Examining User Feedback of a Teleneuropsychological Platform in a mixed sample of Norwegians and Polish People in Norway

Szymon W. Różycki and Mathilde Erland Nordtveit

University of Bergen

May 2023

Author Note

Both authors contributed equally to this work

Correspondence concerning this article should be addressed to Szymon W. Różycki
Email: Szymonwiroz@gmail.com

Tusen takk til veilederen vår Rune Raudeberg, for all sparringen og støtten du viste til vår agens under oppgaveskrivingen.

Veileder: Rune Raudeberg

Public significance statement

Our study seeks to address the accessibility of teleneuropsychological tests to better meet the demand for neuropsychological assessment in the general population and to provide a comparable service for minorities living in Norway.

Abstract

This study seeks to explore users' satisfaction and feedback of using teleneuropsychological tests among Norwegian and Polish participants living in Norway and to explore potential differences in cognitive assessments conducted in Norwegian for Polish and Norwegian participants. Social media posts were used to recruit participants, resulting in 37 sign-ups, of which eight participants completed the tests and users' satisfaction survey, yielding a 22% response rate. The sample included one individual wanting to be compared with biological men and seven with biological women. Polish participants represented 25% of the sample. Participant age ranged from 18 to 69, and 75% having completed 16+ years of education. The TeleNP-tests were conducted using Mindmore's screening test battery in the Norwegian version. The majority of tests were automatically scored, with user experiences rated on a Likert scale (0-4) and qualitative feedback obtained through open-text questions. Overall, participants reported a positive experience. However, Polish participants experienced lower user satisfaction and more technical difficulties compared to the Norwegian participants. The mean Z-scores for cognitive functions were somewhat below the Swedish normative means: Memory z= -0.43; Attention and Tempo z=-0.49; Executive Function z=-0.37. This feasibility study highlights the potential of teleneuropsychological testing in Norway. However, the small sample size requires caution when interpreting results. Further research with larger and more diverse samples is necessary to draw more definitive conclusions.

Keywords: teleneuropsychology, cognitive testing, neuropsychological testing, minority testing, cross-cultural neuropsychology

Abstrakt

Denne studien forsøker å utforske brukernes tilfredshet og tilbakemeldinger ved bruk av telenevropsykologiske tester blant norske og polske deltakere bosatt i Norge, samt å undersøke potensielle forskjeller i kognitive vurderinger for norsk for polske og norske deltakere. Sosiale medieinnlegg ble brukt for å rekruttere deltakere, noe som resulterte i 37 påmeldinger, hvorav åtte deltakere fullførte testene og bruker-tilfredshetsundersøkelsen, som resulterte i en svarprosent på 22%. Utvalget inkluderte én person som ønsket sammenligning med biologiske menn og syv med biologiske kvinner. Polske deltakere utgjorde 25% av utvalget. Deltakernes alder varierte fra 18 til 69 år, og 75% hadde fullført 16 års utdanning eller mer. TeleNP-testene ble utført ved hjelp av Mindmores screeningsbatteri i den norske versjonen. Flertallet av testene ble automatisk scoret, og brukernes opplevelser ble vurdert på en Likert-skala (0-4), og kvalitative tilbakemeldinger ble samlet inn gjennom åpne tekstspørsmål. Totalt sett rapporterte deltakerne om en positiv brukeropplevelse. Imidlertid opplevde polske deltakere lavere brukertilfredshet og flere tekniske vanskeligheter sammenlignet med de norske deltakerne. Gjennomsnittlig Z-score for kognitive funksjoner var noe under de svenske normative verdiene: Hukommelse z=-0.43; Oppmerksomhet og Tempo z=-0.49; Eksekutive funksjoner z=-0.37. Denne studien belyser potensialet for telenevropsykologisk testing i Norge. Imidlertid krever det lille utvalget forsiktighet ved tolkning av resultatene. Videre forskning med større og mer variert utvalg er nødvendig for å trekke mer definitive konklusjoner.

Nøkkelord: telenevropsykologi, kognitiv testing, nevropsykologisk testing, minoritetstesting, tverrkulturell nevropsykologi

Examining User Feedback of a Teleneuropsychological Platform in a mixed sample of Norwegians and Polish People in Norway

The use of digital screening and testing has recently become more popular, especially for dementia-screening (Alim-Marvasti et al., 2022a; Chin et al., 2020; Hassenstab et al., 2020; Nicosia et al., 2022). Computers have been of use for psychologists ever since their first introduction to the field in 1950s, although at first computers were merely used as a way of storing data acquired in other ways (Graham et al., 2013, pp. 141–164). In the 1960s we saw an expansion of this use in data interpretation as well. Since then, the use of computers in neuropsychological testing has become more and more popular, making assessment more efficient and accurate (Butcher et al., 2000). According to Diaz-Orueta et al. (2020) there are benefits to computerization of pen-and-paper tests, as well as using digital tools to improve the pen-and-paper tests. Benefits include: having more focused, descriptive and accurate descriptions of behaviours; recording responses and timing behaviours involved in task-solving by "identifying processes, detecting and classifying errors and behavioural patterns; and by registering latency from moving through different behavioural steps into a sequence" (Diaz-Orueta et al., 2020, p. 11); by reducing errors and bias during scoring; reducing procedure times by increased efficiency; increasing specificity of cognitive/behavioural performances; Recognizing the appearance of endophenotypic patterns; Identifying contextual and state-related variables (such as fluctuations in attention, affective state, and low motivation) that may affect performance ratings (Diaz-Orueta et al., 2020). One example of digital neuropsychological tests is the M-CogScore, that can be completed remotely in under five minutes without assistance (Alim-Marvasti et al., 2022). It's common to base the digital tests on well-known neuropsychological tests, for example, BrainCheck is based on the Trail Making Test (TMT) A, the Trail Making Test B, the Stroop Test, and the Digit Symbol Substitution Task (Ye et al., 2022). Vrijsen, van Erpecum, de Rooij , Niebuur and Smidt (2021) discuss their version of The Ruff Figural Fluency Test (RFFT), that is a valid and reliable instrument to measure executive cognitive functioning, though it cannot be used interchangeably with the paper-and-pen RFFT, as participants had systematically lower scores on the digital version than on the paper-and-pen version. Vrijsen et al. (2021) suggest this may be due to participants being less accustomed to drawing on iPads.

Recently, the use of digital tests has transited into what is now known as Teleneuropsychology (TeleNP). TeleNP is defined broadly as "application of audio-visual technologies to enable remote clinical encounters with patients" (Bilder et al., 2020, p. 648). This can be done in a multitude of ways, from using videoconferencing techniques to using platforms which allow the patients to undergo neuropsychological tests without the need for a test administrator. It is hard to pinpoint the exact moment TeleNP sprung to existence. That said, one of, if not the first attempt at bringing the field together by providing initial practice guidelines for TeleNP is attributed to Grosch et al. (2011). The field has since expanded its use from being largely focused on the use of videocalls with paper-and-pen tests, to now providing a way to do away with the use of paper all together. Before the 2020 COVID-19 pandemic TeleNP was not widely used by clinical neuropsychologists. "In response to the coronavirus disease 2019 (COVID-19) pandemic, neuropsychologists rapidly adopted TeleNP services to ensure continued clinical care" (Hewitt et al., 2022, p. 790).

Development of automated distance platform to administer neuropsychological tests is similarly hard to pinpoint. To our knowledge, the earliest of such platforms is Cogtest from a

2005 study seeking to standardise and cross-validate that platform (Barua et al., 2005). There are now many digital tests platforms available for researchers and clinicians, to name a few: Momoro, Mindmore, RUDAS, and BrainCheck (Hansen, 2016; Nielsen et al., 2019; van den Hurk et al., 2022; Ye et al., 2020). However, providing an overview of the current status and availability of neuropsychological digital tests is outside the scope of this paper.

In Norway, digital tests are also commonly used, especially within the field of neuropsychology (Egeland et al., 2016). Some of these tests include the Sunnaas Driving Test, Useful Field of View test (Wood & Owsley, 2014), Conners CPT-3 (Conners et al., 2018) and Wisconsin Card Sorting Test (Grant & Berg, 2014). In addition, digital surveys and ratings are widely used in Norwegian mental healthcare system (CheckWare AS, 2021).

There have been some studies on the use of digital neurocognitive tests in Norway from a team in Trondheim (Hansen et al., 2015, 2016; Karlsen et al., 2021) using the platform Momoro, focusing on people older than 65. Results from Momoro studies show test-retest reliability comparable to traditional pen-and-paper tests, computerized tests, and web-based batteries used clinically and in research for the test batteries used in those studies. In Sweden, the digital tests developed by Mindmore has shown to be valid and user-satisfaction is high (van den Hurk et al., 2022; van den Hurk & Föyen, 2021).

Access and availability of mental health services is an important part of a functioning mental healthcare system. An important factor of which is wait-time. Long waits for mental care are a cause for dissatisfactions and can have dire consequences for some patients (Biringer et al., 2015). Longer wait times reflect inadequate resources as compared to the demand for those resources (Gulliford et al., 2002). Ways in which the Norwegian government has tried to lower wait times often include stricter guideline and deadlines for treatment start-up,which can lead to increasing the time pressure placed on the clinician. This affects how much time they can use on patients with sovereign needs, like those with minority background that require cross-cultural perspective in addition to the usual treatment (Bernal & Scharrón-del-Río, 2001).

In Norway, the social help services might require an individual to get a neuropsychological evaluation in cases where the individual is trying to get disability related social security (NAV, 2023). This shows the need for an efficient assessment process. In addition, some ethnicities are at a higher risk of disability (Williams et al., 2020). It is therefore important for a clinician to be certain how and if the tools available to them should be used in evaluations of individuals with a minority status.

Many neuropsychological tests have been developed and validated primarily on samples that are not representative of the diverse population. This lack of representation can lead to wrongful assessment of cognitive abilities for individuals that strafe from the sample group (Henrich et al., 2010). This is especially true for individuals with a minority status. Furthermore, minorities face additional challenges that can affect their cognitive abilities (Whaley & Davis, 2007). It is therefore important to meet an individual as they are in an intersectional perspective, to ensure that the results are indeed reflective of the individual's real-life performance (Bernal & Scharrón-del-Río, 2001). However, developing and re-norming neuropsychological tests takes time and is costly. Digital tests have the potential to be efficiently administered with minimal costs to large samples and developing up-to date representative normative data can therefore be more efficient. Thus, neuropsychological assessment can be made available to more people, such as minority groups.

As of the end of 2022, immigrants, and Norwegian-born people with immigrant parents make up 20% of the population of Norway. The largest national minority are polish immigrants, making up about 11% of all immigrants in Norway. The next two largest immigrant groups Lithuanian, and Swedish, at 5% and 4% respectively (*SSB*, 2023).

The most used tests in Norway, such as the Wechsler-tests (Egeland et al., 2016; Vaskinn & Egeland, 2012) are available mostly only in Norwegian, as the cost to access them is high. Norms for other countries are also not always available leaving the individual to be compared to a sample that might be very far away from the cultural context the individual exists in. This affects the way in which the scores reflect the individual's actual performance (Raudeberg et al., 2019).

Due to Poland's political history and strong family values, Polish people can struggle with seeking help outside of the family unit, like at a psychologist's office (Czapka, 2010). This distrust that Czapka (2010) describes, that many get socialized into, combined with repeated experiences of a narrow cultural view and lack of resources can lead to Polish people not being represented in patient samples, making data on their experiences while reaching out the more important.

Minorities face a range of challenges in Norway's healthcare system tied to their minority status, made worse by prioritization of resources (Debesay et al., 2019) In the current study, we will investigate some of the potential TeleNP might have to improve some of these conditions. We will administer a set of web-based neuropsychological tests to a sample of volunteers, both Norwegians and Polish people living in Norway, and conduct a survey of the user satisfaction and user experience of taking web-based neuropsychological tests.

Hypothesis

We hypothesize that user satisfaction will be high, as this was the case with a previous survey using the same platform (van den Hurk & Föyen, 2021). In addition, we want to investigate whether the experience is different when doing neuropsychological assessments in a non-native language for our Polish sample, as compared to our Norwegian sample. Finally, we expect our participants to have test performance somewhat above the normative means, as self-selected samples tend to consist of younger and more educated people (Bethlehem, 2010; Brodaty et al., 2014; Gosling et al., 2004).

Method

The current study has been evaluated by The Norwegian Agency for Shared Services in Education and Research (reference number 832232) and found to be in compliance with the current legislation as specified in the General Data Protection Regulation (GDPR), specifically Article 6(1)(a) and Article 9(2)(a).

For this study we are using Mindmore as our choice of TeleNP platform to conduct neuropsychological tests. Mindmore has developed a cognitive screening battery including 14 traditional cognitive tests that have been digitised and adapted for self-administration (van den Hurk et al., 2022). They also have 19 clinical tests for different mental health concerns. They started out with testing in Swedish and have been expanding to other languages.

Participants signed up though a link in social media posts. The survey consisted of standard consent information in compliance with the GDPR, which the survey asked the participants to accept, and then share their email so that we could send them the test through Mindmore’s platform. After the participants shared their email address, we then logged it in an

Excel sheet and tied an id-code for use in Mindmore's platform (which also adheres to GDPR regulations).

Using Mindmore's platform we sent out digital neuropsychological tests to participants. Participants received an email with instructions on how to access the test, information about the study, and contact information. Mindmore's test includes a mandatory short survey where participants state whether they use a mouse or a touchpad on their computer; how many years of education they have completed; which is their dominant hand; how well they can see the text on the screen; how well they can hear; how rested they feel; and how calm and free from stress they feel. This is followed by a sound-check before the neuropsychological tests start.

Post-test, Mindmore asks the participants for some feedback on their experiences with going through the test. Mindmore after-test survey is mandatory and asks the following questions: Were the instructions clear? (Yes, No), Did you experience any of the following during testing? (Nervousness, High stress levels, General tiredness, Tired eyes, Headache, The tasks were difficult), Were you disturbed during testing? (Yes, No), Was there something about the test you found difficult, and you wish to mention here? (Yes, No), What is your comprehensive perspective of how the app works? (Rate 0-5, *Not well at all (0), Very well (5)*), How likely is it that you would repeat the test if asked to do so by healthcare personnel? (Rate 0-5, *Not at all likely (0), Very likely (5)*)

After sending the Mindmore's test, we sent out an email with a link to our after-test survey to participants. We also provided contact information with a statement inviting participants to write back if they had any questions or troubles. Our after-test survey is based on the survey Mindmore used during their usability study (van den Hurk & Föyen, 2021). In addition, we asked about the participants' first language. If participants wanted their results, they could state their year of birth, which sex they prefer to be compared against, and their email address.

Translating the after-test survey was done by the authors, see appendix 2 for Norwegian version. One of the authors (Szymon Wiesław Różycki) is a native Polish speaker being able to translate and provide valuable feedback from other polish speakers currently living in Poland. We recruited our sample through a social media recruitment post, posted on eight different groups on Facebook, with a total of 195 838 members. Two of the groups were in Polish, we translated the recruitment post accordingly. In addition, we published an article about the study in a Polish-Norwegian internet newspaper. Our goal was to reach a broad audience and so we wanted to stray away from using groups mainly populated by students. All the tests in the test battery and the platform itself were developed, tested, and norms were developed by Mindmore on a Swedish sample consisting of 720 (57.5% female) healthy adults aged 17-93 (van den Hurk et al., 2022). There is precedence for Scandinavian norms instead of separate norms for each Nordic country (Brøndbo & Egeland, 2019), and it is thus reason to assume that the Swedish normative data is applicable to Norwegians. Mindmore's in-house study on the usability of the tests provides a comparison between the pen-and-paper version of the test and their digital version. The digital tests are shown to be a good alternative to the paper-and pen version. The TeleNP-tests are intended for use for ages 18-75 years old.

We decided to exclude verbal tests from the test battery, as the verbal tests proved to be difficult to automatically score during our beta testing, particularly because of the different dialects of the Norwegian language, and the Polish accents of the Polish participants. At the time of testing, Mindmore was working on improving the Norwegian version, with some input from our beta-test.

We did not use any of the self-administered screening tests for mental or somatic illnesses as we wanted to test user experience regardless of health-state and due to participant confidentiality. We included participants' test results in our study to see if the results indicate that the Swedish norms are applicable to Norwegians and/or Polish people living in Norway, though we did not couple them with the survey results due to participants' confidentiality.
All the results were scored automatically by the software, except for the CUBE and CLOCK tests, which had to be manually scored by the authors.

There are eight digitized traditional tests in the screening battery used in this study. Memory was assessed using the CORSI test. To assess attention and processing speed, the Klick SRT, Click Trail Making Test (TMT) - A, TMT-D, and SDPT were used. Executive function was measured using Click CRT, PASAT, TMT-B, and Stroop. Visuoconstructive function was measured using CUBE and CLOCK- test. The following description of the tests are from the Mindmore Test Manual and is presented in the same order (Mindmore, n.d.)

Trail Making Test - Click version for laptop use.

The test was originally developed in the USA (DC: War Department, 1944). It has three parts: TMT A, which measures mental processing speed, selective attention, and hand-eye coordination; and TMT B, which measures mental flexibility - the ability to switch between two parallel systems, and attention and tempo under time pressure. In addition to adaptations of the original 1944 TMT A and B tests, the Mindmore version also includes TMT D, which measures motor tempo. All three parts consist of 25 circles on the screen. In part A, the test-taker is instructed to click on circles marked 1-25 in ascending order. In part B, the test-taker follows the same principle but constantly alternates between numbers and letters (1-A, A-2, 2-B, B-3, etc.). Finally, in part D, the test-taker connects 25 circles where the order in which this is to be done is pre-marked with arrows between the circles. The test-taker is instructed to work as quickly as possible and make as few mistakes as possible. In Mindmore's digital click version of TMT, adapted for self-administration of the tests, incorrect clicks and connections are clearly marked. To proceed in the test, the test-taker must find the next correct circle and click on it. Completion time is counted as the time from clicking on the circle marked START until all connections are correct and the test-taker clicks on the circle marked END.

Motor tempo (part D) intends to measure pure motor speed without cognitive load. This measure provides interesting additional information when examining the other results. For example, if it is seen that the test-taker is very slow motorically, this is most likely to result in lower results for parts A and B as well. Thus, motor tempo can be factored out independently from the A and B results.

Symbol Digits Processing Test (SDPT)

The test measures visual scanning, tracking, and psychomotor speed. A key with nine different symbols, where each symbol is associated with a number (1-9), is displayed in the upper part of the screen. In the centre of the screen, one stimulus at a time is presented in the form of one of the nine symbols. The test-taker's task is to respond to as many stimuli as possible within 90 seconds by searching for the associated number for each stimulus in the key and pressing the corresponding number in a 3 x 3-digit matrix at the bottom of the screen. In Mindmore's SDPT, a unique code key is created for each test session by randomly selecting from 30 different symbols to reduce the learning effect from repeated testing.

Primary cognitive domain: Processing speed and tempo Secondary cognitive domain: Executive function

Presented results: Number of correct answers. Number of incorrect answers.

Simple & complex reaction time (REACTION) - Click version for laptop use.

The click version of simple and complex reaction time for laptop use is developed by Mindmore and measures psychomotor tempo, attention, and inhibition of automatic impulses (go/no-go). The test is performed on a computer using either a mouse or touchpad.

In simple reaction time (SRT), the stimulus color is displayed in a green circle at irregular intervals. The task is to click on the circle as quickly as possible when it turns green. In complex reaction time, the stimulus color is yellow instead. Additionally, in complex reaction time, blue, grey, and yellow distraction signals are displayed for 2 seconds alternating with the yellow stimulus signals. The task is to click on the circle as quickly as possible only when it turns yellow and the color before was blue. Reaction should be inhibited (go/no-go) when the circle turns grey or blue and when the circle turns yellow and the color before was something other than blue. During intervals, the circle is white or empty. If there is no reaction, the stimulus color is displayed for 2 seconds.

Primary cognitive domain SRT: Processing speed and tempo Primary cognitive domain CRT: Executive function Secondary cognitive domain CRT: Processing speed and tempo

The standard deviation of responses provides information about the spread of the reactions and, in addition to the information about the number of misses and errors, gives an indication of whether a lack of concentration and attention affects the reaction times (with a larger standard deviation and more errors and misses than expected).

The Mindmore norms for the click version of simple reaction time have been collected for use with touch screens and computer-mice separately on a variety of computers (Mindmore, n.d.). It cannot be ruled out that choice of hardware to some extent affects the outcome as it can impact how long it takes for the machine to register reaction time.

Corsi Block-Tapping Test

The purpose of the test is to provide information about visual abilities, attention, short-term memory, and working memory. It consists of two parts. Both parts are based on nine blocks, and the computer displays a sequence of a certain number of blocks. In the first part, the computer starts by showing a sequence of two blocks, and the test taker is then asked to repeat the sequence by pointing to the blocks in the sequence in the same order (forward block repetition). The difficulty level increases up to a maximum of nine blocks until the test taker points out an incorrect sequence twice in a row at the same number of blocks. The second part of the test involves repeating the same series of sequences in reverse order (backward block repetition).

Primary cognitive domain: Memory

Presented result: Number of correctly repeated blocks, with a maximum of nine.

CUBE

Its purpose is to evaluate visuospatial difficulties. The test taker is asked to copy a three-dimensional cube (i.e., the Necker Cube). The option is given to remove the last line an unlimited number of times by pressing 'Undo' or start over from the beginning by pressing 'Start Over.' When the test taker is finished, they complete the task by pressing 'Done.' Primary cognitive domain: Visuospatial function. Presented results: Illustration of the drawn cube for qualitative visual assessment.

CLOCK

Its purpose is to evaluate visuospatial and visuoconstructive difficulties. The test taker is instructed to write all the numbers on a prepared empty circular clock face and draw the clock hands so that the time shown is ten minutes past eleven. The option is given to remove the last line an unlimited number of times by pressing 'Undo' or start over from the beginning by pressing 'Start Over.' When the test taker is finished, they complete the task by pressing 'Done.' If no interaction occurs within 2 minutes, the test is terminated. Primary cognitive domain: Visuospatial function. Results presented: Not applicable, qualitative assessment through visual inspection.

STROOP

The purpose of the test is to provide information about the ability to inhibit an automatic response in favor of a less common one. It consists of two parts: In the first part, 20 color words (green, yellow, blue, or red) are presented with the letters in the same color as the meaning of the word. The color words are displayed on four buttons at the bottom of the screen. The participant's task is to press the button that matches the word as accurately and quickly as possible. In the second part, 20 color words (green, yellow, blue, or red) are presented with a different color for the letters than the meaning of the word. The participant's task is to press the button at the bottom of the screen that matches the color of the word as accurately and quickly as possible. Primary cognitive domain: Executive function Secondary cognitive domain: Processing speed and tempo.

PASAT

Paced Auditory Serial Addition Test (PASAT) is a series addition task designed to assess information processing ability and sustained and divided attention. A series of numbers is presented by a computer-voice, and on the screen, there are two buttons, 'Even' and 'Odd'. The participant's task is to add each new number to the previous one and press the 'Even' button if the sum is even or the 'Odd' button if the sum is odd. The test consists of 61 spoken numbers (60 additions). The numbers are presented at a rate of one number every three seconds. Primary cognitive domain: Executive function Secondary cognitive domain: Processing speed and tempo.

To evaluate the user-experience, we used a questionnaire based on the *Usability report Mindmore tests* (van den Hurk & Föyen, 2021) which we translated from Swedish to Norwegian and Polish.

Results

A total of 37 participants signed up for the survey and Mindmore tests. Of those, eight participants completed the neuropsychological tests and the questionnaire, yielding a response rate of 22%. Two Polish participants started taking the test, but never finished, nor completed the after-test survey. One participant answered the questionnaire twice, their second-input data have been excluded.

One participant wanted to be compared against the male normative data, seven chose to be compared against the female normative data. Six were Norwegian, two were Polish. Both Polish participants rate their Norwegian language skills are a 7 out of 10. One Polish participant stated that they used a translator-program to answer the survey. All demographic data is presented in table 1. Half of our participants were aged 40-59. Three quarters of them with an education of 16+ years. On a scale from 1-10 asking how comfortable the participants are with using a computer, the two Polish participants scored 8 and 9 the Norwegian sample had one participant rating themselves at 9, with the rest at 10. All eight participants stated they could hear, read, and see everything clearly during the test.

Participants were asked to rate their experiences after undertaking the tests, from *not at all* (0), *a little* (1), *some* (2), *quite a bit* (3), and *very much* (4), This is presented in Figure 1, where user ratings have been converted such that higher values means better user rating.

Participants were asked how much they agree with statements describing positive experiences with the test, from *Not at all* (0), *Slightly disagree* (1), *Somewhat agree* (2), *Quite agree* (3) to *Strongly agree* (4). This is presented in Figure 2.

When asked why they chose to participate in the study, six participants expressed interest in the project, two expressed wanting diagnostics to be more easily accessible and efficient, one participant stated they wanted to contribute. Two of the participants stated they like to participate in research, and one disclosed a personal interest in cognitive testing.

When asked to describe their experience with completing the test, one participant replied, “completing the test went great, but I’d have liked to be prepared for the drawing-task, as I struggle with drawing on a touchpad”. Two participants said it went well, but that some tasks were difficult. Another participant replied that it was “easy to understand (the test). Some tasks went a little fast.” One participant replied that they became “surprisingly invested in doing well”, that “it was fun testing” and they “became very engaged” when they made mistakes.

When asked if there was anything from their experience whilst testing, they would like to inform us of, one participant stated that the voice giving instructions was disturbing at first because of wrong inflection, but that they became accustomed with it during the testing. One participant thought the test worked well, except for the PASAT task, as that was quite rapid. When asked if they think something should be improved with the test, or the process of administering and completing the test, three participants commented on the recorded voice should be improved. Three participants answered “no”. One participant stated the administration, testing and completion was fine.

In summary, the participants report positive experiences with the Mindmore test, and in general found everything to be working fine. There were several comments about the computer voice reading them that the instructions were sounding artificial, and that it would be better if it had been more natural.

Participants report varying test-environments and distractions. Participant 1 reported having eye strain under the test, and a score for visibility of three out of five. Despite this the participants managed to score well on the test battery. Participant 2 scored themselves 4/5 for hearing, stress and restedness, and 5/5 for sight. They also gained a very low score in executive function and reported high stress levels during testing. Participant 3 scored themselves 5/5 for hearing, sight, rest, and stress. Participant 4 scored themselves at 4/5 for hearing, 5/5 for sight and 3/5 for restedness and stress pre-test. Participant 5 scored themselves 5/5 for hearing and sight before testing, 5/5 restedness, and 3/5 stress. They were also interrupted whilst completing PASAT. Participant 6 scored themselves before testing at 5/5 for sight and hearing, and 4/5 for free from stress and restedness, but reported high levels of stress during testing. Participant 7 reported a score of three out of 5 of being free from stress, and a score of two out of five of being well-rested. They also left a comment that their partner came home during the test, them sitting in an uncomfortable position, and not having enough light available. This participant scored somewhat low on memory, somewhat low on attention and tempo, and within average on executive function. Participant 8 scored themselves 5/5 for sight and hearing, 4/5 for restedness and stress.

The tests were scored in the Mindmore platform using the Swedish norms from van den Hurk et al. (2022), which are adjusted for age, sex and education.

The mean distance cognitive test results of our participants can be seen in Figure 3. Most scored below a Z-score of 0. One participant scored especially poorly on executive function as compared to the rest with a Z-score of -4.37. This largely weight down by their Click CRT Z-score of -17.33. With the outlier the Z-score average is -0.91, without the outlier Z-score is -0.37. This is shown in Figure 3.

In Figure 4 we see that all participants have a Z-score between –1.66 and 0.95 on the Memory, and Attention and Tempo domains.

Mindmore classifies z-scores below -2.054 as *very low*, -2.054 to –1.405 as *low*, -1.341 to -0.706 as *somewhat low*, –0.674 to 0.674 is *within average*, over 0.706 is defined as *above average*.

Discussion

Our goal with this study was to investigate the user satisfaction of a Norwegian version of Mindmore's TeleNP tests, in a sample comprised of Norwegian and Polish people.

We translated parts of the questionnaire from van den Hurk & Föyen (2021) into Norwegian, as we wished to compare the two usability studies. We note that the scales are positively weighted, with more positive options than negative ones, and neutral options.

All participants reported feeling some extent of interest during testing. This is expected, as the decision to participate innately requires some interest given the absence of economic incentives.

Most participants (88%) reported feeling focused to some extent during testing, showing that people can complete the testing at home, without a test administrator, whilst focusing on the tasks. When it comes to unpleasant, negative experiences, all participants had low scores on S*adness*, *Irritation* and *Nervousness* during testing. All participants reported that they to some extent agreed that they liked doing the test at home without a test-leader nearby, showing that this is a comfortable setting. This corroborates with the Mindmore usability study (van den Hurk & Föyen, 2021) where most of their participants agreed that they liked doing the tests on their own. All participants somewhat agreed or strongly agreed with the test being fun to take and they thought that taking it digitally worked well. For the most part they felt the instructions were clear and easy to understand, and they felt they received adequate information before testing. This matches the results of (van den Hurk & Föyen, 2021) regarding positive feedback from participants.

Using remote digital testing can be a way to screen for cognitive deficits in a larger patient population, and then reserve specialist resources to offer an expanded battery with test administrators for those whom the digital tests show has underlying issues. This can be especially useful for people who for different reasons are less suited for remote digital testing, for example older people who are less comfortable using computers, or people who need more support to complete the tests. In general, TeleNP testing opens the possibility for other healthcare-professionals, like general practitioners, to administer screening tests for their patients, and receive their results efficiently, providing information as to whether they need a referral to specialist healthcare. Thus, more people can potentially gain access to neuropsychological services.

A benefit of digital testing is that the administration of the tests became more standardized and can lead to less uncertainty between administrations than with the use of test administrators (Diaz-Orueta et al., 2020).

The use of remote digital tests can improve the quality of tests, but it also has challenges, like the different environments people are in whilst doing the tests (Diaz-Orueta et al., 2020). As our findings show, test takers can be interrupted and distracted by the environment at home, and this has the potential to affect test performance negatively. In addition, the scores varied a lot when it comes to measures of concentration, with some participants reported being interrupted by people they live with during tests, which can be a source of error when measuring cognitive abilities. This might be an important factor in explaining some of the low scores of some participants in the current study. *Lack of concentration* got varied scores, with most participants reporting some lack of concentration

TeleNP makes it harder for test-administrators to control some confounding variables. One of those might be that patients can “cheat”, using third party tools or the aid of other people, in order to achieve more desired scores. This is more likely in cases where results can affect the patient's personal economy or access to services. Development of anti-cheat features might mitigate this, for example the tests like TOMM (Polsinelli & Cerhan, 2020), a test designed to discover if the patient is deliberately underperforming on other tests. Underperformance is a potential confounding variable for both pen-and-paper tests and digital testing, though not observing the test-situation might make it more difficult for the clinician to evaluate motivation.

When administering neuropsychological tests, whether digital or pen-and-paper, it is important to keep in mind the cost and benefit for the patient. Neuropsychological testing can be challenging for patients, especially for those with disabilities, which may lead to lower detection of the need for different accommodations when a clinician is not present during the taking of a test. This may lead to the patient struggling continuously and losing motivation, making the data less useful, or not completing the test. This is something one must be mindful of when administering TeleNP tests like the Mindmore-tests.

Our sample was a relatively old, with a mean of 43 years old, the oldest participant being 69 years old. Nevertheless, all participants rated themselves at an 8 out of 10 of higher in how comfortable they were with computers. This points to that the general “fear of technology” often associated with the older population (Lee et al., 2019), might not be a big issue. On the other hand, the recruitment happened online, and this might serve as a self-selecting effect, as those who signed up to participate likely already were comfortable with the use of computers and digital tools.

We set out to recruit a much bigger sample as we thought that the prospect of receiving results would be a great incentive for people to join the study. In the beginning we were talking about a sample closer to 100, especially since we had access to the biggest Facebook page for polish people living in Norway. The reality of the situation didn’t meet our ambitions. There are a few things that have come to mind as possible reasons for the weaker than expected response rate. At the end of Mindmore’s TeleNP test mindmore conducts their own survey. Asking a few questions about the user’s experience with the test. Thus, we cannot rule out that the participants that have completed the Mindmore TeleNP tests, but not our separate after-test survey, might have thought that the survey at the end of the Mindmore test was ours. We sent a separate email to each of the participants with the link to the survey to mitigate that, but we cannot know if our participants read it, and we do not know to what extent this affected our data collection.

Considering the broader socioeconomic context, if is worth to mention that Norway has been experiencing a rise in prices of life-necessary goods like food and electricity, partly due to the war in Ukraine and the socio-economic situation in Norway. Our study required approximately 45min of the participants' time, without providing any monetary incentives, at a time when working people need to use more time on work to sustain a standard of living, making participation a lower priority(Göritz, 2006).

Our sample is small, and the Polish sample consists of only two people, far from enough representation. This despite the Facebook sites we reached out through having at least three time as many Polish members. Due to the lack of knowledge about minority testing in Norway, we chose to still discuss the issue, though we can’t draw any conclusions.

Out of 13 Polish users who registered 3 did not agree to us using data as described in the consent form, and one used a temporary email service, which made it impossible for us to send them a link to the test. This opposed to all Norwegian participants agreeing to us using their data. It is difficult to be sure about the reasons those participants chose not to agree. This might be due to the lack of trust in the competence and values of the Norwegian healthcare system in the Polish community (Lajunen & Wróbel, 2022). Though, without the ability to contact the participants we can never be sure. One reason for the lack of Polish participants might be the socio-political context in Poland making it harder for Polish immigrants to reach out for help outside the family-unit, therefore making them more sceptical of study participation (Czapka, 2010). The lack of studies about Polish immigrants in Norway leads to a lack of visibility, which together with negative experiences related to being a minority makes it understandable that this group might be less trusting of the academics as their struggles are not reflected in the literature in Norway(Lysheim, 2016, p. 2).

Our results show that on average our sample had a Z-score of -0.43 excluding participant 6. Furthermore 75% of our sample have had 16+ years of education. One cause of this skewedness in years of education in our sample might be self-selection bias. Higher education usually leads to a more comfortable lifestyle, and so more free time and being able to prioritize study participation. Furthermore, being able to finish higher education might cause an individual to be more used to being tested and judged. We also see lower amount of people with learning disabilities in higher education (Heiman & Precel, 2003), who despite being one of the groups who would benefit from our study the most, may a higher threshold of taking such tests as it requires more of them.

The high percentage of our participants having 16+ years of education makes the lower-than-average results surprising, considering our participants level of education. The norms take educational attainment into account, so we would expect the results to be around average. The participants have stated their motivations for participating, so we expect them to do as well as they are able to. We do not know about their mental and physical health, so we cannot rule out that some participants indeed had cognitive problems, which could explain their lower-than-average scores. We don’t expect that technical issues are the cause of any low scores, as only two participants reported slight issues. Judging from participants statements and answers to Mindmore survey (free from stress etc.), the participants seem to be overall healthy people. The norms are recent, are based on a representative sample of Swedish people and it is reasonable to believe they are applicable in Norway due to the many similarities between the countries. Our results nevertheless suggest that the Mindmore normative data should be compared to test results obtained from a larger and more representative sample of the Norwegian population.

Neuropsychology encompasses a privileged knowledge and the ability to diagnose, better understand, and work with patients that suffer from neuropsychological problems. Patients with such problems can require accommodation when working with a psychologist, as is the case for people with autism spectrum disorder (ASD) (*NICE CG 140*, 2012) and so other neurodivergence for ex. ADHD, dyslexia, OCD etc. Underdiagnosis and focus on comorbid conditions by clinicians (Ginsberg et al., 2014; O'Nions et al., 2023) can therefore lead to trouble receiving helpful treatment. Access to TeleNP tests could help clinicians with differential diagnosis and provide better overall help for patients with comorbid neuropsychological conditions requiring accommodations, and adjustments in the therapeutic framework.

Understanding how culture differentiates how people might react to the world is a very difficult but important part of conducting multicultural research. In general, a simple translation is not sufficient to take into account the broad affect a differing culture has on one's worldview (Nasif et al., 1991). Some cultures might have higher or lower criteria for answering with a 5/5 or a 1/1. Furthermore, words do not always mean the same in every language, and concepts can be moralized as negative or positive based on the cultural context. It is therefore important to judge the results of such differences in a correct cultural context, so that our conclusions are as correct with an ethnic eye, and an emic eye.

In our study we saw the Polish sample in general didn't score their user satisfaction with the Mindmore platform as positive as the Norwegian sample. This may be because of them having to go through the test in Norwegian. It may be because culturally giving the highest score has a higher threshold in Poland than it has in Norway. It may be that the experience they had was just not as good. Either way we can't say anything for sure based on the size of our sample.

Limitations

Recruitment using Facebook pages comes with its own set of challenges. Facebook uses an algorithm to feed content to their users, meaning that not every member of a Facebook group sees everything posted on the group. According to Meta, parent company of Facebook, their algorithm determines the users feed (Meta, 2022). We experienced a lot more sign-ups during the first few days, and few to none after that. Spreading the recruitment over a longer period might have improved our reach, resulting in a larger sample.

For our Polish sample reaching out through more established Polish community figures might have been a better option securing ourselves some second-hand trust from the Polish community. This is something we saw with reaching out through the Polish-Norwegian newspaper, many more people visited our registration form after the article went out, though not enough to be able to use the data to make any substantial claims.

This study is written as our thesis finishing our psychology profession studies at the University of Bergen. The project equals one semester of work and therefore limits the recruitment period. We did not qualify for research grants and therefore had limited resources to use for recruitment incentives. We administered seven beta-tests before starting data-collection.

Because of the GDPR regulations concerning personal data, we could not couple the test results with the survey-results, which we think would have given us more interesting data to discuss. We also did not collect health info, life stressors and other anamnestic information from our participants, as one would before administering these tests in a clinical setting, as it would further complicate our study. This was due to time limits, but primarily also to ensure that the study was in line with current legislation and ethical standards in research.

When using digital tests, variables like device type, screen size, input type, and browser can impact the results, as shown in (Passell et al., 2021). Less optimal test-environments like uncomfortable position, extreme temperatures, lights (Passell et al., 2021). Less optimal test-environments like uncomfortable position, extreme temperatures, lights-settings, distracting sounds and visual stimuli can all affect results. The only information of this sort that was collected was input-device (touchpad or mouse) that Mindmores pre-test survey collects for the norms. We do not have information of other confounding variables, other than what our participants chose to disclose in the free-text questions of the survey.

Future directions

Digitalizing neuropsychological tests can take many forms. When changing a test from one medium, like pen and paper, to another, like an online platform, it is important to consider the possibilities that the new medium gives us, and the ones it takes away. Less advanced forms of digitalization will be no more than a fillable pdf, still requiring the clinician, and a patient sitting in the same room, or maybe on a video call. This way of digitalizing does not use the new digital medium to its full extent. Using computers opens the possibility of collecting data, that is impossible to collect with only a pen and paper. For example, during a traditional pen and paper test it is very hard to impossible for the clinician to collect information about the path the client's pen takes while writing the answers, or the path their pupils take while scanning a picture. Using a digitalized test that is trying to use the whole spectrum of possibilities that TeleNP tests have to offer, would enable one to collect these kinds of data which would make the conclusion more valid, as the results can be based off a broader set of variables. Of course, having as many variables as possible might make scoring harder for the clinician. But even here the digital medium gives the ability of using AI to correlate variables. Many clinicians already prefer the digital way of scoring the protocol sheets, as it removes the need for hand calculation, and so the possibility of hand calculation mistakes. Taking the next step and removing the human error aspect from yet another factor of the test will make them less prone to error, at the same time as with the ability of collecting and correlating more variables it would make the tests themselves more valid.

TeleNP opens an exciting opportunity for using different normative samples on each patient group. This is a way to better the experience minorities have of psychoneurological assessment, as with a big enough sample one might differentiate between for example Polish people living in Norway and Polish people living in Poland. Providing translations through platforms like Mindmore removes the need of the clinician to know the language, makes sure to have all different versions of the tests available, and interpret results in the correct cultural context. This could better enable minorities to access accommodations through a more cross-culturally relevant and international neurocognitive assessment.

The understanding of gender has been broadened in the social science fields in the last years. It is important not to attribute looking outside the gender binary to white researchers, or as a western phenomenon. There exist cultural groups that have accepted a non-bodypart based view on gender for many generations. Norms for neuropsychological tests still often conform to the binary view of gender and sex, Mindmore’s norms being amongst them. Scoring the results from the Mindmore test, the administrator must input the participants gender and year of birth to access the results. To be gender-inclusive in our study, we asked our participants disclose whether they wanted to be compared to a sample of biological men of biological women.

Accepting that gender, and sex are broader than man and woman is an important step towards a more accurate assessment of those who do not identify as either a man, or a woman, identify in the middle, or those whose gender identity changes temporarily.

Conclusion

To conclude, our sample of participants generally reported having positive experiences with taking the Mindmoretests at home. This confirms our main hypothesis and coincides with the results from Mindmores Swedish usability study (van den Hurk & Föyen, 2021). Our sample also commented on the artificial computer-voice giving verbal instructions, like the Swedish sample did.

We do not have a large enough number of Polish participants to conclude much in regard to cross-cultural and non-native language testing, though we do see that in our sample in general scored lower than the Norwegian sample on terms of user-satisfaction.

Conflict of interest

We’ve had several meetings with Mindmore and have given feedback tied to the Norwegian version of the tests. We have not received any compensation from Mindmore for the help, neither have they had the ability to influence or investigate the results of our study. Our cooperation with Mindmore was focused on the use and usability of the platform itself. Participants were able to contact Mindmore with questions or troubles with the tests, Mindmore sends those questions to us, and we contacted the participants in question ourselves to limit the effect the team at Mindmore would have on the results.

References

Alim-Marvasti, A., Kuleindiren, N., Harvey, K., Ciocca, M., Lin, A., Selim, H., & Mahmud, M. (2022). Validation of a rapid remote digital test for impaired cognition using clinical dementia rating and mini-mental state examination: An observational research study. *Frontiers in Digital Health*, *4*, 1029810. https://doi.org/10.3389/fdgth.2022.1029810

Barua, P., Bilder, R., Small, A., & Sharma, T. (2005). Standardisation and cross-validation study of cogtest an automated neurocognitive battery for use in clinical trials of schizophrenia. *Schizophrenia Bulletin*, *31*(2), 318–318.

Bernal, G., & Scharrón-del-Río, M. R. (2001). Are empirically supported treatments valid for ethnic minorities? Toward an alternative approach for treatment research. *Cultural Diversity and Ethnic Minority Psychology*, *7*(4), 328–342. https://doi.org/10.1037/1099-9809.7.4.328

Bethlehem, J. (2010). Selection Bias in Web Surveys: Selection Bias in Web Surveys. *International Statistical Review*, *78*(2), 161–188. https://doi.org/10.1111/j.1751-5823.2010.00112.x

Bilder, R. M., Postal, K. S., Barisa, M., Aase, D. M., Cullum, C. M., Gillaspy, S. R., Harder, L., Kanter, G., Lanca, M., Lechuga, D. M., Morgan, J. M., Most, R., Puente, A. E., Salinas, C. M., & Woodhouse, J. (2020). Inter Organizational Practice Committee Recommendations/Guidance for Teleneuropsychology in Response to the COVID-19 Pandemic†. *Archives of Clinical Neuropsychology*, *35*(6), 647–659. https://doi.org/10.1093/arclin/acaa046

Biringer, E., Sundfør, B., Davidson, L., Hartveit, M., & Borg, M. (2015, April 25). *Life on a waiting list: How do people experience and cope with delayed access to a community mental health center?* Psykologisk.no. https://psykologisk.no/sp/2015/04/e6/

Brodaty, H., Mothakunnel, A., De Vel-Palumbo, M., Ames, D., Ellis, K. A., Reppermund, S., Kochan, N. A., Savage, G., Trollor, J. N., Crawford, J., & Sachdev, P. S. (2014). Influence of population versus convenience sampling on sample characteristics in studies of cognitive aging. *Annals of Epidemiology*, *24*(1), 63–71. https://doi.org/10.1016/j.annepidem.2013.10.005

Brøndbo, P. H., & Egeland, J. (2019). *Måleegenskaper ved den norske versjonen av Wechsler Intelligence Scale for Children, Fifth Edition (WISC-V)* [Electronic]. https://doi.org/10.21337/0064

Butcher, J. N., Perry, J. N., & Atlis, M. M. (2000). Validity and utility of computer-based test interpretation. *Psychological Assessment*, *12*(1), 6–18.

CheckWare AS. (2021, September 16). *Lynrask implementering gjør at alle norske helseforetak bruker CheckWare innen psykisk helse og rus*. CheckWare Norge. https://www.checkware.no/post/alle-helseforetak-bruker-checkware

Chin, J., Kim, D. E., Lee, H., Yun, J., Lee, B. H., Park, J., Yeom, J., Shin, D.-S., & Na, D. L. (2020). A Validation Study of the Inbrain CST: A Tablet Computer-based Cognitive Screening Test for Elderly People with Cognitive Impairment. *Journal of Korean Medical Science*, *35*(34). https://doi.org/10.3346/jkms.2020.35.e292

Conners, K. C., Sitarenios, G., & Ayearst, L. E. (2018). Conners' Continuous Performance Test Third Edition. In J. S. Kreutzer, J. DeLuca, & B. Caplan (Eds.), *Encyclopedia of Clinical*

Neuropsychology (pp. 929–933). Springer International Publishing. https://doi.org/10.1007/978-3-319-57111-9_1535

Czapka, E. (2010). *The health of Polish labour immigrants in Norway: A research review* (Vol. 3/2010). Norwegian Center for Minority Health Research.

DC: War Department. (1944). *Manual of directions and scoring*. Washington, DC: War Department, Adjutant General's Office.

Debesay, J., Arora, S., & Bergland, A. (2019). 4. Migrants' Consumption of Healthcare Services in Norway: Inclusionary and Exclusionary Structures and Practices. In *Inclusive Consumption* (pp. 63–78). Universitetsforlaget. https://doi.org/10.18261/9788215031699-2019-04

Diaz-Orueta, U., Blanco-Campal, A., Lamar, M., Libon, D. J., & Burke, T. (2020). Marrying Past and Present Neuropsychology: Is the Future of the Process-Based Approach Technology-Based? *Frontiers in Psychology*, *11*, 361. https://doi.org/10.3389/fpsyg.2020.00361

Egeland, J., Løvstad, M., Norup, A., Nybo, T., Persson, B. A., Rivera, D. F., Schanke, A.-K., Sigurdardottir, S., & Arango-Lasprilla, J. C. (2016). Following international trends while subject to past traditions: Neuropsychological test use in the Nordic countries. *The Clinical Neuropsychologist*, *30*(sup1), 1479–1500. https://doi.org/10.1080/13854046.2016.1237675

Ginsberg, Y., Quintero, J., Anand, E., Casillas, M., & Upadhyaya, H. P. (2014). Underdiagnosis of Attention-Deficit/Hyperactivity Disorder in Adult Patients: A Review of the Literature. *The Primary Care Companion for CNS Disorders*, *16*(3), 23591. https://doi.org/10.4088/PCC.13r01600

Göritz, A. S. (2006). *Incentives in Web Studies: Methodological Issues and a Review*.

Gosling, S. D., Vazire, S., Srivastava, S., & John, O. P. (2004). Should We Trust Web-Based Studies? A Comparative Analysis of Six Preconceptions About Internet Questionnaires. *American Psychologist*, *59*(2), 93–104. https://doi.org/10.1037/0003-066X.59.2.93

Graham, J. R., Naglieri, J. A., & Weiner, I. B. (Eds.). (2013). *Handbook of psychology: Assessment psychology, Vol. 10, 2nd ed* (pp.141-164). John Wiley & Sons, Inc.

Grant, D. A., & Berg, E. A. (2014). *Wisconsin Card Sorting Test* [Data set]. https://doi.org/10.1037/t31298-000

Grosch, M. C., Gottlieb, M. C., & Cullum, C. M. (2011). Initial Practice Recommendations for Teleneuropsychology. *The Clinical Neuropsychologist*, *25*(7), 1119–1133. https://doi.org/10.1080/13854046.2011.609840

Gulliford, M., Figueroa-Munoz, J., Morgan, M., Hughes, D., Gibson, B., Beech, R., & Hudson, M. (2002). What does “access to health care” mean? *Journal of Health Services Research & Policy*, *7*(3), 186–188.

Hansen, T. I. (2016). *Memoro: Evaluation of core psychometric properties and usability of a new self-administered web-based neuropsychological test platform* [Doctoral thesis, NTNU]. https://ntnuopen.ntnu.no/ntnu-xmlui/handle/11250/2414256

Hansen, T. I., Haferstrom, E. C. D., Brunner, J. F., Lehn, H., & Håberg, A. K. (2015). Initial validation of a web-based self-administered neuropsychological test battery for older adults and seniors. *Journal of Clinical and Experimental Neuropsychology*, *37*(6), 581–594. https://doi.org/10.1080/13803395.2015.1038220

Hansen, T. I., Lehn, H., Evensmoen, H. R., & Håberg, A. K. (2016). Initial assessment of reliability of a self-administered web-based neuropsychological test battery. *Computers in Human Behavior*, *63*, 91–97. https://doi.org/10.1016/j.chb.2016.05.025

Hassenstab, J., Aschenbrenner, A. J., Balota, D. A., McDade, E., Lim, Y. Y., Fagan, A. M., Benzinger, T. L. S., Cruchaga, C., Goate, A. M., Morris, J. C., Bateman, R. J., & Network, T. D. I. A. (2020). Remote cognitive assessment approaches in the Dominantly Inherited Alzheimer Network (DIAN). *Alzheimer's & Dementia*, *16*(S6), e038144. https://doi.org/10.1002/alz.038144

Heiman, T., & Precel, K. (2003). Students with Learning Disabilities in Higher Education: Academic Strategies Profile. *Journal of Learning Disabilities*, *36*(3), 248–258. https://doi.org/10.1177/002221940303600304

Henrich, J., Heine, S. J., & Norenzayan, A. (2010). The weirdest people in the world? *Behavioral and Brain Sciences*, *33*(2–3), 61–83. https://doi.org/10.1017/S0140525X0999152X

Hewitt, K. C., Block, C., Bellone, J. A., Dawson, E. L., Garcia, P., Gerstenecker, A., Grabyan, J. M., Howard, C., Kamath, V., LeMonda, B. C., Margolis, S. A., McBride, W. F., Salinas, C. M., Tam, D. M., Walker, K. A., & Del Bene, V. A. (2022). Diverse experiences and approaches to tele neuropsychology: Commentary and reflections over the past year of COVID-19. *The Clinical Neuropsychologist*, *36*(4), 790–805. https://doi.org/10.1080/13854046.2022.2027022

Karlsen, R. H., Saksvik, S. B., Stenberg, J., Lundervold, A. J., Olsen, A., Rautio, I., Folvik, L., Håberg, A. K., Vik, A., Karr, J. E., Iverson, G. L., & Skandsen, T. (2021). Examining the Subacute Effects of Mild Traumatic Brain Injury Using a Traditional and Computerized

Neuropsychological Test Battery. *Journal of Neurotrauma*, *38*(1), 74–85. https://doi.org/10.1089/neu.2019.6922

Lajunen, T., & Wróbel, B. (2022). Acculturation, trust to health care system, and attitudes to COVID-19 vaccination: A comparative study between Polish immigrants in Norway, Polish in Poland, and Norwegians in Norway. *Current Research in Ecological and Social Psychology*, *3*, 100047. https://doi.org/10.1016/j.cresp.2022.100047

Lee, C. C., Czaja, S. J., Moxley, J. H., Sharit, J., Boot, W. R., Charness, N., & Rogers, W. A. (2019). Attitudes Toward Computers Across Adulthood From 1994 to 2013. *The Gerontologist*, *59*(1), 22–33. https://doi.org/10.1093/geront/gny081

Lysheim, D. (2016). Helsen til polske arbeidsinnvandrere i Norge [Master thesis, Norwegian University of Life Sciences, Ås]. In *74*. https://nmbu.brage.unit.no/nmbu-xmlui/handle/11250/2398551

Meta. (2022, December 16). *Our approach to ranking | Transparency Center*. https://transparency.fb.com/features/ranking-and-content/

Mindmore. (n.d.). *Användarmanual*. Mindmore.

Nasif, E. G., Al-Daeaj, H., Ebrahimi, B., & Thibodeaux, M. S. (1991). Methodological Problems in Cross-Cultural Research: An Updated Review. *MIR: Management International Review*, *31*(1), 79–91.

NAV. (2023, May 11). *Uføretrygd – legens rolle*. nav.no. https://www.nav.no/samarbeidspartner/uforetrygd-legens-rolle

Nicosia, J., Aschenbrenner, A. J., Balota, D. A., Sliwinski, M. J., Tahan, M., Adams, S., Stout, S. S., Wilks, H., Gordon, B. A., Benzinger, T. L. S., Fagan, A. M., Xiong, C., Bateman, R. J., Morris, J. C., & Hassenstab, J. (2022). Unsupervised high-frequency smartphonebased cognitive assessments are reliable, valid, and feasible in older adults at risk for Alzheimer's disease. *Journal of the International Neuropsychological Society*, 1–13. https://doi.org/10.1017/S135561772200042X

Nielsen, T. R., Segers, K., Vanderaspoilden, V., Bekkhus-Wetterberg, P., Bjørkløf, G. H., Beinhoff, U., Minthon, L., Pissiota, A., Tsolaki, M., Gkioka, M., & Waldemar, G. (2019). Validation of the Rowland Universal Dementia Assessment Scale (RUDAS) in a multicultural sample across five Western European countries: Diagnostic accuracy and normative data. *International Psychogeriatrics*, *31*(2), 287–296. https://doi.org/10.1017/S1041610218000832

O'Nions, E., Petersen, I., Buckman, J. E. J., Charlton, R., Cooper, C., Corbett, A., Happé, F., Manthorpe, J., Richards, M., Saunders, R., Zanker, C., Mandy, W., & Stott, J. (2023). Autism in England: Assessing underdiagnosis in a population-based cohort study of prospectively collected primary care data. *The Lancet Regional Health – Europe*, *29*. https://doi.org/10.1016/j.lanepe.2023.100626

Passell, E., Strong, R. W., Rutter, L. A., Kim, H., Scheuer, L., Martini, P., Grinspoon, L., & Germine, L. (2021). Cognitive test scores vary with choice of personal digital device. *Behavior Research Methods*, *53*(6), 2544–2557. https://doi.org/10.3758/s13428-021-01597-3

Polsinelli, A. J., & Cerhan, J. H. (2020). Early Cutoff Criteria for Strong Performance on the Test of Memory Malingering. *Archives of Clinical Neuropsychology*, *35*(4), 429–433. https://doi.org/10.1093/arclin/acz079

Raudeberg, R., L. Iverson, G., & Hammar, Å. (2019). Norms matter: U.S. normative data under-estimate cognitive deficits in Norwegians with schizophrenia spectrum disorders. *The*

Clinical Neuropsychologist, *33*(sup1), 58–74. https://doi.org/10.1080/13854046.2019.1590641

Recommendations | Autism spectrum disorder in adults: Diagnosis and management | Guidance | NICE. (2012, June 27). NICE. https://www.nice.org.uk/guidance/CG142/chapter/Recommendations#interventions-for-coexisting-mental-disorders

SSB. (2023). *Fakta om innvandring—Statistisk sentralbyrå*. SSB. https://www.ssb.no/innvandring-og-innvandrere/faktaside/innvandring

van den Hurk, W., & Föyen, L. F. (2021). *Usability report Mindmore tests*.

van den Hurk, W., Bergman, I., Machado, A., Bjermo, J., & Gustavsson, A. (2022). Swedish Normative Data for Mindmore: A Comprehensive Cognitive Screening Battery, Both Digital and Self-Administrated. *Journal of the International Neuropsychological Society*, *28*(2), 188–202. https://doi.org/10.1017/S135561772100045X

Vaskinn, A., & Egeland, J. (2012). Testbruksundersøkelsen: En oversikt over tester brukt av norske psykologer. *Tidsskrift for Norsk psykologforening*, *49*(7). https://psykologtidsskriftet.no/fagartikkel/2012/07/testbruksundersokelsen-en-oversikt-over-tester-brukt-av-norske-psykologer

Vrijsen, J., van Erpecum, C. L., de Rooij, S. E., Niebuur, J., & Smidt, N. (2021). The validity and reliability of a digital Ruff Figural Fluency Test (RFFT). *BMC Psychology*, *9*(1), 65. https://doi.org/10.1186/s40359-021-00566-x

Whaley, A. L., & Davis, K. E. (2007). Cultural competence and evidence-based practice in mental health services: A complementary perspective. *American Psychologist*, *62*, 563–574. https://doi.org/10.1037/0003-066X.62.6.563

Williams, E. D., Cox, A., & Cooper, R. (2020). Ethnic Differences in Functional Limitations by Age Across the Adult Life Course. *The Journals of Gerontology: Series A*, *75*(5), 914–921. https://doi.org/10.1093/gerona/glz264

Wood, J. M., & Owsley, C. (2014). Useful Field of View Test. *Gerontology*, *60*(4), 315–318. https://doi.org/10.1159/000356753

Ye, S., Ko, B., Phi, H., Eagleman, D. M., Flores, B., Katz, Y., Huang, B., & Ghomi, R. H. (2020). *Validity of Computer Based Administration of Cognitive Assessments compared to Traditional Paper-based Administration* (p. 2020.05.12.20099507). medRxiv. https://doi.org/10.1101/2020.05.12.20099507

Ye, S., Sun, K., Huynh, D., Phi, H. Q., Ko, B., Huang, B., & Hosseini Ghomi, R. (2022). A Computerized Cognitive Test Battery for Detection of Dementia and Mild Cognitive Impairment: Instrument Validation Study. *JMIR Aging*, *5*(2), e36825. https://doi.org/10.2196/36825

Tables

Table 1

Frequency of demographic data (sex, age, years of education, first language) of all participants

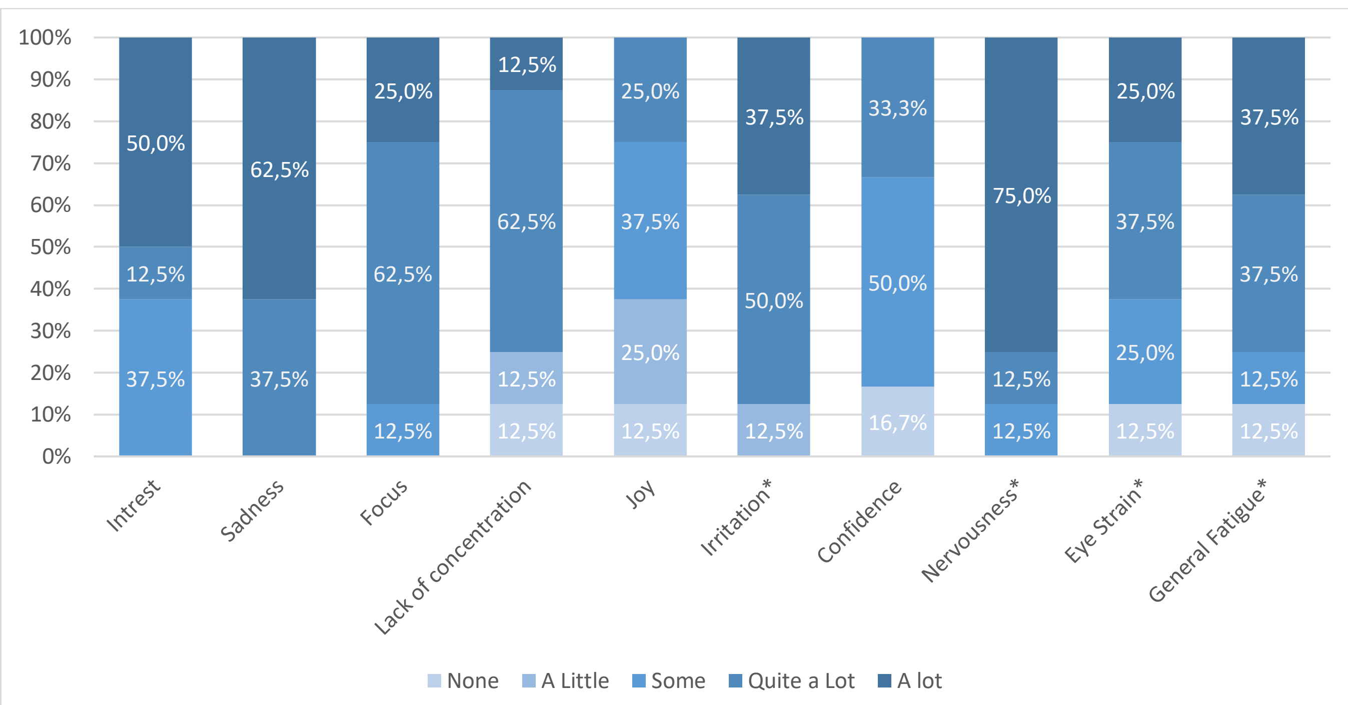
Demographic		n	%
Sex to compare	Men	1	12.5%
	Women	7	87.5%
Age	18-29	2	25.0%
	30-39	1	12.5%
	40-49	2	25.0%

	50-59	2	25.0%
	60-69	1	12.5%
Years of Education	11-13	1	12.5%
	14-16	1	12.5%
	16+	6	75.0%
First language	Norwegian	6	75.0%
	Polish	2	25.0%

Figures

Figure 1

Participants ratings of experiences after undertaking the test in the graphics



*Note: *Score reversed*

Figure 2

Participants positive experiences with the test

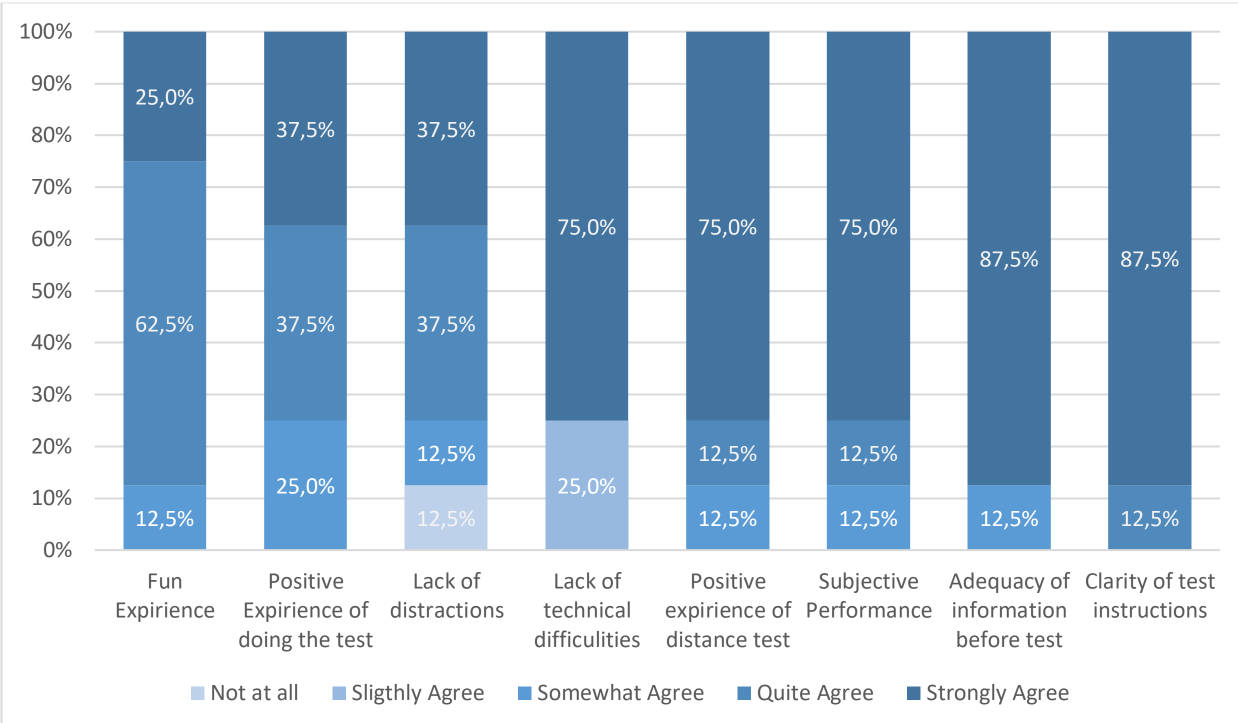


Figure 3

Average results of the cognitive tests

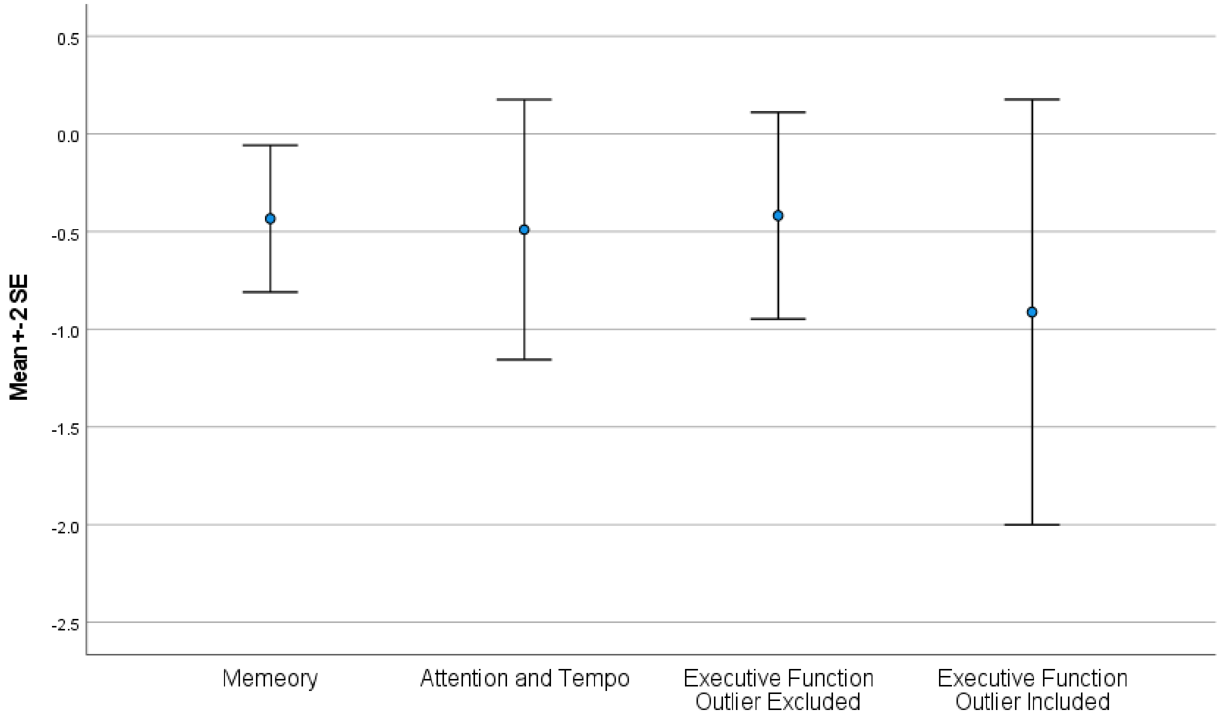
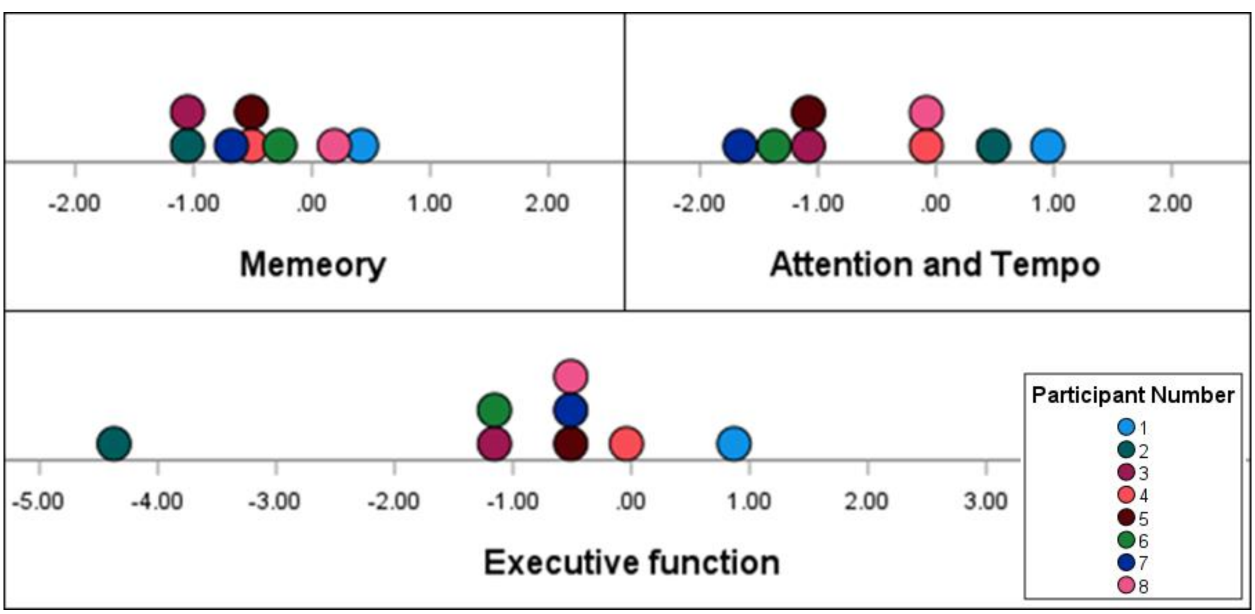


Figure 4

Participants Test results per domain per participant.



Appendix 1

Guidelines for APA, Psychology & Neuroscience

This thesis is written with the intention of submitting it to the American Psychology Asociacion's Psychology & Neuroscience journal.

The following is a link to the journal's guidelines:

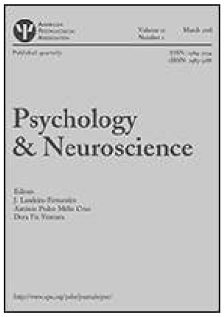
https://www.apa.org/pubs/journals/pne/?fbclid=IwAR1x3vCwtlSDjfG9Zndc6k5nPp3MrwkaU9xC3PH5M6m85IW1Z4bGaOoGg-A

The following link is to the journals call for teleneuropsychology in clinical practice and research papers: https://www.apa.org/pubs/journals/pne/pros-cons-teleneuropsychology?utm_campaign=apa_publishing&utm_medium=direct_email&utm_source=businessdevelopment&utm_content=gc_pne_cfp_tele_04062023&utm_term=btn_bottom_learn

The journal has a limit of 30 pages, including the introduction, methods, results, and discussion. Tables, figures and references may be outside of this page limit; however, the combined number of tables and figures should not exceed 5. Authors should include the page count and number of figures/tables on the title page of the manuscript.

AMERICAN PSYCHOLOGICAL ASSOCIATION

Psychology & Neuroscience



SUBMIT TO JOURNAL

- Read this journal
- Read free articles
- Journal snapshot
- Advertising information

Editor: Daniel C. Mograbi
ISSN: 1984-3054
eISSN: 1983-3288
Published: quarterly, beginning in March
This journal is a publication of Instituto Brasileiro de Neuropsicologia e Comportamento (IBNeC)

Journal scope statement

Psychology & Neuroscience publishes articles encompassing all intersection areas between psychology and neurosciences.

The journal is organized into five thematic sections:

- Psychophysics and Perception
- Behavior/Systems/Cognition
- Plasticity and Neural Development
- Clinical and Experimental Neuropsychology
- Neuropsychopharmacology

Topics covered by the journal include, but are not limited to:

- neural basis of sensory processing and perception;
- new approaches to psychophysics paradigms;
- computational models of brain processing;
- basic neuroscience and animal model studies exploring behavioral and cognitive

processes;

- studies from basic to clinical neuroscience investigating plasticity and changes in brain structure;
- neural development across the age spectrum, from embryology to old age;
- neurodevelopmental and neurodegenerative conditions;
- neuropsychological assessment and rehabilitation across development stages and clinical groups;
- experimental neuropsychology;
- EEG and neuroimaging studies;
- test development and validity;
- preclinical and clinical psychopharmacology studies; and
- advances in the development of new psychopharmacological interventions.

In addition to original empirical work, the journal also accepts reviews, with an emphasis on systematic reviews/meta-analysis summarizing findings or narrative reviews providing novel hypothesis and theoretical models. Reviews can have the regular article length, but there is also there is also an article format of mini reviews (maximum word count of 3000 words).

Psychology & Neuroscience is the official publication of Instituto Brasileiro de Neuropsicologia e Comportamento (IBNeC).

Subscribe to the RSS feed for *Psychology & Neuroscience* (http://content.apa.org/journals/pne.rss)

Equity, diversity, and inclusion

Psychology & Neuroscience supports equity, diversity, and inclusion (EDI) in its practices. More information on these initiatives is available under EDI Efforts (https://www.apa.org/pubs/journals/pne?tab=5#tabs) .

Journal highlight

This journal is available online only. Visit the pricing information page (/pubs/journals/pne/pricing) for information on how to subscribe.

Call for papers

- Pros and cons of teleneuropsychology in clinical practice and research (/pubs/journals/pne/pros-cons-teleneuropsychology)
- General call for papers (/pubs/journals/pne/call-for-papers-general)

Submission Guidelines

Prior to submission, please carefully read and follow the submission guidelines detailed below. Manuscripts that do not conform to the submission guidelines may be returned without review.

Psychology & Neuroscience is a subscription-based journal and there are no APCs associated with the submission or acceptance of an article. Should an author choose to publish their article Open Access, please refer to APA Journals' Open Access options (/pubs/journals/resources/open-access) .

Submission

To submit to the Editorial Office of Daniel C. Mograbi, please submit manuscripts electronically through the Manuscript Submission Portal in Microsoft Word or Open Office format.

Prepare manuscripts according to the *Publication Manual of the American Psychological Association* using the 7th edition. Manuscripts may be copyedited for bias-free language (see Chapter 5 of the *Publication Manual*). APA Style and Grammar Guidelines (https://apastyle.apa.org/style-grammar-guidelines?_ga=2.108621957.62505448.1611587229-1146984327.1584032077&_gac=1.60264799.1610575983.Cj0KCQiA0fr_BRDaARIsAABw4EvuRpQd5ff159C0LIBvKTktJUIeEjl7uMbrD1RjULX63J2Qc1bJoEIaAsdnEALw_wcB) for the 7th edition are available.

SUBMIT MANUSCRIPT (HTTPS://WWW.EDITORIALMANAGER.COM/PNE/DEFAULT1.ASPX)

General correspondence may be directed to the editor's office (mailto:danielmograbi@puc-rio.br) . Do not submit manuscripts to the editor's email address.

In addition to addresses and phone numbers, please supply email addresses and fax numbers for use by the editorial office and later by the production office. The majority of correspondence between the editorial office and authors is handled by email, so a valid email address is important to the timely flow of communication during the editorial process.

Please provide email addresses in your cover letter and keep a copy of the manuscript to guard against loss. Manuscripts are not returned.

Peer Review policy

Submissions are first evaluated by the editor. A submitted manuscript may be rejected without detailed comments after this initial review if the manuscript is considered inappropriate or of insufficient scientific priority for publication in *Psychology & Neuroscience.*

After initial review by the editor, the manuscript may be assigned to an associate editor. It is either the editor or one of the associate editors who selects and sends the manuscript to two reviewers for critical evaluation. *Psychology & Neuroscience* uses a double-blind peer review system. Manuscripts are blinded such that authors are unknown to the assigned reviewers and, in turn, all reviewers remain unknown to the authors. Every manuscript is treated by the editors and reviewers as privileged information, and they are instructed to exclude themselves from review of any manuscript that might involve a conflict of interest of the appearance thereof.

Comments from reviewers are examined by the editor or associate editor assigned, who then corresponds with the author and makes the final decision on acceptance or rejection of the manuscript.

Editorial board members are only permitted to submit manuscripts to the journal for evaluation once every two years. The editorial board member's identity is not made known to the reviewers and associate editors.

Page limits

Manuscripts should not exceed 30 pages inclusive of the introduction, methods, results, and discussion. Tables, figures and references may be outside of this page limit; however, the combined number of tables and figures should not exceed 5. Authors should include the page count and number of figures/tables on the title page of the manuscript.

Review APA's Journal Manuscript Preparation Guidelines (/pubs/journals/resources/manuscript-submission-guidelines) before submitting your article.

Formatting

Double-space all copy. Other formatting instructions, as well as instructions on preparing tables, figures, references, metrics, and abstracts, appear in the *Manual*. Additional guidance on APA Style is available on the APA Style website (https://apastyle.apa.org) .

Below are additional instructions regarding the preparation of display equations, computer code, and tables.

Display equations

We strongly encourage you to use MathType (third-party software) or Equation Editor 3.0 (built into pre-2007 versions of Word) to construct your equations, rather than the equation support that is built into Word 2007 and Word 2010. Equations composed with the built-in Word 2007/Word 2010 equation support are converted to low-resolution graphics when they enter the production process and must be rekeyed by the typesetter, which may introduce errors.

To construct your equations with MathType or Equation Editor 3.0:

- Go to the Text section of the Insert tab and select Object.
- Select MathType or Equation Editor 3.0 in the drop-down menu.

If you have an equation that has already been produced using Microsoft Word 2007 or 2010 and you have access to the full version of MathType 6.5 or later, you can convert this equation to MathType by clicking on MathType Insert Equation. Copy the equation from Microsoft Word and paste it into the MathType box. Verify that your equation is correct, click File, and then click Update. Your equation has now been inserted into your Word file as a MathType Equation.

Use Equation Editor 3.0 or MathType only for equations or for formulas that cannot be produced as Word text using the Times or Symbol font.

Computer code

Because altering computer code in any way (e.g., indents, line spacing, line breaks, page breaks) during the typesetting process could alter its meaning, we treat computer code differently from the rest of your article in our production process. To that end, we request separate files for computer code.

In online supplemental material

We request that runnable source code be included as supplemental material to the article. For more information, visit Supplementing Your Article With Online Material (/pubs/journals/resources/supplemental-material) .

In the text of the article

If you would like to include code in the text of your published manuscript, please submit a separate file with your code exactly as you want it to appear, using Courier New font with a type size of 8 points. We will make an image of each segment of code in your article that exceeds 40 characters in length. (Shorter snippets of code that appear in text will be typeset in Courier New and run in with the rest of the text.) If an appendix contains a mix of code and explanatory text, please submit a file that contains the entire appendix, with the code keyed in 8-point Courier New.

Tables

Use Word's Insert Table function when you create tables. Using spaces or tabs in your table will create problems when the table is typeset and may result in errors.

Academic writing and English language editing services

Authors who feel that their manuscript may benefit from additional academic writing or language editing support prior to submission are encouraged to seek out such services at their host institutions, engage with colleagues and subject matter experts, and/or consider several vendors that offer discounts to APA authors (/pubs/journals/resources/editing-services) .

Please note that APA does not endorse or take responsibility for the service providers listed. It is strictly a referral service.

Use of such service is not mandatory for publication in an APA journal. Use of one or more of these services does not guarantee selection for peer review, manuscript acceptance, or preference for publication in any APA journal.

Submitting supplemental materials

APA can place supplemental materials online, available via the published article in the APA PsycArticles® database. Please see Supplementing Your Article With Online Material (/pubs/journals/resources/supplemental-material) for more details.

Abstract and keywords

All research manuscripts should include a **structured abstract** containing a maximum of 250 words. The abstract, presented in paragraph form, should be typed on a separate page (page 2 of the manuscript), and must include each of the following sections:

- **Objective:** the primary purpose of the article should be clearly stated.
- **Methods:** this section must state the sample size and nature of subjects, data sources, study design, how dependent variables were measured and the specific analytic techniques (statistical tests, qualitative analysis strategy) that were used.
- **Results:** primary findings should be stated clearly and concisely, describing statistical results as appropriate, including effect sizes or confidence intervals with significance testing.
- **Conclusions:** a summary of the research and implications of the findings.

Abstracts that are incomplete or do not conform to the above structure will be returned to the authors for revision.

After the abstract, please supply three to five keywords.

Public significance statements

Authors submitting manuscripts to the journal *Psychology & Neuroscience* are now required to provide 2–3 brief sentences regarding the relevance or public health significance of their study or review described in their manuscript. This description should be included within the manuscript on the abstract/keywords page.

The public significance statement (similar to the Relevance section of NIH grant submissions) summarizes the significance of the study's findings for a public audience in one to three sentences (approximately 30-70 words long). It should be written in language that is easily understood by both professionals and members of the lay public. This statement supports efforts to increase dissemination and usage of research findings by larger and more diverse audiences.

When an accepted paper is published, these sentences will be boxed beneath the abstract for easy accessibility. All such descriptions will also be published as part of the Table of Contents, as well as on the journal's web page. This new policy is in keeping with efforts to increase dissemination and usage by larger and diverse audiences.

Research transparency

Authors must include the following items in their manuscript upon submission and/or revision:

- funding sources, financial disclosures, and disclaimers (in the Author note) even if there no funding was received, it must be stated
- conflict of Interest statement (in the Author note)

References

List references in alphabetical order. Each listed reference should be cited in text, and each text citation should be listed in the References section.

Examples of basic reference formats:

Journal Article

McCauley, S. M., & Christiansen, M. H. (2019). Language learning as language use: A cross-linguistic model of child language development. *Psychological Review*, *126*(1), 1–51. https://doi.org/10.1037/rev0000126 (https://doi.org/10.1037/rev0000126)

Authored Book

Brown, L. S. (2018). *Feminist therapy* (2nd ed.). American Psychological Association. https://doi.org/10.1037/0000092-000 (https://doi.org/10.1037/0000092-000)

Chapter in an Edited Book

Balsam, K. F., Martell, C. R., Jones. K. P., & Safren, S. A. (2019). Affirmative cognitive behavior therapy with sexual and gender minority people. In G. Y. Iwamasa & P. A. Hays (Eds.), *Culturally responsive cognitive behavior therapy: Practice and supervision* (2nd ed., pp. 287–314). American Psychological Association. https://doi.org/10.1037/0000119-012 (https://doi.org/10.1037/0000119-012)

Figures

Preferred formats for graphics files are TIFF and JPG, and preferred format for vector-based files is EPS. Graphics downloaded or saved from web pages are not acceptable for publication. Multipanel figures (i.e., figures with parts labeled a, b, c, d, etc.) should be assembled into one file. When possible, please place symbol legends below the figure instead of to the side.

Resolution

- All color line art and halftones: 300 DPI
- Black and white line tone and gray halftone images: 600 DPI

Line weights

- Adobe Photoshop images
    a. Color (RGB, CMYK) images: 2 pixels
    b. Grayscale images: 4 pixels
- Adobe Illustrator Images
    a. Stroke weight: 0.5 points

APA offers authors the option to publish their figures online in color without the costs associated with print publication of color figures.

The same caption will appear on both the online (color) and print (black and white) versions. To ensure that the figure can be understood in both formats, authors should add alternative wording (e.g., “the red (dark gray) bars represent”) as needed.

For authors who prefer their figures to be published in color both in print and online, original color figures can be printed in color at the editor's and publisher's discretion provided the author agrees to pay:

- $900 for one figure
- An additional $600 for the second figure
- An additional $450 for each subsequent figure

Publication policies

APA policy prohibits an author from submitting the same manuscript for concurrent consideration by two or more publications.

See also APA Journals® Internet Posting Guidelines (/pubs/journals/resources/internet-posting-guidelines) .

APA requires authors to reveal any possible conflict of interest in the conduct and reporting of research (e.g., financial interests in a test or procedure, funding by pharmaceutical companies for drug research).

- Download Disclosure of Interests Form (PDF, 38KB) (/pubs/authors/disclosure-of-interests.pdf)

Authors of accepted manuscripts are required to transfer the copyright to APA.

- For manuscripts **not** funded by the Wellcome Trust or the Research Councils UK
  Publication Rights (Copyright Transfer) Form (PDF, 83KB) (/pubs/authors/publication-rights-form.pdf)
- For manuscripts funded by the Wellcome Trust or the Research Councils UK
  Wellcome Trust or Research Councils UK Publication Rights Form (PDF, 34KB) (/pubs/authors/publication-rights-form-wellcome-rcuk.pdf)

Ethical Principles

It is a violation of APA Ethical Principles to publish "as original data, data that have been previously published" (Standard 8.13).

In addition, APA Ethical Principles specify that "after research results are published, psychologists do not withhold the data on which their conclusions are based from other competent professionals who seek to verify the substantive claims through reanalysis and who intend to use such data only for that purpose, provided that the confidentiality of the participants can be protected and unless legal rights concerning proprietary data preclude their release" (Standard 8.14).

APA expects authors to adhere to these standards. Specifically, APA expects authors to have their data available throughout the editorial review process and for at least 5 years after the date of publication.

Authors are required to state in writing that they have complied with APA ethical standards in the treatment of their sample, human or animal, or to describe the details of treatment.

- Download Certification of Compliance With APA Ethical Principles Form (PDF, 26KB) (/pubs/authors/ethics.pdf)

The APA Ethics Office provides the full Ethical Principles of Psychologists and Code of Conduct (/ethics/code) electronically on its website in HTML, PDF, and Word format. You may also request a copy by emailing (mailto:ethics@apa.org) or calling the APA Ethics Office (202-336-5930). You may also read "Ethical Principles," December 1992, *American Psychologist*, Vol. 47, pp. 1597–1611.

Other information

Visit the Journals Publishing Resource Center (/pubs/journals/resources) for more resources for writing, reviewing, and editing articles for publishing in APA journals.

Editorial Board

Editor

Daniel C. Mograbi, PhD
Pontifícia Universidade Católica do Rio de Janeiro, Brazil and *King's College London, United Kingdom*

Associate editors

Joe Bathelt, PhD
Royal Holloway, University of London, United Kingdom

Elodie Bertrand, PhD
Université Paris Cité, France

Eelco van Duinkerken, PhD
Pontifícia Universidade Católica do Rio de Janeiro, Brazil and *VU University Medical Center, Netherlands*

Laszlo A. Erdodi, PhD
University of Windsor, Canada

Qi Fang, PhD
University of Southern California, United States

Chiara Della Libera, PhD
University of Verona, Italy

Lorenz S. Neuwirth, PhD
SUNY College at Old Westbury, United States

Patricia Oliveira-Silva, PhD
Universidade Católica Portuguesa, Portugal

Amir M. Poreh, PhD, ABAP
Cleveland State University, United States

Adam T. Schmidt, PhD
Texas Tech University, United States

Argiro Vatakis, PhD
Panteion Panepistemio Koinonikon kai Politikon Epistemon, Greece

Armin Zlomuzica, PhD
Ruhr University Bochum, Germany

Founding editors

J. Landeira-Fernandez, PhD
Pontifícia Universidade Católica do Rio de Janeiro, Brazil

Antônio Pedro Mello Cruz, PhD
Universidade de Brasília, Brazil

Dora Fix Ventura, PhD
Universidade de São Paulo, Brazil

Consulting editors

Sebastião S. Almeida, PhD
Universidade de São Paulo, Ribeirão Preto, Brazil

Antonio J. Aznar-Casanova, PhD
Universidad de Barcelona, Spain

Fernando P. Cardenas, PhD
Universidad de los Andes, Colombia

Marcelo F. Costa, CO, PhD
Universidade de São Paulo, Brazil

David A. Eckerman, PhD
University of North Carolina, Chapel Hill, United States

M. Angela Guimarães Feitosa, PhD
Universidade de Brasília, Brazil

Rochele Fonseca, PhD
Pontifícia Universidade Católica do Rio Grande do Sul, Porto Alegre, Brazil

Sérgio S. Fukusima, PhD
Universidade de São Paulo, Ribeirão Preto, Brazil

Luiz G. Gawryszewski, PhD
Universidade Federal Fluminense, Brazil

Clarice Gorenstein, PhD
Universidade de São Paulo, Brazil

Russell D. Hamer, PhD
Florida Atlantic University, United States

Fred J. Helmstetter, PhD
University of Wisconsin, Milwaukee, United States

Gerson A. Janczura, PhD
Universidade de Brasília, Brazil

Andrew Kemp, PhD
University of Sydney, Australia

Jeansok J. Kim, PhD
University of Washington, United States

Jan Kremers, Prof. Dr.
University of Erlangen-Nuremberg, Germany

Sílvio Morato, PhD
Universidade de São Paulo, Ribeirão Preto, Brazil

Galina Paramei, PhD, Dr. habil.
Liverpool Hope University, United Kingdom

Maria Teresa A. Silva, PhD
Universidade de São Paulo, Brazil

Luiz Carlos L. Silveira, PhD
Universidade Federal do Pará, Brazil

Yossi Zana, PhD
Universidade Federal do ABC, Brazil

Peer review coordinator

Kara Hamilton
American Psychological Association, United States

Abstracting & Indexing

Abstracting and indexing services providing coverage of *Psychology & Neuroscience*

- Cabell's Directory of Publishing Opportunities in Psychology
- Chemical Abstracts
- LATINDEX (Index of Latin American journals in sciences and humanities. Universidad Nacional Autónoma de México Database)
- LILACS (Literatura Latino-Americana e do Caribe em Ciências da Saúde. BIREME Database)
- OCLC
- PsycInfo
- SCOPUS

Special Issues

- International Affect, Personality and Embodied Brain (APE) Network (/pubs/journals/special/pne-international-affect-personality-embodied-brain-pdf) Special issue of APA's Psychology & Neuroscience, Vol. 15, No. 4, December 2022. This special issue comprises a selection of representative studies from the Affect, Personality and Embodied Brain conferences. The included studies span behavioral and brain studies of nonclinical and clinical populations.
- Women in Neuroscience (/pubs/journals/special/pne-women-neuroscience-pdf) Special issue of APA journal Psychology & Neuroscience, Vol. 15, No. 2, June 2022. This special issue features empirical research articles authored by women in the lead (first) author role and the guest editors and editorial team selected one paper for the Psychology & Neuroscience Early Career Award for Women in Neuroscience.
- Fronto-Executive Functions (/pubs/journals/special/pne-fronto-executive-functions-pdf) Special issue of APA journal Psychology & Neuroscience, Vol. 13, No. 3, September 2020. This special issue reflects new directions in the study of the development of fronto-executive functions in normal children and those with neurodevelopmental disorders.
- Neuropsychology of Aging (/pubs/journals/special/6261202) Special issue of the APA journal Psychology & Neuroscience, Vol. 12, No. 2, June 2019. The issue provides data and insights into normal and impaired aging, and the articles have implications for the clinical and theoretical aspects of the cognitive changes associated with aging.
- Neurodevelopment (/pubs/journals/special/6261102) Special issue of the APA journal Psychology & Neuroscience, Vol. 11, No. 2, June 2018. Includes articles about neurodevelopmental processes in stress and attention in preterm infants, children's working memory, intelligence, cognitive and motor development, and communication.

EDI Efforts

Inclusive reporting standards

- Bias-free language and community-driven language guidelines (required)
- Author contribution roles using CRediT (recommended)
- Data sharing and data availability statements (recommended)
- Impact statements (required)

More information on this journal's reporting standards is listed under the submission guidelines tab (https://www.apa.org/pubs/journals/pne?tab=1#tabs) .

Other EDI offerings

Masked peer review

This journal offers masked peer review (where both the authors' and reviewers' identities are not known to the other). Research has shown that masked peer review can help reduce implicit bias against traditionally female names or early-career scientists with smaller publication records (Budden et al., 2008; Darling, 2015).

Find this article at:
https://www.apa.org/act/resources/fact-sheets/development-5-years

Appendix 2

Norwegian after-test survey

Brukeropplevelse ved digitale tester

* Required

1. Mitt morsmål/første språk er: *

   ◯ Norsk

   ◯ Polsk

   ◯ Annet

2. Hva er morsmålet ditt? *

3. På en skala fra 1-10, der 1 betyr at du forstår noen ord, men må bruke oversetter, og 10 betyr at du forstår alt og kommuniserer sømløst hvor god er din norskforståelse? *

0	1	2	3	4	5	6	7	8	9	10

Forstår noen ord — Forstår alt

4. Jeg bruker oversettelsesprogram for å svare på dette spørreskjemaet *

    ◯ Ja

    ◯ Nei

5. Vi håper å senere sende ut polsk utgave av testen, ønsker du å få denne tilsendt? *

    ◯ Ja

    ◯ Nei

6. Vennligst oppgi epostadresse; den polske utgaven vil sendes til denne epostadressen

7. Hvor gammel er du *

- ◯ 18-29
- ◯ 30-39
- ◯ 40-49
- ◯ 50-59
- ◯ 60-69
- ◯ 70-79
- ◯ 80+

8. Hvor mange fullførte år med utdanning har du? *

- ◯ 7-10 år (fullført grunnskole)
- ◯ 11-13 (fullført videregående eller tilsvarende)
- ◯ 14-16 (bachelor)
- ◯ 16+

9. Hvor komfortabel er du med å bruke datamaskin? *

0	1	2	3	4	5	6	7	8	9	10

Ikke i det heletatt — Veldig komfortabel

10. I hvilken grad opplevde du følgene under testingen? *

	Ikke i det heletatt	litt	en del	ganske mye	veldig mye
Interesse	○	○	○	○	○
Tristhet	○	○	○	○	○
Fokus	○	○	○	○	○
Mangel på konsentrasjo n	○	○	○	○	○
Glede	○	○	○	○	○
Irritasjon	○	○	○	○	○
Selvtillit	○	○	○	○	○
Nervøsitet	○	○	○	○	○
Øyeanstreng else	○	○	○	○	○
Generell tretthet	○	○	○	○	○

11. I hvilken grad er du enig i følgende påstander? *

	Ikke i det heletatt	litt uenig	litt enig	ganske enig	Veldig enig
Jeg synes det var gøy å gjøre testen	○	○	○	○	○
Jeg synes det fungerte god å gjennomføre testen digitalt	○	○	○	○	○
Jeg kunne gjennomføre testen i fred uten distraksjoner	○	○	○	○	○
Jeg opplevde ingen tekniske problemer	○	○	○	○	○
Jeg likte å gjøre testen hjemme uten testleder i nærheten	○	○	○	○	○
Jeg gjorde mitt beste på alle testene	○	○	○	○	○
Jeg fikk tilstrekkelig med informasjon før testingen	○	○	○	○	○
Jeg synes at instruksjonene var tydelige og enkel å forstå	○	○	○	○	○

12. Kunne du høre, lese og se alt tydelig under testen? *

- ◯ Ja
- ◯ Nei

13. Hvorfor valgte du å delta i dette forskningsprosjektet? *

14. I dine egne ord, hvordan vil du beskrive din opplevelse med å gjennomføre testen? *

15. Er det noe annet fra din erfaring med testingen du vil informere oss om? *

16. Er det noe du synes bør forbedres med testen, eller prosessen med oppstart og avslutning av testen? *

17. Hvorfor valgte du å delta i dette forskningsprosjektet? *

18. Ønsker du å få tilsendt testresultatene dine? *

- Ja
- Nei

19. Vennligst oppgi ditt fødselsår *

20. Vennligst oppgi din Epostadresse *

21. Jeg vil bli sammenlignet med et utvalg av *

- ◯ Biologiske menn
- ◯ Biologiske kvinner