFO.
- de Graaf, R., & Bijl, R. V. (2002). Determinants of mental distress in adults with a severe auditory impairment: Differences between prelingual and postlingual deafness. *Psychosomatic Medicine, 64*(1), 61-70.
- Diaz, D. R., Landsberger, S. A., Povlinski, J., Sheward, J., & Sculley, C. (2013). Psychiatric disorder prevalence among deaf and hard-of-hearing outpatients. *Comprehensive Psychiatry, 54*(7), 991. doi:<http://dx.doi.org/10.1016/j.comppsy.2013.04.004>
- du Feu, M., & Chovaz, C. (2014). *Mental health and deafness*. Oxford, NY: Oxford University Press.

Folstein, M. F., Folstein, S. E., & McHugh, P. R. (1975). Mini-mental state: A practical method for grading the cognitive state of patients for the clinician. *Journal of Psychiatric Research*, *12*(3), 189-198.

Landsberger, S. A., & Diaz, D. R. (2010). Inpatient psychiatric treatment of deaf adults:

Demographic and diagnostic comparisons with hearing inpatients. *Psychiatric Services*, *61*(2), 196-199.

Pollard, R. Q., Jr., DeMatteo, A., Lentz, E., & Rediess, S., (2007). A prose recall test using stories in american sign language. *Rehabilitation Psychology*, *52*(1), 11-24.

Tse, C., Li, Y., & Altarriba, J. (2011). The effect of semantic relatedness on immediate serial recall and serial recognition. *The Quarterly Journal of Experimental Psychology*, *64*(12), 2425-2437. doi:<http://dx.doi.org/10.1080/17470218.2011.604787>