Are Acceptability Levels Significantly High Among Therapists, Individuals with a (Sub)Clinical Disorder and the Healthy Population Regarding the Addition of a Neurofeedback Learning Companion to Neurofeedback Training for the Improvement of Executive Functions?

Willemijn O.K. Meiborg

S3771105

Department of Psychology, University of Groningen

PSB3E-BT15: Bachelor Thesis

Group number: 4

Supervisor: Dr Stefanie Enriquez Geppert

Second evaluator: Dr Mark Span

In collaboration with: Theresia Antoniadou, Simon Dijkstra, Cameron K. Taylor, Saar M.D. Weijerman

June 15, 2024

A thesis is an aptitude test for students. The approval of the thesis is proof that the student has sufficient research and reporting skills to graduate, but does not guarantee the quality of the research and the results of the research as such, and the thesis is therefore not necessarily suitable to be used as an academic source to refer to. If you would like to know more about the research discussed in this thesis and any publications based on it, to which you could refer, please contact the supervisor mentioned

Acknowledgements

No content generated by AI technologies has been presented as my own work.

I acknowledge that I utilized AI tools, such as ChatGPT (OpenAI, 2023) for assistance in improving my writing (e.g. spelling), however ChatGPT (OpenAI, 2023) was not used to generate content, to ensure originality.

I acknowledge the use of ChatGPT (OpenAI, 2023) to give me feedback on clarity, to check whether my intended arguments came across well, while explicitly asking not to rewrite my texts for me.

Abstract

Introduction: Neurofeedback training is a promising intervention for cognitive enhancement. However, there is still room for improvement to address challenges such as interindividual learning variability and non-responsiveness and enhance its effectiveness. This feasibility study investigates the acceptability of the addition of a neurofeedback learning companion to neurofeedback training to address these challenges. Method: A convenience sample of 519 participants, including therapists, individuals with (sub)clinical diagnoses (stakeholder groups), and a healthy population completed a questionnaire assessing perceived ease-of-use, perceived usefulness, and behavioural intention regarding the companion. This was analysed using on-sample t-tests and nonparametric Kruskal Wallis tests. Results: Consistently high levels of perceived ease-of-use, perceived usefulness and behavioural intention were found across all stakeholder groups, indicating widespread acceptability of the neurofeedback learning companion. An exploratory analysis showed some differences between groups, with most prominently significant differences in perceived ease-of-use between therapists with a diagnosis and other groups. Discussion: The results underscore the potential viability of integrating a neurofeedback learning companion into neurofeedback training. Limitations in sample representativeness and familiarity with neurofeedback training warrant consideration. Future research could try to improve acceptability levels and further develop the neurofeedback learning companion.

Keywords: Acceptability, Feasibility Study, Neurofeedback, Learning Companion, Cognitive Enhancement, Executive Functions

Are Acceptability Levels Significantly High Among Therapists, Individuals with a (Sub)Clinical Disorder and the Healthy Population Regarding the Addition of a Neurofeedback Learning Companion to Neurofeedback Training for the Improvement of Executive Functions?

Neurofeedback is a promising treatment for cognitive function enhancement (Loriette et al., 2021; Enriquez-Geppert et al., 2017). However, as highlighted by reviews on the topic (Loriette et al., 2021; Viviani & Vallesi, 2021), there is still room for improvements in neurofeedback training techniques, and various approaches could be undertaken to address current limitations and enhance its efficacy. By providing real-time feedback on electroencephalography (EEG) recordings, neurofeedback allows individuals to regulate their brain activity (Viviani & Vallesi, 2021). Consequently the goal of neurofeedback training is to modulate this particular brain activity into more desired patterns and thereby improving cognitive function and clinical symptoms (Cai et al., 2021; Enriquez-Geppert et al., 2014; Smit et al., 2023). There are various neurofeedback protocols, each targeting specific aspects of brain activity, which are associated with distinct physiological states (Marzbani et al., 2016). One such protocol is the frontal-midline theta protocol, targeting theta oscillations (4-8 Hz), which has demonstrated efficacy in enhancing executive functions with sustained effects (Smit et al., 2023; Viviani & Vallesi, 2021). Executive functions constitute a collection of cognitive processes that enable an individual to govern their thoughts and behaviours toward achieving desired goals. These functions involve tasks such as inhibiting impulsive responses, managing distractions, updating working memory, and attention shifting (Banich, 2009; Friedman & Miyake, 2017; Smit et al., 2023).

Executive functions are important for effective cognitive functioning, exerting profound influences on both clinical and cognitive outcomes as well as everyday life (Snyder et al., 2015; Vaughan & Giovanello, 2010). These cognitive abilities enable individuals to

navigate complex tasks and adaptively respond to challenges encountered in daily life (Banich, 2009; Diamond, 2013). Deficits in executive functions are considered transdiagnostic, as they are pervasive across various psychological disorders. They serve as a core feature underlying psychopathology (Abramovitch et al., 2021; Nolen-Hoeksema & Watkins, 2011; Snyder et al., 2015). Impaired executive functions can greatly impact multiple domains in an individual's life such as interpersonal relationships, academic and occupational performance, as well as overall quality of life (Mohamed et al., 2019; Zhang et al., 2021).

While neurofeedback training shows promise for enhancing cognitive functions, it is essential to address the challenges associated with general learning variability and non-responsiveness among certain individuals. Non-responsiveness is common in psychological interventions, with Gloster et al. (2020) reporting that 30-40% of patients do not respond to standard treatment. In the specific context of neurofeedback, non-responders encounter challenges in modulating their brain activity and appear to fail to control it (Alkoby et al., 2018; Enriquez-Geppert et al., 2014). Notably, Alkoby et al. (2018) highlighted that across various neurofeedback protocols approximately 30-50% of individuals were classified as non-responders. Moreover, non-responsiveness is also observed in the broader field of Brain-computer Interface (BCI), of which neurofeedback is a subtype, where up to 10-30% of participants are unsuccessful (Alkoby et al., 2018). Where, in general, in BCI brain activity is used to control external devices, in neurofeedback external feedback is used to control brain activity (Wood et al., 2014). Additionally, even among individuals who do respond to neurofeedback and BCI, there is considerable interindividual variability in learning rates and outcomes (Enriquez-Geppert et al., 2017; Jeunet et al., 2016). Individuals exhibit varying levels of success and speed in achieving control over their brain activity through neurofeedback training (Enriquez-Geppert et al., 2017). Consequently, researchers are actively striving to enhance these outcomes by investigating personalized approaches and

advancing neurofeedback tools to account for individual differences in learning and responsiveness (Alkoby et al., 2018; Loriette et al., 2021).

Research into interindividual learning variability in neurofeedback identified various factors that may contribute to individual differences in cognitive outcomes. Neuroimaging studies have revealed associations between brain structures, connectivity patterns, and learning variability during neurofeedback training (Sitaram et al., 2017; Enriquez-Geppert et al., 2017). While these neurobiological factors provide valuable insights into the neural mechanism underlying learning variability, psychological aspects also play a crucial role in shaping individual responses to neurofeedback training. Although thorough research on psychological variables underlying non-responsiveness in neurofeedback is limited (Kadosh & Staunton, 2019), diverse psychological and cognitive traits and states have been investigated and related to BCI-performance as possible contributing factors (Jeunet et al., 2016). States, as defined by Chaplin et al. (1988), are “temporary, brief and caused by external circumstance”, while traits are “stable, long-lasting, and internally caused”. In their meta-analysis Jeunet et al. (2016) classified these traits and states into three categories: the user-technology relationship and the control, suggesting that individuals with lower perceived control over technologies, such as BCIs, may face greater challenges in their utilisation; attention, covering both trait-based attentional abilities and fluctuating attention levels influenced by environmental factors, mood, and motivation; and spatial abilities, encompassing predictors linked to motor abilities and mental imagery production, potentially affecting BCI control. Furthermore, emotional factors such as anxiety and depression, tension and autonomy seem to influence performance in BCI research (Nijboer, 2010; Pillette et al., 2020).

To address some of these challenges, Pillette et al. (2020) have designed a learning companion within BCI systems to enhance social presence and emotional support. As one of

the earlier definitions of a learning companion, Chou et al. (2003). described them as a non-human computer-based intelligent tutoring system fostering learning through social interactions without authoritarian influence. This definition still holds today, with learning companions acting as knowledgeable peers (Johnson & Lester, 2018) playing a social and motivational role in learning (Kim et al., 2006; Lim, 2012). Previous research in educational settings and interactive learning environments, has demonstrated a positive impact of learning companions on motivation (Lester et al., 1997), task engagement, and task efficiency (Kim et al., 2006). While learning companions are most commonly utilized in more traditional educational settings, their educational purposes have also found applications in diverse domains such as military settings and healthcare (Johnson et al., 2011; Martínez-Miranda et al., 2019; Sillice et al., 2018), demonstrating their potential impact beyond conventional educational environments. In their study, Pillette et al. (2020) found promising results, with a 3.9% performance improvement among non-autonomous BCI users – individuals who prefer social learning context - when a learning companion was added in the training compared to traditional BCI methods. Additionally, participants using the learning companion reported a 7.4% increase in learning and memorability scores, while autonomous users exhibited a 13.4% improvement in efficiency. Despite the differing goals of BCI and neurofeedback protocols, these findings suggest that incorporating learning companions could potentially yield similar benefits.

During the process of intervention development, the role of acceptability and acceptance should be investigated prior to implementing new innovations (Gadke et al., 2021). These constructs offer valuable insights into the likelihood and rationale behind user's engagement with new technologies, influencing their sustained adoption and utilization (Alexandre et al., 2018). Acceptability reflects an individual's preconceived attitudes and expectations toward new tools prior to engaging with it (Barcenilla & Bastien, 2010; Février,

2011). It can be gauged through behavioural intention which signifies individuals' willingness to try or use the technology and is predominantly influenced by perceived usefulness and perceived ease-of-use (Grevet et al., 2023). Perceived usefulness reflects subjective assessments of the tool's utility, or in other words the degree to which a person believes that using the tool will enhance their performance or achieve desired outcomes (Grevet et al., 2023). When a user perceives a technology as useful, they are more likely to develop a positive intention to use it. Perceived ease-of-use, on the other hand, indicates beliefs regarding the effort required to use the tool (Grevet et al., 2023). If a tool is perceived as easy to use, an individual is more likely to adopt it, as the lower effort required reduces potential resistance and hence increases behavioural intention. In contrast to acceptability, acceptance entails the pragmatic evaluation of a tool after actual interaction, encompassing the user's assessment of its utility and usability. Notably, the key distinction between acceptability and acceptance lies in the timing of assessment.

Feasibility studies evaluate the practicality and viability of implementing new interventions and research initiatives (Gadke et al., 2021; Tickle-Degnen, 2013). They explore various components including acceptability studies, thereby laying the groundwork for more extensive investigations (Gadke et al., 2021). The primary aim is to ascertain the feasibility of proposed interventions, addressing questions of both capability and appropriateness. By evaluating these components prior to conducting controlled evaluation studies, feasibility research enhances both internal and external validity by refining interventions and research designs factoring in the results of the feasibility components, thereby maximizing scientific robustness (internal validity) and generalizability to real-world settings (external validity) (Gadke et al., 2021; Tickle-Degnen, 2013). Although feasibility studies are more commonly associated with medical and health interventions, their significance extends to other fields,

including psychology and psychiatry (e.g. Handley et al. (2014); Huffman et al. (2014), as underscored by Gadke et al. (2021).

Prioritizing acceptability among key stakeholders during the feasibility stage enhances the likelihood of thorough evaluation of promising interventions and subsequent implementation in real-world settings (Gadke et al., 2021). Stakeholders in health and health-related research encompass individuals with vested interests, responsibilities, or expertise in the matter including e.g. clinicians, patients and caregivers (Concannon et al., 2012; Deverka et al., 2012; Sekhon et al., 2017). Unlike the healthy population, stakeholders possess a direct interest in specific healthcare issues, lending their engagement a rational perspective and enhancing the potential for improving the quality and legitimacy of future actions. This active involvement contributes to the relevance and translatability of research findings (Deverka et al., 2012).

Building on the insights from previous research on neurofeedback and BCI systems and recognizing the role of acceptability and feasibility in treatment development, the current study aims to investigate the acceptability of integrating a learning companion into neurofeedback training for the improvements of executive functions. Specifically, we seek to gauge the acceptability of the neurofeedback learning companion among key stakeholder groups, namely therapists, and individuals with a (sub)clinical diagnosis, while also assessing the perceptions of the healthy population to provide a comprehensive understanding of acceptability across diverse contexts in neurofeedback training. Concretely the research question is as follows: Are acceptability levels significantly high among therapists, individuals with a (sub)clinical disorder and the healthy population regarding the addition of a neurofeedback learning companion to neurofeedback training for the improvements of executive functions?

In this context therapists are individuals with a medical professional background, while the clinical group comprises individuals with diagnosed psychological or cognitive disorders, the subclinical group comprises individuals with strong cognitive complaints and the healthy population includes individuals without such medical background, diagnosis, or complaints. We anticipate varying degrees of expertise and perspectives among these groups, with the clinical group potentially having relevant personal experiences with other treatment options, and therapists bringing their medical knowledge into consideration (Deverka et al., 2012). High levels of acceptability across stakeholder groups are imperative for the feasibility and progression of subsequent studies involving the integration of a neurofeedback learning companion. The success of intervention implementation hinges on acceptability of the intervention by both intervention deliverers and recipients (Gadke et al., 2021; Sekhon et al., 2017). Therefore, an adequate level of acceptability is necessary for the feasibility of the intervention, especially among those who are likely to use the intervention and are more invested in the need for treatment development such as the therapists and the (sub)clinical groups.

To quantitively assess acceptability measured through perceived ease-of-use, perceived usefulness and behavioural intention, we adopt a critical score of 50 on a scale from 0 to 100. This threshold is chosen based on the assumption that a score of 50 represents a medium level of acceptability given its equidistance from both negative and positive extremes, making it a reasonable minimal benchmark for acceptability. A score at or above this level suggests that the intervention is viewed favourably enough to warrant further development and testing. Therefore, we hypothesise the following:

Hypothesis 1, H_0. The perceived ease-of-use scores are not significantly higher than 50 for therapists, people with a (sub)clinical diagnosis and the healthy population regarding the addition of a neurofeedback learning companion.

Hypothesis 1, H_1. The perceived ease-of-use scores are significantly higher than 50 for therapists, people with a (sub)clinical diagnosis and the healthy population regarding the addition of a neurofeedback learning companion.

Hypothesis 2, H_0. The perceived usefulness scores are not significantly higher than 50 for therapists, people with a (sub)clinical diagnosis and the healthy population regarding the addition of a neurofeedback learning companion.

Hypothesis 2, H_1. The perceived usefulness scores are significantly higher than 50 for therapists, people with a (sub)clinical diagnosis and the healthy population regarding the addition of a neurofeedback learning companion.

Hypothesis 3, H_0. The behavioural intention scores are not significantly higher than 50 for therapists, people with a (sub)clinical diagnosis and the healthy population regarding the addition of a neurofeedback learning companion.

Hypothesis 3, H_1. The behavioural intention scores are significantly higher than 50 for therapists, people with a (sub)clinical diagnosis and the healthy population regarding the addition of a neurofeedback learning companion.

By testing these hypotheses, we aim to provide valuable insights into the acceptability of integrating learning companions into neurofeedback training across diverse stakeholder groups. Ultimately informing the development and implementation of more effective and user-centred approaches in cognitive enhancement.

Method

Recruitment and inclusion criteria

This is a still-running study with ongoing participant recruitment, which started on January 11, 2024. The study has received ethical approval from the Institutional Review Board, documented under the ethical reference number PSY-2324-S-0092. The participants were acquired through a convenience sample. Several recruitment strategies were used. Flyers

were displayed in various physical areas in addition to digital spaces such as group chats, personal social media and pertinent social media groups. Additionally, links to participate in the questionnaire were also sent out selectively by email to institutions and medical professionals whose backgrounds are relevant to the neurofeedback training.

Participants

At the point of data extraction, a total of 519 participants took part in this ongoing feasibility study with ages ranging from 18 to 86 years old (Mdn= 22, SD= 12,67). This included 394 women (Mdn= 20, SD= 12.42), 113 men (Mdn= 22, SD= 13.89) and 12 who identified as other gender identities or did not want to disclose their gender (Mdn= 22.5, SD= 5.78). The median age was chosen as a measure of central tendency due to the skewness of the data. The age of 18 and above was used as an inclusion criterion. Most participants had a Dutch (46%), German (17%) or French (13%) nationality, although 48 different nationalities were represented (see Table A1). Moreover, most participants were residing in the Netherlands (72%).

As for employment status, presented more elaborately in Figure A1, most participants were students and working students, accounting for 49.9% and 20.8% of the total sample respectively. Full-time employment represented 12.9%, self-employment 3.7%, and retirement 1.5%. The unemployed made up 1.5%. High school was the most common level of completed education, with 65.5% of participants indicating they had completed it. Those with bachelor's degrees comprised 10.6%, master's degrees 8.7%, and PhDs 7.5%. Additionally, some participants had completed professional apprenticeships (2.5%), practical training (1.7%), or secondary school education (1.5%). A smaller portion of the sample (1.9%) indicated "Other" for their educational background, with responses including associate degrees, college diplomas, and similar. The demographic profile should be considered when examining the survey variables.

Procedure

The study collected data through an online questionnaire, which was accessed by participants via a provided link and QR-code. The estimated time of completion of the survey was 15 to 20 minutes. This study adhered to the principles outlined in the Declaration of Helsinki and was approved by the Ethics Committee of the Faculty of Behavioural and Social Sciences at the University of Groningen. All participants provided informed consent before beginning the online questionnaire.

This declaration of consent comprised subsections detailing the study's objectives, procedures, duration of participation, privacy and confidentiality measures, voluntary participation, potential risks and benefits, dissemination of findings, and ultimately, the participant's consent. Participants who chose not to participate were thanked for their time and given the option to exit the study. Those who consented were instructed to create a unique identifier number for their participation before proceeding to complete the questionnaire.

All participants walked through the questionnaire in the same order. They started with the demographics section. After the items about a participant’s own experience with neurofeedback an explanatory section followed, providing information about neurofeedback and a neurofeedback learning companion, including descriptive texts accompanied by illustrative photos and videos, aimed at providing fundamental knowledge on the topic. Following this, validity items were included, consisting of a multiple-choice quiz on the explanatory material, designed to assess participants' understanding of the topics. It proceeded with the items about their basic understanding, goals and expectations. The questionnaire continued with the preference section, the acceptability factors, the cognitive complaints questionnaire and ended with the BFI. As deceit was not a component of this study, participants did not receive a debriefing. Upon completion of the questionnaire and some accompanying questions, participants were thanked for their time, and the research concluded.

Design

This study employed a cross-sectional correlational research design to examine the levels of acceptability among diverse stakeholder groups. These groups encompassed therapists, a clinical group, a subclinical group, and the healthy population, functioning as independent variables. This study centred on the three acceptability factors, including perceived ease-of-use, perceived usefulness and behavioural intention, each serving as a dependent variable. While the questionnaire included numerous constructs and variables, not all were subjected to analysis. It is worth noting that certain constructs were utilized by colleagues in related feasibility studies about the development of a neurofeedback learning companion. The decision to include or exclude specific constructs was guided by the unique objectives and research questions of each study. This selective approach aimed to maintain focus on the specific research inquiries.

Materials

The questionnaire was available in Dutch, French German, Spanish and English to accommodate the diverse linguistic backgrounds of the participants, as it was distributed worldwide.

Demographic questionnaire

For the broader scope of the feasibility studies following this survey relevant demographic data were collected. This included variables such as age, gender, employment status, highest completed level of education, country of residency and nationality. Participants were also queried about their professional background, particularly whether it was medical or health related. Follow-up questions were posed to assess their familiarity with neurofeedback, including inquiries about their specific medical field, whether they incorporate neurofeedback into their therapies, and their willingness to consider it. Additionally, all participants were asked if they have psychiatric or neurological disorders and had the option to specify them.

Information was also gathered regarding participants' experience with neurofeedback. Through questions participants' understanding of the survey concepts was also evaluated. For participants that had already practised neurofeedback, goals and expectations regarding neurofeedback were assessed using questions like "In general, I think that neurofeedback is a more natural form of treatment than medicine". To address potentially sensitive inquiries, all participants were provided the option to select "I prefer not to disclose".

Questionnaire Assessing the Design Preferences of the Neurofeedback Learning Companion

A preference questionnaire was employed to gather information about participants' characteristic preferences for the neurofeedback companion. All questions regarding these preferences were framed in terms of participants' perceived trustworthiness of the companion's characteristics. Trustworthiness was defined as the participant's readiness to accept the companion's feedback and their willingness to utilise it for enhancing self-regulation of brain activity through neurofeedback. In assessing shape preference, participants engaged in a ranking task involving four proposed shapes. Colour preference was evaluated through two multiple-choice questions concerning colour intensity and the number of colours preferred.

Participants rated the perceived trustworthiness of each name on a continuous analogue scale ranging from 0 to 100, with 0 was "not trustworthy at all" and 100 "maximally trustworthy". Similarly, the perceived trustworthiness of the voices was gauged using a continuous analogue scale ranging from 0 to 100, where 0 indicated "not fitting at all" and 100 indicated "maximally fitting".

Questionnaire Design for Assessing Acceptability of the Neurofeedback Learning Companion

The questions designed to assess the acceptability factors were drawn from the BCI /Neurofeedback Acceptability Tool (Grevet et al., 2023). Acceptability comprises three key variables: perceived ease-of-use, perceived usefulness, and behavioural intention, each of which was evaluated using three items.

For instance, a sample item for perceived ease-of-use is “I think practising neurofeedback with a learning companion would be easy”. A representative example of perceived usefulness is “I think that the neurofeedback learning companion will make the neurofeedback training more pleasant”. Similarly, an example of behavioural intention is “Assuming I had access to a neurofeedback learning companion during my neurofeedback training, I would use it”.

As experience or attitudes toward new technologies can moderate the level of acceptability (Grevet et al., 2023) feelings toward new technologies were also measured with a question about the confidence and pleasure about this subject. These items included “In general, I feel confident using new technologies” and “I enjoy using new technologies”. All questions measuring the acceptability and feelings toward technology used a continuous analogue scale from 0 to 100, where 0 is “totally disagree” and 100 is “totally agree”.

The BCI acceptability model of Grevet et al. (2023)was used as it demonstrated good internal consistency, with Cronbach’s α ranging from .83 to .97 for perceived ease-of-use, perceived usefulness and behavioural intention factors. Additionally, fit indices including the comparative fit index, with a value of .913 and Tucker-Lewis index, with a value of .897, indicated a good fit between the model and their dataset providing support for its validity and utility (Grevet et al., 2023).

Questionnaire Assessing Cognitive Complaints

To assess cognitive complaints, we included a 14-item questionnaire (see Table A2) covering a variety of cognitive domains where participants were asked to indicate the extent

to which they experience difficulties in these areas. Drawing from the American Psychiatric Association's (2013) six main cognitive domains, items predominantly targeted complex attention, executive function, learning and memory, language, perceptual motor and social cognition. An example question is "I experience difficulties remembering important information such as dates, names, or past events". The answers were collected using a 3-point Likert scale with "yes, strongly", "yes, slightly", and "no". Supplementary questions addressing fatigue, self-awareness, and emotional regulation were integrated to ensure a comprehensive evaluation of cognitive functioning. Lastly item 14, an open-end query, allowed participants to report any additional cognitive concerns not covered by the structured items.

Big Five Inventory

Participant personality factors were measured using the Big Five Inventory (BFI) (John et al., 1991), a 44-item questionnaire which uses 5-point Likert scales from "strongly disagree" to "strongly agree". The Big Five personality traits are openness to experience (e.g. "I see myself as someone who is curious about many different things"), conscientiousness (e.g. "I see myself as someone who makes plans and follows through with them"), extraversion (e.g. "I see myself as someone who is outgoing, sociable"), agreeableness (e.g. "I see myself as someone who is generally trusting") and neuroticism (e.g. "I see myself as someone who prefers work that is routine"). The BFI was selected for assessing Big Five personality traits due to its established reliability, evidenced by consistently high Cronbach's α of around $\geq .8$ on average per scale for internal consistency and in three-month test-retest reliability across multiple populations (John & Srivastava, 1999; Rammstedt & John, 2017; Soto & John, 2009). Additionally, the BFI-44 has been validated through various methods, including Confirmatory Factor Analysis of the Multitrait Multimethod Matrix, showing standardised validity coefficients averaging .92 for the BFI-44, indicating a strong convergent

validity (John & Srivastava, 1999). The BFI-44 demonstrates robust discriminant validity, with an average within domain discriminant correlation of .20, indicating its ability to effectively differentiate between the Big Five personality traits (John & Srivastava, 1999; Rammstedt & John, 2017; Soto & John, 2009). Moreover, research suggests that the BFI is more comprehensible to participants compared to alternative Big Five instruments such as the NEO or TDA (Benet-Martínez & John, 1998; John & Srivastava, 1999). Furthermore, the BFI-44 has been translated and validated across multiple languages, including Dutch (Denissen et al., 2008), French (Plaisant et al., 2010), German (Lang et al., 2001), and Spanish (Benet-Martínez & John, 1998), ensuring its applicability to diverse linguistic populations and facilitating its integration into our study with a diverse participant pool.

Statistical Analysis

Sample size estimates

For an estimation of necessary sample size an a priori power analysis was conducted using G* Power version 3.1.9.7. software (Faul et al., 2007). As common practice in behavioural science research (Beck, 2013), we aimed to detect at least a medium effect size (f= .25) using Cohen's (1988) criteria with a significance criterion of $\alpha = .05$ and power = 0.8. The minimal sample size needed for the t-test analyses to test H1 to H3 is N= 398. Given the inclusion of all 519 participants in this study, the obtained sample size is adequate for testing the proposed hypotheses.

Data preparation

As the acceptability factors were assessed using three items each, the mean scores of these three items were computed to derive the dependent variables representing perceived usefulness, perceived ease-of-use and behavioural intention for the statistical analyses.

To categorise participants into key stakeholder groups, four dummy variables were created representing therapist status (therapist vs. non-therapist), the clinical group (presence

vs. absence of a diagnosis), the subclinical group (presence vs. absence of strong cognitive complaints) and the healthy population (in at least one other category vs in no other category). These variables were coded as binary dummy variables (1= yes and 0= no). Participants indicating a professional medical background (e.g. ergotherapist, neurologist, psychiatrist, psychologist, psychological psychotherapist, physiotherapist, nurse, other) were classified as therapists. Only participants who reported having an officially diagnosed psychological or cognitive disorder were categorised as such. Participants who chose the option "Yes, strongly" on at least one item of cognitive complaints were put in the subclinical group to ensure sensitivity in identifying individuals with notable cognitive difficulties. Lastly, participants not falling in any of above-mentioned groups were categorised as healthy population.

To ensure having independent groups for the statistical analysis using a one-sample t-test with a critical value, participants who fell into multiple categories were assigned to a single group. Participants who indicated having both an official diagnosis and strong cognitive complaints were categorised solely in the clinical group. This classification acknowledges the interrelation between strong cognitive complaints and diagnosis status, as many disorders can face cognitive issues (Abramovitch et al., 2021; Nolen-Hoeksema & Watkins, 2011; Snyder et al., 2015). Additionally, participants who indicated being a therapist and having an official diagnosis or strong cognitive complaints were categorised as therapists, as their medical expertise is expected to influence their perspective (Deverka et al., 2012).

Statistical method

To test the three hypotheses, t-tests with a critical value of 50 were conducted to assess whether the acceptability levels, measured through of perceived usefulness, perceived ease-of-use and behavioural intention, were significantly higher than 50.

The dataset was tested for univariate outliers. Consistent with common practice in psychology research (Leys et al., 2019), a threshold of 3 standard deviations from the mean was first used to identify outliers. No outliers were found using this criterion. Although a few outliers were observed using less conservative cutoff points of 2 or 2.5 standard deviations, with a maximum z-score of 2.04, they were deemed legitimate within the sample and distribution and were not excluded. Even though a t-test analysis is sensitive to outliers, removing them could corrupt the conclusions (Leys et al., 2019). While no outliers were detected across the entire dataset, further examination by condition revealed potential outliers. To minimise the risk of Type I errors, data were analysed without division by condition following André's recommendations (2022).

To test the assumption of normality, normality for perceived usefulness, perceived ease-of-use and behavioural intention for each stakeholder group is assessed. Shapiro-Wilk tests revealed significant p-values, ranging from $p < .001$ to $p = .80$ (see Table B1 to B4). Despite these results indicating violations of normality, the t-tests were conducted. This decision is supported by the Central Limit Theorem (Rencher, 2002), which states that for large samples ($N \geq 30$), the sampling distribution of the mean is approximately normal, even if the underlying data distribution is not. Therefore, given the large sample size in this study, the assumption of normality is considered reasonable for conducting the one sample t-test analyses.

Exploratory Analysis

To provide additional insights into the data and examine differences between stakeholder groups, an exploratory analysis was conducted. To ensure comprehensiveness and accuracy, the four independent variables were consolidated into a single categorical variable comprising six distinct levels and allowing each participant to be exclusively assigned to one group. These categories include the healthy population, therapists, therapists with an official

diagnosis, therapists with strong cognitive complaints, individuals with an official diagnosis and individuals with strong cognitive complaints. Participants presenting both a diagnosis and strong cognitive complaints were categorised solely under the diagnosis group, while therapists with both strong cognitive complaints and a diagnosis were classified under the therapists with a diagnosis group. This approach not only enhances the precision of the analysis but also ensures that we do not overlook the nuanced experiences of participants, particularly therapists who bring both their expertise and their personal health experiences to the study. To assess differences among groups a nonparametric Kruskal Wallis test was performed, which is not sensitive to deviations from normality and homogeneity of variances. Furthermore, to test the influence of outliers on the analysis, the Kruskal Wallis test was also conducted with the exclusion of outliers with a z-score of ≥2 in perceived usefulness, perceived ease-of-use or behavioural intention. Following André's recommendations (2022), outliers were assessed over across the entire dataset rather than per stakeholder group to avoid increasing the risk of Type I errors. Using this cutoff point, 7 participants were excluded from this part of the analysis.

Results

Demographics Stakeholder Groups

The stakeholder group of 80 therapists (17 men, 61 women, and 2 others) had an age range of 19 to 79 (Mdn=38, SD=16.18). Predominantly from the Netherlands (33.8%), followed by France (27.5%) and Germany (17.5%)). Employment-wise, 38.8% were full-time employed, 26.3% were (working) students, 17.5% part-time employed, 10% self-employed and with the rest categorised differently.

The clinical group consisted of 51 participants (8 men, 38 women, and 5 others), aged 18 to 60 (Mdn= 21, SD= 9.55). Mostly from the Netherlands (78.4%) and student (72.5%) and varied employment statuses among the rest.

The subclinical group comprised 151 participants (26 men, 123 women, and 2 others), aged 18 to 61 (Mdn= 19, SD=6.48). Primarily from the Netherlands (86.1%), with a large proportion of (working) students (79.5%).

The healthy population consisted of 237 participants (63 men, 173 women, and 1 other), aged 18 to 86 (Mdn= 20, SD= 11.45). Mainly form the Netherlands (75.9%), with a substantial student population (79.7%) and diverse employment statuses.

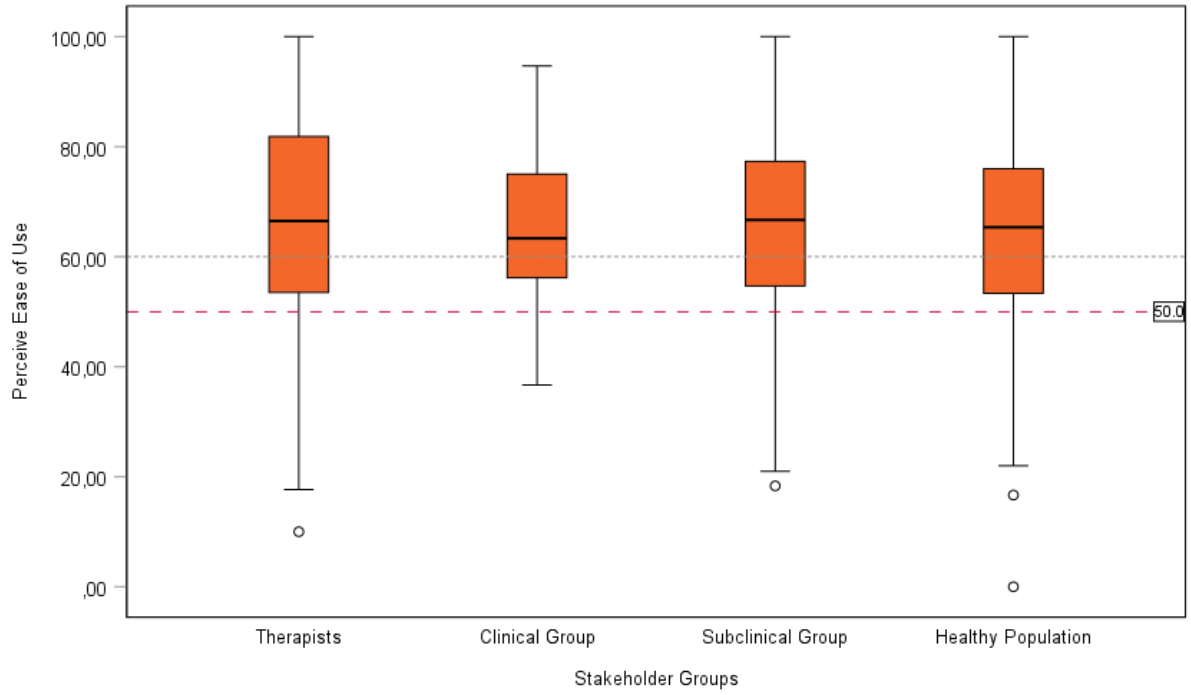
For more elaborate details of the descriptives of the stakeholder groups, see Table C1 and C2.

Results H1 to H3

One-sample t-tests were conducted to determine whether the perceived ease-of-use, perceived usefulness and behavioural intention scores for each stakeholder group were significantly higher than the critical value of 50. See Table D1 to D3 for the full details of the analysis. Moreover, see Figure 1.1 to 1.3 for the boxplots for acceptability levels across stakeholder groups to illustrate data distribution.

Figure 1.1

Boxplot Perceived Ease-of-Use per Stakeholder Group



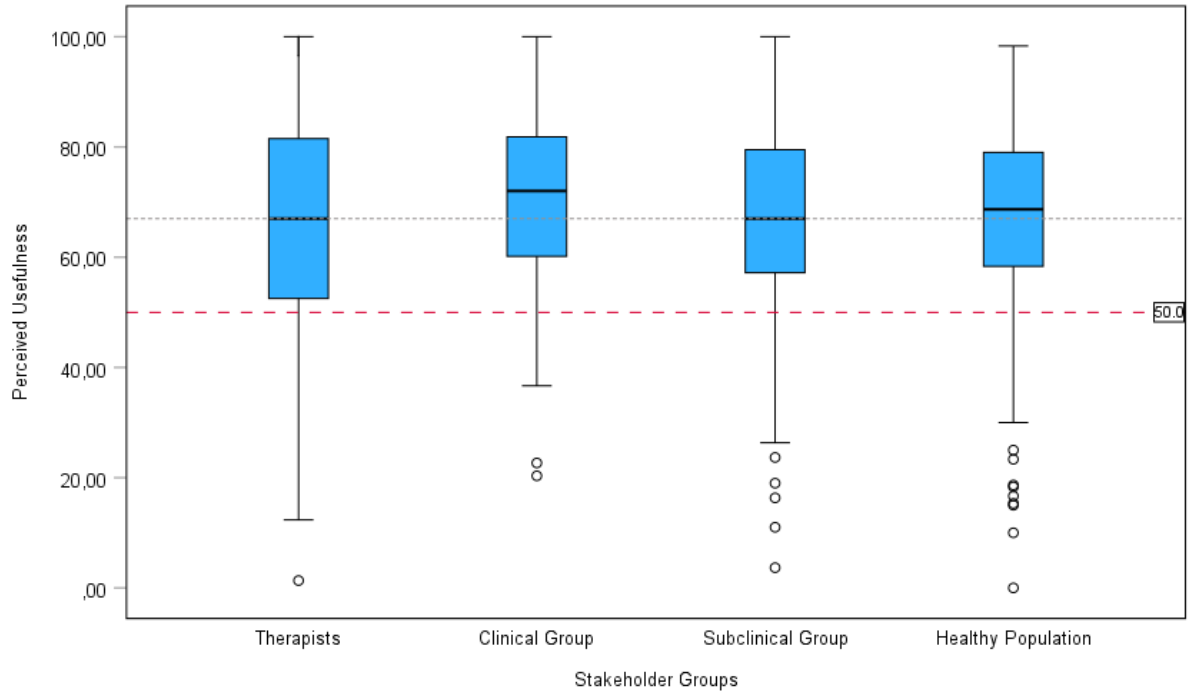
Note. The red dashed line represents the critical value of 50. The grey finely dashed line is the Mean of perceived ease-of-use (M= 65.57, SD= 16.91) across all stakeholder groups.

Results H1 Perceived Ease-of-Use Scores

The mean perceived ease-of-use scores were significantly higher than 50 for all stakeholder groups, all indicating a large effect. For therapists, the mean score (M= 67.34, SD= 19.53) yielded a t-value of t(79)= 7.94, $p < .001$, with an effect size of Cohen's d= 1.13 (95% CI [.77,1.47]). Similarly, the clinical group (M= 65.84, SD= 14.08) and the subclinical group (M= 65.68, SD= 17.17) also exhibited significantly higher mean perceived ease-of-use scores, with t-scores of t(50)= 8.03, $p < .001$ and t(150)= 11.23, $p < .001$ and effect sizes of Cohen's d= .89 (95% CI [.63,1.15]) and Cohen's d= .91 (95% CI [.72,1.1]), respectively. For the healthy population the mean perceived ease-of-use score (M= 64.83, SD= 16.41) yielded a t-value of t(236)= 13.92, $p < .001$, and an effect size of Cohen's d= 0.9 (95% CI [.75,1.06]).

Figure 1.2

Boxplots Perceived Usefulness per Stakeholder Group



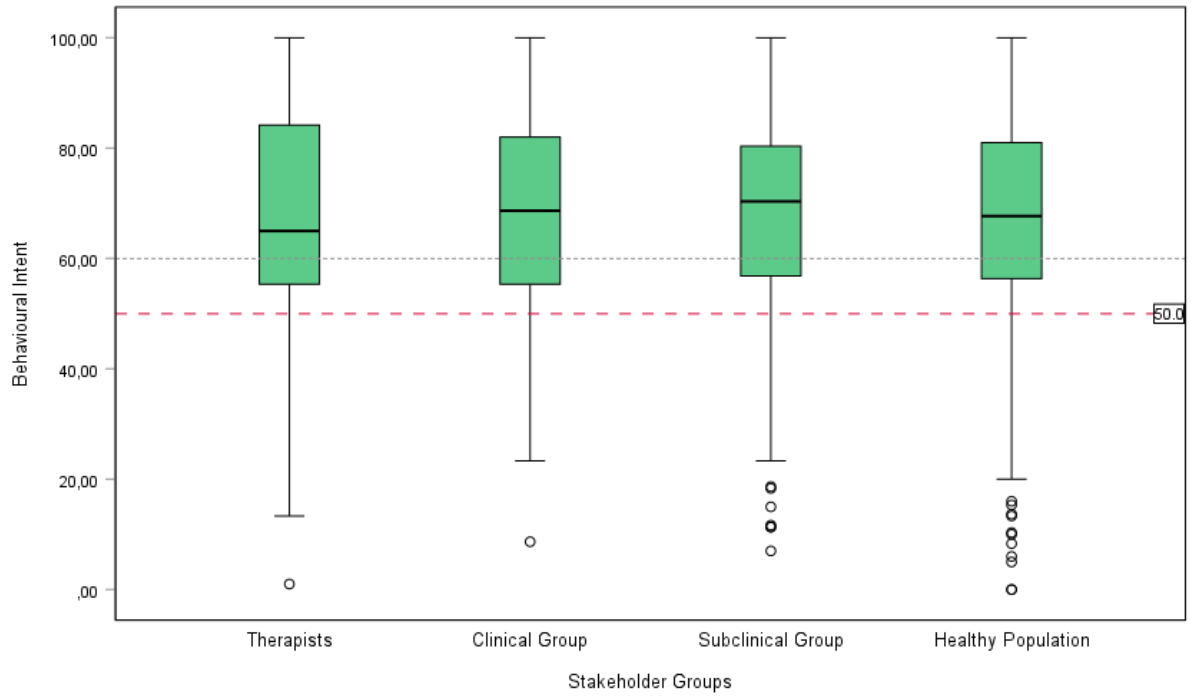
Note. The red dashed line represents the critical value of 50. The grey finely dashed line is the Mean of perceived usefulness (M= 66.98, SD= 18.6) across all stakeholder groups.

Results H2 Perceived Usefulness Scores

All stakeholder groups demonstrated significantly higher mean perceived usefulness scores than 50, all indicating a large effect. For therapists, the mean perceived usefulness score (M= 66.19, SD= 20.85) yielded a t-value of t(79)= 6.95, $p < .001$, with an effect size of Cohen's d= .78 (95% CI [.52,1.03]). The clinical group (M= 69.05, SD= 17.49) and the subclinical group (M= 66.04, SD= 18.43) also showed significantly higher mean perceived usefulness scores, with t-values of t(50)= 7.78, $p < .001$ and t(150)= 10.7, $p < .001$ and effect sizes of Cohen's d= 1.09 (95% CI [.74,1.43]) and Cohen's d= .87 (95% CI [.68,1.06]), respectively. For the healthy population, the mean perceived usefulness score (M= 67.41, SD= 18.2) yielded a t-value of t(236)= 14.73, $p < .001$ and an effect size of Cohen's d= .96 (95% CI [.8,1.11]).

Figure 1.3

Boxplots Behavioural Intention per Stakeholder Group



Note. The red dashed line represents the critical value of 50. The grey finely dashed line is the Mean of BI (M= 66.07, SD= 21.08) across all stakeholder groups.

Results H3 Behavioural Intention Scores

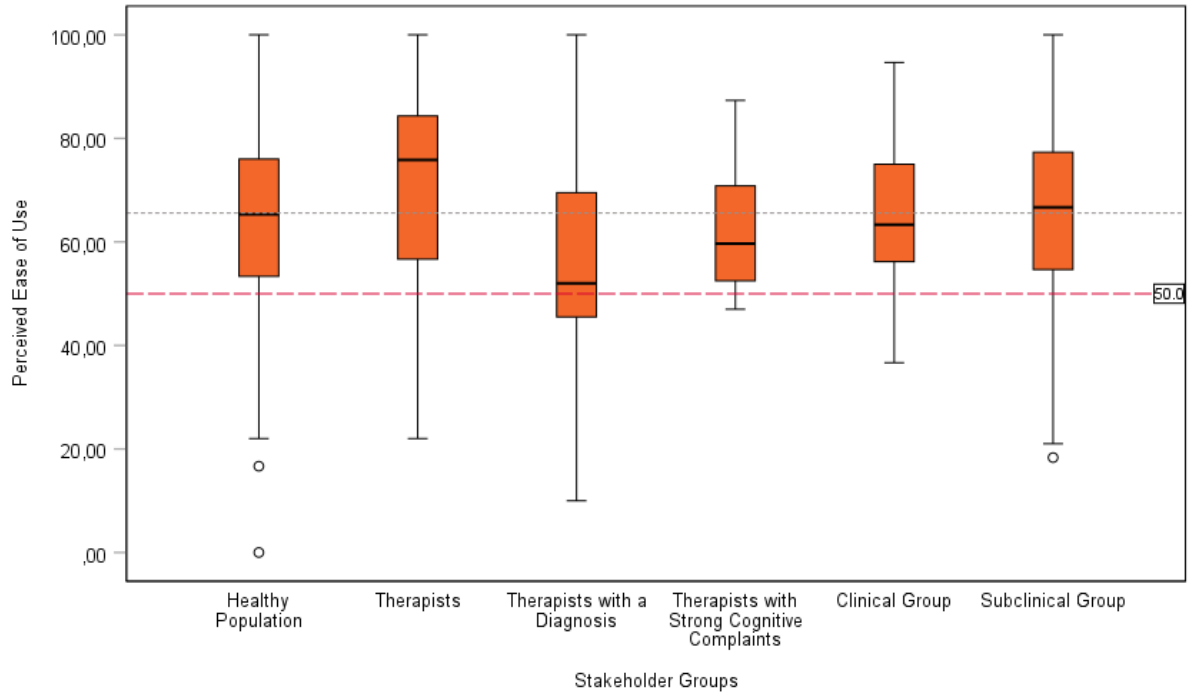
Significantly higher mean behavioural intention scores were observed for all stakeholder groups compared to 50, all with a large effect except for the healthy population where the effect is medium to large. For therapists, the mean behavioural intention score (M= 67.74, SD= 20.5) yielded a t-value of t(79)= 7.74, p < .001, with an effect size of Cohen's d= .87 (95% CI [.61,1.12]). Similarly, the clinical group (M= 68.22, SD= 19.62) and the subclinical group (M= 66.08, SD= 20.69) exhibited significantly higher mean behavioural intention scores, with t-values of t(50)= 6.63, p < .001 and t(150)= 9.55, p < .001, and effect sizes of Cohen's d= .93 (95% CI [.56,1.26]) and Cohen's d= .78 (95% CI [.59,.96]), respectively. For the healthy population, the mean behavioural intention score (M= 65.03, SD= 21.86) yielded a t-value of t(236)= 10.58, p < .001and an effect size of Cohen's d= 0.69 (95% CI [.55,.83]).

Exploratory Analysis

To provide additional insights into the data, an exploratory analysis using a nonparametric Kruskal Wallis test was performed. This test investigated the differences in levels of acceptability between the six stakeholder groups, see Table E1 for the detailed descriptives of these groups. The Kruskal Wallis test revealed non-significant differences in perceived usefulness ($H(5) = 6.243$, $p = .283$) and behavioural intention ($H(5) = 7.66$, $p = .176$) among the six groups. However, significant differences were found in perceived ease-of-use ($H(5) = 11.414$, $p = .44$) among these groups. See Figure 2.1 to 2.3 for the boxplots for acceptability levels across stakeholder groups to illustrate data distribution.

Figure 2.1

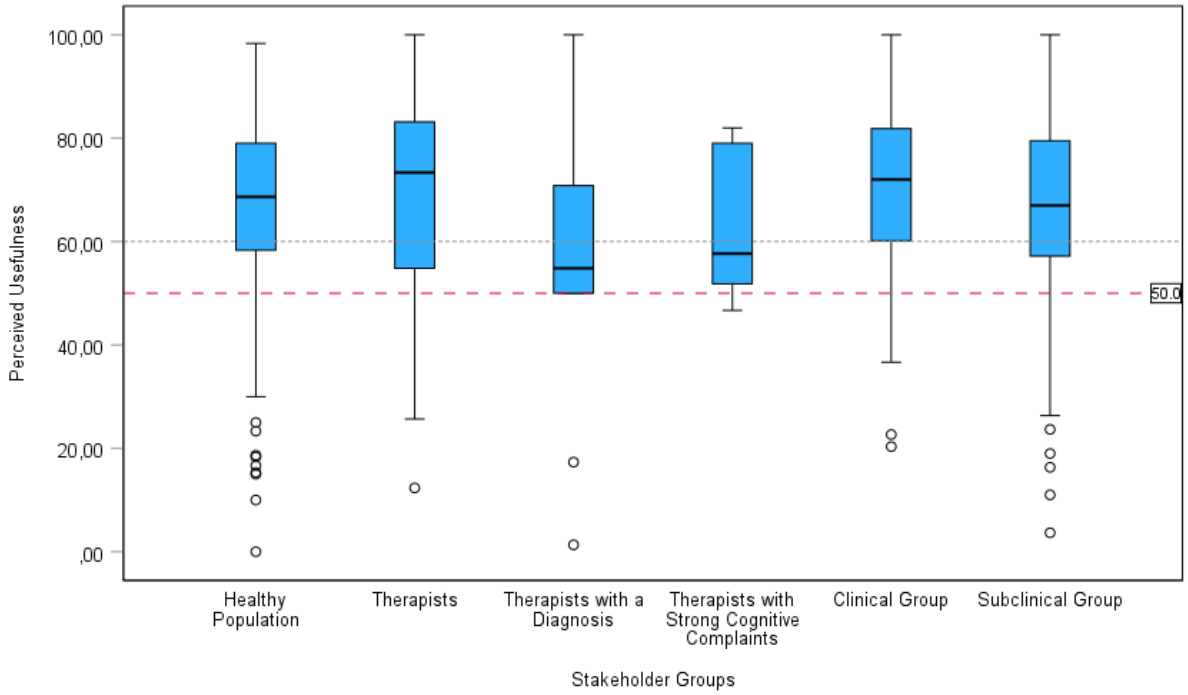
Boxplots Perceived Ease-of-Use Exploratory Analysis



Note. The red dashed line represents the critical value of 50. The grey finely dashed line is the Mean of perceived ease-of-use (M= 65.57, SD= 16.91) across all stakeholder groups.

Figure 2.2

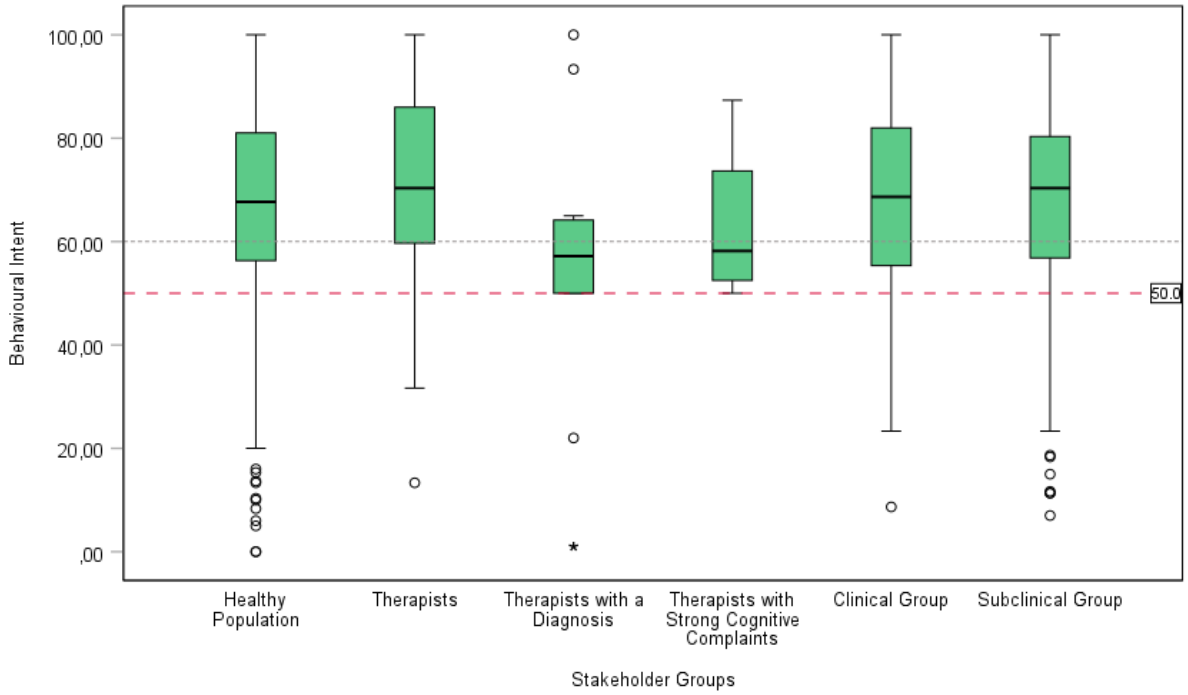
Boxplots Perceived Usefulness Exploratory Analysis



Note. The red dashed line represents the critical value of 50. The grey finely dashed line is the Mean of perceived usefulness (M= 66.98, SD= 18.6) across all stakeholder groups.

Figure 2.3

Boxplots Behavioural Intention Exploratory Analysis



Note. The red dashed line represents the critical value of 50. The grey finely dashed line is the

Mean of BI (M= 66.07, SD= 21.08) across all stakeholder groups. The outlier defined by a star shape is considered an extreme outlier.

Following Dunn's test, significant differences were observed between:

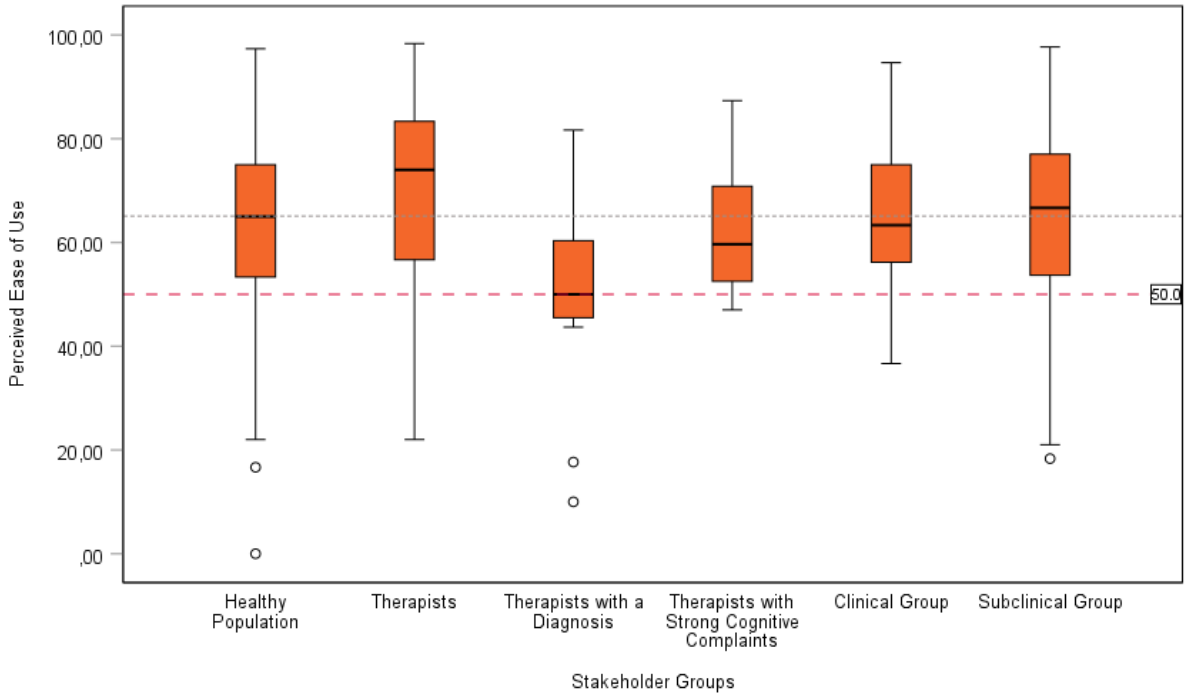
- Therapists with a diagnosis and individuals with strong cognitive complaints (p=.05),
- Therapists with a diagnosis and therapists (p=.005),
- The healthy population and therapists (p=.012).

More conservatively, after applying the Bonferroni corrections, none of the pairwise comparisons remained significant with a p-value for each pair between p= .078 and p= 1. See Table E2 to E6 for the full details of the Kruskal Wallis test.

The Kruskal Wallis test was conducted again excluding outliers. See Table E7 for the descriptives without outliers. The Kruskal Wallis test revealed non-significant differences in perceived usefulness (H(5) = 7.977, p = .158) and behavioural intention (H (5) = 9.115, p = .105) among the six groups. Again, significant differences were found in perceived ease-of-use (H (5) = 12.810, p = .025) among these groups. See Figure 3.1 to 3.3 for the boxplots for acceptability levels across stakeholder groups to illustrate data distribution.

Figure 3.1

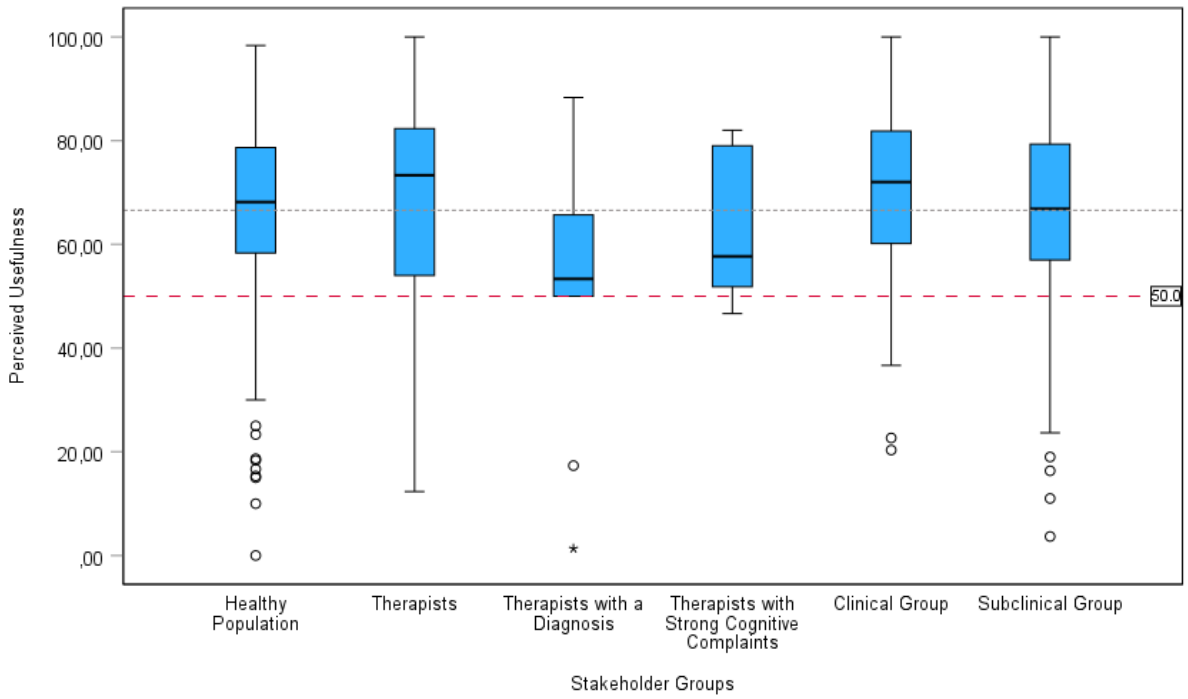
Boxplots Perceived Ease-of-Use Exploratory Analysis Without Outliers



Note. The red dashed line represents the critical value of 50. The grey finely dashed line is the Mean of perceived ease-of-use (M= 65.57, SD= 16.91) across all stakeholder groups.

Figure 3.2

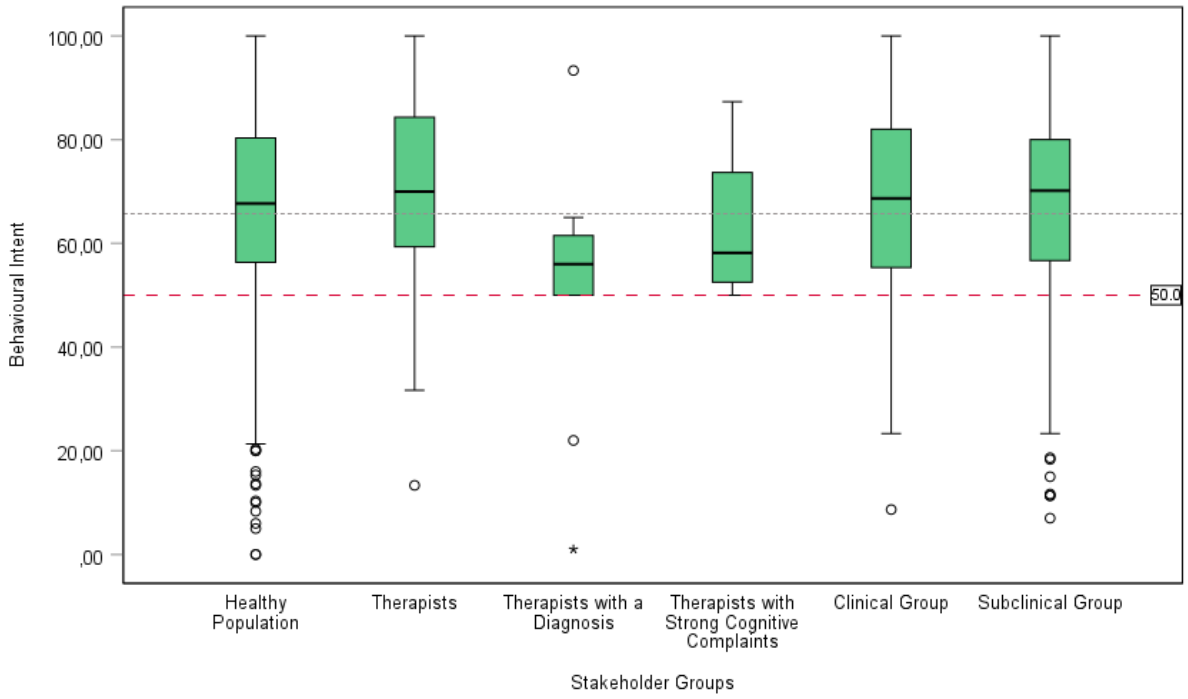
Boxplots Perceived Usefulness Exploratory Analysis Without Outliers



Note. The red dashed line represents the critical value of 50. The grey finely dashed line is the Mean of perceived usefulness (M= 66.98, SD= 18.6) across all stakeholder groups. The outlier defined by a star shape is considered an extreme outlier.

Figure 3.3

Boxplots Behavioural Intention Exploratory Analysis Without Outliers



Note. The red dashed line represents the critical value of 50. The grey finely dashed line is the Mean of BI (M= 66.07, SD= 21.08) across all stakeholder groups. The outlier defined by a star shape is considered an extreme outlier.

Following Dunn's test, significant differences were observed between:

- Therapists with a diagnosis and the healthy population (p=.022),
- Therapists with a diagnosis and individuals with a diagnosis (p=.025),
- Therapists with a diagnosis and therapists with strong cognitive complaints (p=.011)
- Therapists and the healthy population (p=.021),
- Therapists with a diagnosis and therapists (p=.001).

More conservatively, after applying the Bonferroni corrections almost all the pairwise comparisons became non-significant with a p value between p= .166 and p= 1, except for the difference between therapists with a diagnosis and therapist (p= .021) which remained significant (see Table 2). See Table E8 to E12 for the full detailed analysis.

Discussion

Findings

The present study aimed to investigate the acceptability of a neurofeedback learning companion with a questionnaire methodology among different stakeholder groups, including therapists, individuals with a (sub)clinical diagnosis, and a healthy population. Overall, our findings revealed consistently high levels of perceived ease-of-use (M= 65.57, SD= 16.91), perceived usefulness (M= 66.98, SD= 18.6) and behavioural intention (M= 66.07, SD= 21.08), measured on a scale from 0 to 100, across all stakeholder groups.

In the primary analysis, all stakeholder groups demonstrated significantly higher mean scores for perceived ease-of-use than the critical value of 50, suggesting an expectation of ease and minimal effort in engaging with the neurofeedback learning companion (Grevet et al., 2023). During the exploratory analysis, further refinement was made by subdividing the therapist group in three categories based on having an official diagnosis or cognitive complaints next to the initial groups. Comparisons of mean perceived ease-of-use scores among these refined groups revealed minimal differences, with most stakeholder groups showing similar perceptions of ease-of-use. However, therapists with a diagnosis exhibited a less favourable perception of the neurofeedback learning companion’s ease-of-use (M=50.18, SD= 21.75) compared to multiple other groups. Moreover, there seems to be some moderately significant differences between the healthy population and therapist group, but it seems less prominent as this significance does not hold after a Bonferroni correction.

Similarly, mean perceived usefulness scores were consistently significantly above 50 for all stakeholder groups, indicating a widespread recognition of the neurofeedback learning companion's usefulness in neurofeedback training. This reflects that participants believe that incorporating a neurofeedback learning companion would enhance their performance or help them achieve better outcomes (Grevet et al., 2023). In the exploratory analysis no significant differences among stakeholder groups were found, indicating all groups have similar expectations regarding perceived usefulness.

Mean behavioural intention scores mirrored the trends observed in perceived ease-of-use and perceived usefulness, with all stakeholder groups exhibiting significantly higher mean behavioural intention scores than the critical value of 50. This suggests a strong willingness among participants in all groups to try neurofeedback training with the addition of a neurofeedback learning companion (Grevet et al., 2023). In the exploratory analysis no significant differences among stakeholder groups were found, indicating all groups have similar expectations regarding behavioural intention.

Overall, the results of this study highlight the extensive acceptability of the neurofeedback learning companion among diverse stakeholder groups. High acceptability among therapists is important due to their medical knowledge or expertise in the field and the necessity for their willingness to utilise neurofeedback training with a neurofeedback learning companion for its practical relevance (Deverka et al., 2012; Gadke et al., 2021) . Considering that neurofeedback training can be used to enhance cognitive function and clinical symptoms (Cai et al., 2021; Enriquez-Geppert et al., 2014; Smit et al., 2023), the high acceptability of the neurofeedback learning companion among the clinical and subclinical group is essential, as these are the individuals who may benefit the most from such training. In the context of a feasibility study, where user acceptability is a crucial determinant of success in the development of technology (Gadke et al., 2021; Tickle-Degnen, 2013), the significantly high

levels of acceptability underscore the potential viability of integrating a neurofeedback learning companion. Such positive reception indicates a promising avenue for further exploration and development within the field of neurofeedback training.

General Perception of the Neurofeedback Learning Companion

The high levels of perceived ease-of-use observed in our study may partially stem from the perception of a BCI, or in this case a neurofeedback learning companion, as a form of toy, as noted by Grevet et al. (2023). However, it's important to note that this perception is not necessarily problematic. Research in other medical fields suggests that playfulness and gamification can enhance patients' compliance, motivation and engagement in health interventions (Korn & Tietz, 2017; Ron-Angevin & Díaz-Estrella, 2009; Sriwatanathamma et al., 2023). Therefore, the positive attitudes toward the neurofeedback learning companion may be indicative of its potential effectiveness as a therapeutic toll, particularly in engaging individuals who might otherwise view neurofeedback training with scepticism or disinterest.

Limitations

Several limitations should be considered when interpreting the findings of this study. Firstly, the use of a convenience sample may limit the generalizability of the results to broader populations. Convenience sampling may introduce selection biases and may not adequately represent the diversity of the target population (Golzar et al., 2022). Despite efforts to recruit a diverse group of participants the predominance of students in the sample may further restrict the generalizability of the findings.

Furthermore, the unequal distribution of participants across stakeholder groups poses methodological challenges. Differences in sample sizes among groups can undermine the statistical power of analyses, as power is significantly influenced by factors as equality of sample sizes and variability within the sample (Rusticus & Lovato, 2019). These factors, in turn, may impact the reliability of the results. However, in multiple one-sample t-tests,

equality of variances is less critical since each test compares a single sample mean to a critical value, though it can still affect the test's power (Rusticus & Lovato, 2019). In the exploratory analysis, efforts were made to address this issue through statistical analyses, such as employing Bonferroni corrections for unequal sample sizes, but the precision and accuracy of the statistical analyses could still be influenced.

Moreover, focusing on the exploratory analysis, some outliers were removed. However, it is important to keep in mind that removing outliers without a good cause could corrupt the conclusions (Leys et al., 2019). Given that the data were collected in real-world settings, outliers should not be removed mindlessly, as it is reasonable to expect some variation in the levels of acceptability among individuals, making the presence of outliers a natural occurrence. Additionally, the limited sample size of the therapists with a diagnosis group (N= 12) raises concerns regarding its representativeness of the broader population, with observed differences possibly attributable to random variation (Tipton et al., 2017). Nonetheless, the found significant difference for therapists with a diagnosis may prompt further exploration into the attitudes of therapists with a diagnosis toward incorporating a neurofeedback learning companion into neurofeedback training, with deeper investigation into underlying motivations.

Considering the selection of the critical value of 50, it was chosen due to its positioning midway between the endpoints of the scale 0 and 100. However, the determination of this value lacked empirical substantiation, as existing literature does not offer conclusive evidence regarding the optimal threshold for acceptability in feasibility studies. The designation of 50 as the critical threshold, interpreted as medium acceptability considering its equidistance from both negative and positive extremes, may not necessarily align with the desired outcome. It remains plausible that only feasibility studies reporting markedly higher acceptability scores would warrant proceeding to the next stages of

development. The acceptability levels observed in this study, ranging from 65.57 to 66.98, remain below 70. While indicative of general acceptability, it may prompt consideration regarding whether higher thresholds are necessary for robust feasibility studies. Having better empirical evidence on an optimal threshold for acceptability would make it easier to determine when to proceed to the next stages of development.

Familiarity with Neurofeedback Training

An additional consideration pertains to participant's familiarity with neurofeedback technology, as most individuals in the study (71,5%) lacked prior experience with neurofeedback. This unfamiliarity may have influenced participant's perceptions and acceptability ratings. Although participants were provided with explanatory material on the basic principles of neurofeedback and underwent a quiz to assess comprehension, our study still required them to envision the process of undergoing neurofeedback training and imagine the potential modifications that a neurofeedback learning companion could bring to this experience. This dual imagination task may raise questions about the construct validity of our measurements, as participants were asked to project their perceptions onto an imaginary scenario. Such a task could introduce biases in participant's levels of acceptability, as their envisioned perceptions might diverge from the reality of undergoing neurofeedback training. Participants may not possess accurate insights into the intricacies of neurofeedback training, nor may they fully grasp the impact that a neurofeedback learning companion could exert on these aspects. Therefore, the validity of our measurements regarding acceptability factors may be subject to scrutiny.

Furthermore, the familiarity or expertise of the therapists in this sample is also an important consideration. Including therapists is commonly seen as important due to their more in depth knowledge about the proposed intervention (Deverka et al., 2012). However, the therapists in this sample might not be fully representative as only 27.5% include

neurofeedback in their practice. While a high degree of expertise can be expected when a therapist uses neurofeedback in their practice, the degree of expertise was not thoroughly investigated in this study. This makes it difficult to assess the depth of knowledge of the other therapists about neurofeedback based solely on whether they had heard of it (76.3%) or have undergone a neurofeedback training session (26.3%).

Future Directions

Building on the findings of this study, several futures research avenues can be pursued to further investigate the development and implementation of the neurofeedback learning companion. More comprehensive acceptability studies are needed to consider the role of familiarity with neurofeedback training, given that most participants in this study were unfamiliar with it. Future research could focus on evaluating acceptability levels among individuals who have already undergone standard neurofeedback training and therapists who implement neurofeedback training into their practice. This approach would eliminate the dual imagination task and promote reliable expert knowledge, providing more accurate insights into the specific impact of incorporating a neurofeedback learning companion.

Considering the somewhat arbitrary nature of the chosen critical value and the observed acceptability levels remaining below 70, future research could also develop a questionnaire to increase acceptability levels. By actively soliciting feedback from stakeholders, insights can be gained into specific aspects that may influence acceptability factors. This could help to identify areas for improvement before progressing to subsequent stages of the development of the neurofeedback learning companion.

After more comprehensive acceptability studies, future endeavours could also continue to investigate whether the promising results reported by Pillette et al. (2020) regarding their integration of a learning companion into BCI could be translated to neurofeedback training. The next phase of research should focus on the other aspects of feasibility studies,

encompassing among other things the design procedures, practicality, integration, effectiveness and generalizability (Gadke et al., 2021). Drawing inspiration from the work of Pillette et al. (2020), who explored physical characteristic preferences for a BCI learning companion, subsequent investigations could explore whether similar preferences translate to the context of a neurofeedback learning companion. During the design phase careful attention should be given to feedback modalities - such as visual, auditory or multimodal feedback - and timing, as these factors play an important role in shaping user experiences and outcomes and best feedback practices might vary among individuals (Jeunet et al., 2016; Pillette, 2019). Subsequent randomized controlled trials could then evaluate the effectiveness and efficacy of the neurofeedback learning companion in laboratory settings (Gadke et al., 2021), shedding further light on its potential therapeutic effects.

Conclusion

In conclusion, this study explored the acceptability of a neurofeedback learning companion among diverse stakeholder groups, revealing consistently high levels of perceived ease-of-use, perceived usefulness and behavioural intention. These promising findings underscore the potential viability of integrating a neurofeedback learning companion into neurofeedback training, particularly given its broad acceptability among therapists and individuals with a clinical diagnosis or cognitive complaints. Despite some limitations, this study provides a valuable foundation for future research. Moving forward, efforts to increase acceptability levels through comprehensive studies and questionnaires could enhance the feasibility and effectiveness of the neurofeedback learning companion. Subsequent investigations should focus on further exploring the integration of the learning companion into neurofeedback training, considering factors such as design procedures, feedback modalities, and effectiveness in randomised controlled trials. By addressing these areas, future research has the potential to advance our understanding of neurofeedback training and

contribute to the development of a neurofeedback learning companion for the enhancement of cognitive functions.

References

Abramovitch, A., Short, T., & Schweiger, A. (2021). The C Factor: Cognitive dysfunction as a transdiagnostic dimension in psychopathology. *Clinical Psychology Review, 86*, 102007. https://doi.org/10.1016/j.cpr.2021.102007

Alexandre, B., Reynaud, E., Osiurak, F., & Navarro, J. (2018). Acceptance and acceptability criteria: A literature review. *Cognition, Technology & Work, 20*(2), 165–177. https://doi.org/10.1007/s10111-018-0459-1

Alkoby, O., Abu-Rmileh, A., Shriki, O., & Todder, D. (2018). Can We Predict Who Will Respond to Neurofeedback? A Review of the Inefficacy Problem and Existing Predictors for Successful EEG Neurofeedback Learning. *Neuroscience, 378*, 155–164. https://doi.org/10.1016/j.neuroscience.2016.12.050

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders.* (5th ed.). https://doi.org/10.1176/appi.books.978089042559

André, Q. (2022). Outlier exclusion procedures must be blind to the researcher's hypothesis. *Journal of Experimental Psychology: General*, *151*(1), 213–223. https://doi.org/10.1037/xge0001069

Banich, M. T. (2009). Executive Function: The Search for an Integrated Account. *Current Directions in Psychological Science, 18*(2), 89–94. https://doi.org/10.1111/j.1467-8721.2009.01615.x

Barcenilla, J., & Bastien, C. (2010). L'acceptabilité des nouvelles technologies: Quelles relations avec l'ergonomie, l'utilisabilité et l'expérience utilisateur ?: *Le travail humain, Vol. 72*(4), 311–331. https://doi.org/10.3917/th.724.0311

Beck, T. W. (2013). The Importance of A Priori Sample Size Estimation in Strength and Conditioning Research. *Journal of Strength and Conditioning Research*, *27*(8), 2323–2337. https://doi.org/10.1519/JSC.0b013e318278eea0

Benet-Martínez, V., & John, O. P. (1998). Los Cinco Grandes across cultures and ethnic groups: Multitrait-multimethod analyses of the Big Five in Spanish and English. *Journal of Personality and Social Psychology*, *75*(3), 729–750. https://doi.org/10.1037/0022-3514.75.3.729

Cai, H., Zhang, Y., Xiao, H., Zhang, J., Hu, B., & Hu, X. (2021). An Adaptive Neurofeedback Method for Attention Regulation Based on the Internet of Things. *IEEE Internet of Things Journal*, *8*(21), 15829–15838. https://doi.org/10.1109/JIOT.2021.3083745

Chaplin, W. F., John, O. P., & Goldberg, L. R. (1988). Conceptions of States and Traits: Dimensional Attributes With Ideals as Prototypes. *Journal of Personality and Social Psychology*, *Vol. 54, No. 4*, 541–557. https://doi-org/10.1037/0022-3514.54.4.541

Chou, C.-Y., Chan, T.-W., & Lin, C.-J. (2003). Redefining the learning companion: The past, present, and future of educational agents. *Computers & Education*, *40*(3), 255–269. https://doi.org/10.1016/S0360-1315(02)00130-6

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2. ed., reprint). Psychology Press.

Concannon, T. W., Meissner, P., Grunbaum, J. A., McElwee, N., Guise, J.-M., Santa, J., Conway, P. H., Daudelin, D., Morrato, E. H., & Leslie, L. K. (2012). A New Taxonomy for Stakeholder Engagement in Patient-Centered Outcomes Research. *Journal of General Internal Medicine*, *27*(8), 985–991. https://doi.org/10.1007/s11606-012-2037-1

Denissen, J. J. A., Geenen, R., Van Aken, M. A. G., Gosling, S. D., & Potter, J. (2008). Development and Validation of a Dutch Translation of the Big Five Inventory (BFI). *Journal of Personality Assessment*, *90*(2), 152–157. https://doi.org/10.1080/00223890701845229

Deverka, P. A., Lavallee, D. C., Desai, P. J., Esmail, L. C., Ramsey, S. D., Veenstra, D. L., & Tunis, S. R. (2012). Stakeholder participation in comparative effectiveness research: Defining a framework for effective engagement. *Journal of Comparative Effectiveness Research*, *1*(2), 181–194. https://doi.org/10.2217/cer.12.7

Diamond, A. (2013). Executive Functions. *Annual Review of Psychology*, *64*(1), 135–168. https://doi.org/10.1146/annurev-psych-113011-143750

Enriquez-Geppert, S., Huster, R. J., & Herrmann, C. S. (2017). EEG-Neurofeedback as a Tool to Modulate Cognition and Behavior: A Review Tutorial. *Frontiers in Human Neuroscience*, *11*. https://doi.org/10.3389/fnhum.2017.00051

Faul, F., Erdfelder, E., Buchner, A., & Lang, A.-G. (2017). *G*Power Version 3.1.9.2.* [Computer software]. Universität Kiel, Germany: Heinrich-Heine-Universität Düsseldorf.

Enriquez-Geppert, S., Huster, R. J., Scharfenort, R., Mokom, Z. N., Zimmermann, J., & Herrmann, C. S. (2014). Modulation of frontal-midline theta by neurofeedback. *Biological Psychology*, *95*, 59–69. https://doi.org/10.1016/j.biopsycho.2013.02.019

Février, F. (2011). *Vers un modèle intégrateur ' ' expérience-acceptation ' ': Rôle des affects et de caractéristiques personnelles et contextuelles dans la détermination des intentions d'usage d'un environnement numérique de travail*.

Friedman, N. P., & Miyake, A. (2017). Unity and diversity of executive functions: Individual differences as a window on cognitive structure. *Cortex*, *86*, 186–204. https://doi.org/10.1016/j.cortex.2016.04.023

Gadke, D. L., Kratochwill, T. R., & Gettinger, M. (2021). Incorporating feasibility protocols in intervention research. *Journal of School Psychology*, *84*, 1–18. https://doi.org/10.1016/j.jsp.2020.11.004

Gloster, A. T., Rinner, M. T. B., Ioannou, M., Villanueva, J., Block, V. J., Ferrari, G., Benoy, C., Bader, K., & Karekla, M. (2020). Treating treatment non-responders: A meta-analysis of randomized controlled psychotherapy trials. *Clinical Psychology Review*, *75*, 101810. https://doi.org/10.1016/j.cpr.2019.101810

Golzar, J., Noor, S., & Tajik, O. (2022). Convenience Sampling. *International Journal of Education Language Studies*, *1*(2). https://doi.org/10.22034/ijels.2022.162981

Grevet, E., Forge, K., Tadiello, S., Izac, M., Amadieu, F., Brunel, L., Pillette, L., Py, J., Gasq, D., & Jeunet-Kelway, C. (2023). Modeling the acceptability of BCIs for motor rehabilitation after stroke: A large scale study on the general public. *Frontiers in Neuroergonomics*, *3*, 1082901. https://doi.org/10.3389/fnrgo.2022.1082901

Handley, T. E., Kay-Lambkin, F. J., Inder, K. J., Attia, J. R., Lewin, T. J., & Kelly, B. J. (2014). Feasibility of internet-delivered mental health treatments for rural populations. *Social Psychiatry and Psychiatric Epidemiology*, *49*(2), 275–282. https://doi.org/10.1007/s00127-013-0708-9

Huffman, J. C., DuBois, C. M., Healy, B. C., Boehm, J. K., Kashdan, T. B., Celano, C. M., Denninger, J. W., & Lyubomirsky, S. (2014). Feasibility and utility of positive psychology exercises for suicidal inpatients. *General Hospital Psychiatry*, *36*(1), 88–94. https://doi.org/10.1016/j.genhosppsych.2013.10.006

Jeunet, C., N'Kaoua, B., & Lotte, F. (2016). Advances in user-training for mental-imagery-based BCI control. In *Progress in Brain Research* (Vol. 228, pp. 3–35). Elsevier. https://doi.org/10.1016/bs.pbr.2016.04.002

John, O. P., Donahue, E. M., & Kentle, R. L. (1991). *The Big Five Inventory – versions 4a and 5*. Berkeley: University of California, Berkeley, Institute of Personality and Social Research.

John, O. P., & Srivastava, S. (1999). The Big-Five Trait Taxonomy: History, Measurement, and Theoretical Perspectives. *In L.A. Pervin & O.P. John (Eds.) Handbook of Personality: Theory and Research*, (pp. 102-138).

Johnson, W. L., Friedland, L., Schrider, P. J., Valente, A., & Sheridan, S. (2011). The Virtual Cultural Awareness Trainer (VCAT): Joint Knowledge Online's (JKO's) Solution to the Individual Operational Culture and Language Training Gap. *In Proceedings of ITEC 2011. London: Clarion Events.*

Johnson, W. L., & Lester, J. C. (2018). Pedagogical Agents: Back to the Future. *AI Magazine*, *39*(2), 33–44. https://doi.org/10.1609/aimag.v39i2.2793

Kadosh, K. C., & Staunton, G. (2019). A systematic review of the psychological factors that influence neurofeedback learning outcomes. *NeuroImage*, *185*, 545–555. https://doi.org/10.1016/j.neuroimage.2018.10.021

Kim, Y., Baylor, A. L., & PALS Group. (2006). Pedagogical Agents as Learning Companions: The Role of Agent Competency and Type of Interaction. *Educational Technology Research and Development*, *54*(3), 223–243. https://doi.org/10.1007/s11423-006-8805-z

Korn, O., & Tietz, S. (2017). Strategies for Playful Design when Gamifying Rehabilitation: A Study on User Experience. *Proceedings of the 10th International Conference on PErvasive Technologies Related to Assistive Environments*, 209–214. https://doi.org/10.1145/3056540.3056550

Lang, F. R., Lüdtke, O., & Asendorpf, J. B. (2001). Testgüte und psychometrische Äquivalenz der deutschen Version des Big Five Inventory (BFI) bei jungen, mittelalten und alten Erwachsenen. *Diagnostica*, *47*(3), 111–121. https://doi.org/10.1026//0012-1924.47.3.111

Lester, J. C., Converse, S. A., Kahler, S. E., Barlow, S. T., Stone, B. A., & Bhogal, R. S. (1997). The persona effect: Affective impact of animated pedagogical agents. *Proceedings of the ACM SIGCHI Conference on Human Factors in Computing Systems*, 359–366. https://doi.org/10.1145/258549.258797

Leys, C., Delacre, M., Mora, Y. L., Lakens, D., & Ley, C. (2019). How to Classify, Detect, and Manage Univariate and Multivariate Outliers, With Emphasis on Pre-Registration. *International Review of Social Psychology*, *32*(1), 5. https://doi.org/10.5334/irsp.289

Lim, M. Y. (2012). Memory Models for Intelligent Social Companions. *Human-Computer Interaction*, *396*, 241–262.

Loriette, C., Ziane, C., & Ben Hamed, S. (2021). Neurofeedback for cognitive enhancement and intervention and brain plasticity. *Revue Neurologique*, *177*(9), 1133–1144. https://doi.org/10.1016/j.neurol.2021.08.004

Martínez-Miranda, J., Martínez, A., Ramos, R., Aguilar, H., Jiménez, L., Arias, H., Rosales, G., & Valencia, E. (2019). Assessment of users' acceptability of a mobile-based embodied conversational agent for the prevention and detection of suicidal behaviour. *Journal of Medical Systems*, *43*(8), 246. https://doi.org/10.1007/s10916-019-1387-1

Marzbani, H., Marateb, H., & Mansourian, M. (2016). Methodological Note: Neurofeedback: A Comprehensive Review on System Design, Methodology and Clinical Applications. *Basic and Clinical Neuroscience Journal*, *7*(2). https://doi.org/10.15412/J.BCN.03070208

Mohamed, S. M. H., Börger, N. A., Geuze, R. H., & Van Der Meere, J. J. (2019). Error monitoring and daily life executive functioning. *Experimental Brain Research*, *237*(9), 2217–2229. https://doi.org/10.1007/s00221-019-05589-w

Nijboer. (2010). The influence of psychological state and motivation on brain-computer interface performance in patients with amyotrophic lateral sclerosis—A longitudinal study. *Frontiers in Neuroscience*. https://doi.org/10.3389/fnins.2010.00055

Nolen-Hoeksema, S., & Watkins, E. R. (2011). A Heuristic for Developing Transdiagnostic Models of Psychopathology: Explaining Multifinality and Divergent Trajectories. *Perspectives on Psychological Science*, *6*(6), 589–609. https://doi.org/10.1177/1745691611419672

OpenAi. (2023). *ChatGPT (version 3.5).* [Computer Software]. https://openai.com/chatgpt

Pillette, L. (2019). Redefining and Adapting Feedback for Mental-Imagery based Brain-Computer Interface User Training to the Learners' Traits and States. *Université de Bordeaux*.

Pillette, L., Jeunet, C., Mansencal, B., N'Kambou, R., N'Kaoua, B., & Lotte, F. (2020). A physical learning companion for Mental-Imagery BCI User Training. *International Journal of Human-Computer Studies*, *136*, 102380. https://doi.org/10.1016/j.ijhcs.2019.102380

Plaisant, O., Courtois, R., Réveillère, C., Mendelsohn, G. A., & John, O. P. (2010). Validation par analyse factorielle du Big Five Inventory français (BFI-Fr). Analyse convergente avec le NEO-PI-R. *Annales Médico-psychologiques, revue psychiatrique*, *168*(2), 97–106. https://doi.org/10.1016/j.amp.2009.09.003

Rammstedt, B., & John, O. P. (2017). Big Five Inventory. In V. Zeigler-Hill & T. K. Shackelford (Eds.), *Encyclopedia of Personality and Individual Differences* (pp. 1–4). Springer International Publishing. https://doi.org/10.1007/978-3-319-28099-8_445-1

Rencher, A. C. (2002). *Methods of multivariate analysis* (2. ed). Wiley.

Ron-Angevin, R., & Díaz-Estrella, A. (2009). Brain–computer interface: Changes in performance using virtual reality techniques. *Neuroscience Letters*, *449*(2), 123–127. https://doi.org/10.1016/j.neulet.2008.10.099

Rusticus, S. A., & Lovato, C. Y. (2019). *Impact of Sample Size and Variability on the Power and Type I Error Rates of Equivalence Tests: A Simulation Study*. *Volume 19, Article 11*. https://doi.org/10.7275/4S9M-4E81

Sekhon, M., Cartwright, M., & Francis, J. J. (2017). Acceptability of healthcare interventions: An overview of reviews and development of a theoretical framework. *BMC Health Services Research*, *17*(1), 88. https://doi.org/10.1186/s12913-017-2031-8

Sillice, M. A., Morokoff, P. J., Ferszt, G., Bickmore, T., Bock, B. C., Lantini, R., & Velicer, W. F. (2018). Using Relational Agents to Promote Exercise and Sun Protection: Assessment of Participants' Experiences With Two Interventions. *Journal of Medical Internet Research*, *20*(2), e48. https://doi.org/10.2196/jmir.7640

Sitaram, R., Ros, T., Stoeckel, L., Haller, S., Scharnowski, F., Lewis-Peacock, J., Weiskopf, N., Blefari, M. L., Rana, M., Oblak, E., Birbaumer, N., & Sulzer, J. (2017). Closed-loop brain training: The science of neurofeedback. *Nature Reviews Neuroscience*, *18*(2), 86–100. https://doi.org/10.1038/nrn.2016.164

Smit, D., Dapor, C., Koerts, J., Tucha, O. M., Huster, R. J., & Enriquez-Geppert, S. (2023). Long-term improvements in executive functions after frontal-midline theta neurofeedback in a (sub)clinical group. *Frontiers in Human Neuroscience*, *17*, 1163380. https://doi.org/10.3389/fnhum.2023.1163380

Snyder, H. R., Miyake, A., & Hankin, B. L. (2015). Advancing understanding of executive function impairments and psychopathology: Bridging the gap between clinical and cognitive approaches. *Frontiers in Psychology*, *6*. https://doi.org/10.3389/fpsyg.2015.00328

Soto, C. J., & John, O. P. (2009). Ten facet scales for the Big Five Inventory: Convergence with NEO PI-R facets, self-peer agreement, and discriminant validity. *Journal of Research in Personality*, *43*(1), 84–90. https://doi.org/10.1016/j.jrp.2008.10.002

Sriwatanathamma, P., Sirivesmas, V., Simatrang, S., & Bhowmik, N. H. (2023). Gamifying Cognitive Behavioral Therapy Techniques on Smartphones for Bangkok's Millennials With Depressive Symptoms: Interdisciplinary Game Development. *JMIR Serious Games*, *11*, e41638. https://doi.org/10.2196/41638

Tickle-Degnen, L. (2013). Nuts and Bolts of Conducting Feasibility Studies. *The American Journal of Occupational Therapy*, *67*(2), 171–176. https://doi.org/10.5014/ajot.2013.006270

Tipton, E., Hallberg, K., Hedges, L. V., & Chan, W. (2017). Implications of Small Samples for Generalization: Adjustments and Rules of Thumb. *Evaluation Review*, *41*(5), 472–505. https://doi.org/10.1177/0193841X16655665

Vaughan, L., & Giovanello, K. (2010). Executive function in daily life: Age-related influences of executive processes on instrumental activities of daily living. *Psychology and Aging*, *25*(2), 343–355. https://doi.org/10.1037/a0017729

Viviani, G., & Vallesi, A. (2021). EEG-neurofeedback and executive function enhancement in healthy adults: A systematic review. *Psychophysiology*, *58*(9), e13874. https://doi.org/10.1111/psyp.13874

Wood, G., Kober, S. E., Witte, M., & Neuper, C. (2014). On the need to better specify the concept of 'control' in brain-computer-interfaces/neurofeedback research. *Frontiers in Systems Neuroscience*, *8*. https://doi.org/10.3389/fnsys.2014.00171

Zhang, S.-Y., Qiu, S.-W., Pan, M.-R., Zhao, M.-J., Zhao, R.-J., Liu, L., Li, H.-M., Wang, Y.-F., & Qian, Q.-J. (2021). Adult ADHD, executive function, depressive/anxiety

symptoms, and quality of life: A serial two-mediator model. *Journal of Affective Disorders*, *293*, 97–108. https://doi.org/10.1016/j.jad.2021.06.020

Appendix A

Demographics

Table 1

Nationality Frequencies

	N	%
Netherlands	242	46,6
Germany	89	17,1
France	67	12,9
Poland	11	2,1
Romania	10	1,9
Slovakia	8	1,5
Ireland	6	1,2
Italy	6	1,2
Russia	5	1,0
South Africa	5	1,0
Bulgaria	4	0,8
Greece	4	0,8
I prefer not to say	4	0,8
Portugal	4	0,8
Spain	4	0,8
United States	4	0,8
Indonesia	3	0,6
United Kingdom	3	0,6
Australia	2	0,4
Belgium	2	0,4
Cyprus	2	0,4
Czech Republic	2	0,4
Hungary	2	0,4
India	2	0,4
Kenya	2	0,4
Sri Lanka	2	0,4
Sweden	2	0,4
Albania	1	0,2
Armenia	1	0,2
Austria	1	0,2
Brazil	1	0,2
China	1	0,2

Croatia	1	0,2
Denmark	1	0,2
Estonia	1	0,2
Finland	1	0,2
Hong Kong	1	0,2
Israel	1	0,2
Japan	1	0,2
Lithuania	1	0,2
Luxembourg	1	0,2
Morocco	1	0,2
Netherlands Antilles	1	0,2
Northern Macedonia	1	0,2
Norway	1	0,2
Switzerland	1	0,2
Syria	1	0,2
Turkey	1	0,2
Ukraine	1	0,2

Table 2

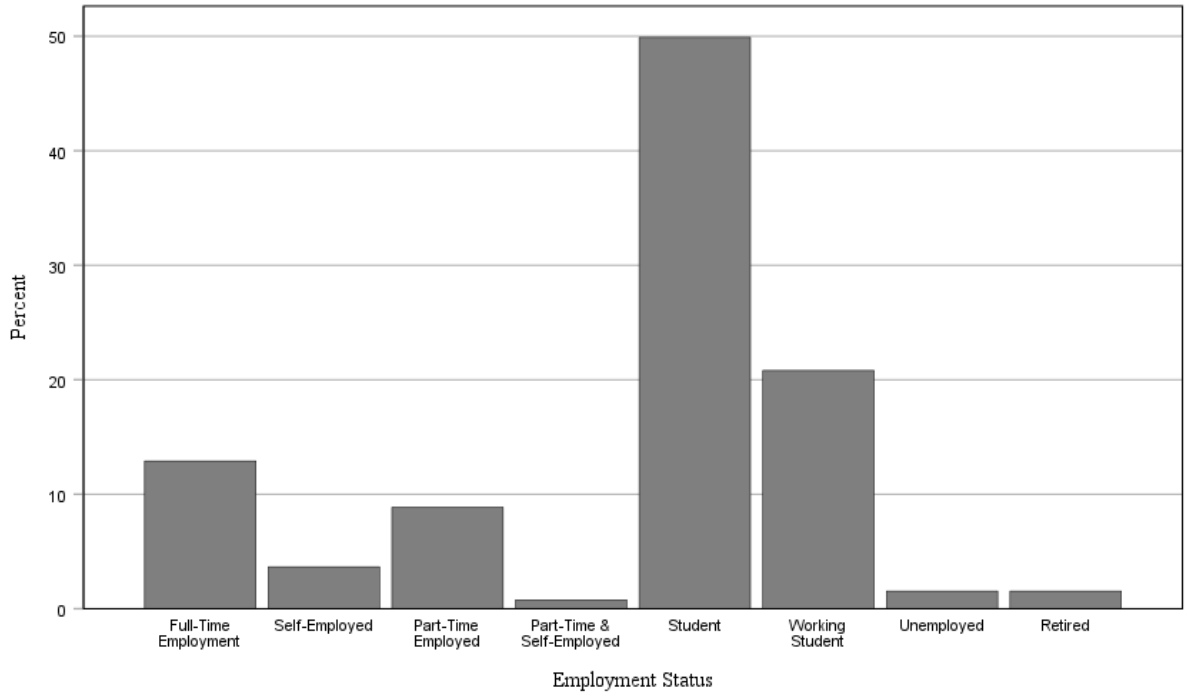
Cognitive Complaints Questionnaire

Cognitive Domain	*Question*
Memory	*I experience difficulties remembering important information, such as dates, names, or past events.*
Language skills	*I struggle to find the right words during conversations or have trouble understanding what others are saying.*
Learning ability	*I find learning new things challenging.*
Attention and focus	*I get frequently distracted or find it hard to concentrate on the task I am doing.*
Organizational and decision-making skills	*I face difficulties in organizing tasks, planning ahead, or making decisions.*

Mental flexibility	*I find it hard to switch between different activities, like moving from checking emails to focusing on a work project*
Fatigue	*I often feel unusually tired or fatigued without a clear reason.*
Visuospatial skills	*I have trouble judging distance or size, or recognizing familiar people and places.*
Social cognition	*I have trouble understanding other people's behaviour, thoughts, or feelings.*
Reading and comprehension	*I find it difficult to understand written text (like books, instructions, or newspapers).*
Motor skills	*I find tasks that require fine motor skills, like writing, drawing, or buttoning clothes, challenging.*
Emotional regulation	*I experience sudden mood changes or find it hard to control your emotions.*
Self-awareness	*People around me often point out mistakes or forgetfulness that I was not aware of, or I find myself surprised by feedback from others about my behaviour or decisions.*
Other cognitive concerns	*I have other cognitive issues that I have noticed, namely:*

Figure 1

Employment status



Note. Working students include 5 participants working full-time as a student, the rest are part-time employed. One participant is self-employed and a student.

Appendix B

Assumptions Check

Table 1

Test of Normality of Perceived Usefulness, Perceived Ease f Use and Behavioural Intention for Subclinical Group

	Subclinical group	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
PU	,00	,066	300	,003	,961	300	<,001
	1,00	,061	217	,049	,962	217	<,001
PEOU	,00	,040	300	,200*	,987	300	,010
	1,00	,037	217	,200*	,983	217	,011
BI	,00	,090	300	<,001	,951	300	<,001
	1,00	,074	217	,006	,951	217	<,001

Note. Perceived ease-of-use is abbreviated as PEOU, perceived usefulness is abbreviated as PU and behavioural intention is abbreviated as BI.

*. This is a lower bound of the true significance.

[a.] Lilliefors Significance Correction.

Table 2

Test of Normality of Perceived Usefulness, Perceived Ease-of-Use and Behavioural Intention for Clinical Group

	Clinical group	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
PU	,00	,060	454	<,001	,965	454	<,001
	1,00	,086	63	,200*	,949	63	,011
PEOU	,00	,035	454	,200*	,988	454	<,001
	1,00	,096	63	,200*	,966	63	,075
BI	,00	,084	454	<,001	,951	454	<,001
	1,00	,075	63	,200*	,956	63	,024

Note. Perceived ease-of-use is abbreviated as PEOU, perceived usefulness is abbreviated as PU and behavioural intention is abbreviated as BI.

*. This is a lower bound of the true significance.

[a]. Lilliefors Significance Correction.

Table 3

Test of Normality of Perceived Usefulness, Perceived Ease-of-Use and BI for Therapists

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Therapists	Statistic	df	Sig.	Statistic	df	Sig.
PU	,00	,073	437	<,001	,960	437	<,001
	1,00	,097	80	,062	,956	80	,008
PEOU	,00	,036	437	,200*	,988	437	,001
	1,00	,096	80	,065	,967	80	,037
BI	,00	,086	437	<,001	,947	437	<,001
	1,00	,093	80	,081	,958	80	,010

Note. Perceived ease-of-use is abbreviated as PEOU, perceived usefulness is abbreviated as PU and behavioural intention is abbreviated as BI.

*. This is a lower bound of the true significance.

[a]. Lilliefors Significance Correction.

Table 4

Test of Normality of Perceived Usefulness, Perceived Ease-of-Use and Behavioural Intention for Healthy population

	Healthy	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	population	Statistic	df	Sig.	Statistic	df	Sig.
PU	,00	,058	468	<,001	,967	468	<,001
	1,00	,111	49	,174	,899	49	<,001
PEOU	,00	,037	468	,148	,987	468	<,001
	1,00	,112	49	,165	,958	49	,080
BI	,00	,073	468	<,001	,956	468	<,001
	1,00	,142	49	,015	,912	49	,001

Note. Perceived ease-of-use is abbreviated as PEOU, perceived usefulness is abbreviated as PU and behavioural intention is abbreviated as BI.

[a]. Lilliefors Significance Correction.

Appendix C

Descriptive Stakeholder Groups

Table 1

Countries of Residence per Stakeholder Group

Stakeholder groups		N	%
Healthy population	Albania	1	0,4
	Australia	1	0,4
	Bulgaria	1	0,4
	China	1	0,4
	Cyprus	1	0,4
	Czech Republic	1	0,4
	France	28	11,8
	Germany	6	2,5
	I prefer not to say	3	1,3
	Ireland	1	0,4
	Italy	1	0,4
	Netherlands	180	75,9
	Netherlands Antilles	5	2,1
	Norway	1	0,4
	Romania	1	0,4
	Russia	1	0,4
	Slovakia	1	0,4
	Sweden	1	0,4
	United States	2	0,8
Therapists	Australia	1	1,3
	Austria	1	1,3
	France	22	27,5
	Germany	14	17,5
	Ireland	1	1,3
	Israel	1	1,3
	Morocco	1	1,3
	Nepal	1	1,3
	Netherlands	27	33,8
	Netherlands Antilles	1	1,3
	South Africa	3	3,8
	Sweden	1	1,3
	Switzerland	2	2,5
	United Arab Emirates	1	1,3

	United Kingdom	1	1,3
	United States	2	2,5
Clinical group	France	7	13,7
	Germany	1	2,0
	Netherlands	40	78,4
	Netherlands Antilles	1	2,0
	United Arab Emirates	2	3,9
Subclinical group	France	8	5,3
	Germany	3	2,0
	Greece	2	1,3
	Hungary	1	0,7
	I prefer not to say	1	0,7
	Indonesia	1	0,7
	Netherlands	130	86,1
	Netherlands Antilles	3	2,0
	Romania	1	0,7
	United Arab Emirates	1	0,7

Table 2

Employment Status per Stakeholder Group

Stakeholder Groups		N	%
Therapists	Full-Time Employed	31	38,8
	Self-Employed	14	17,5
	Part-Time Employed	8	10,0
	Part-Time Employed and Self-Employed	2	2,5
	Student	13	16,3
	Working Student	8	10,0
	Unemployed	1	1,3
	Retired	3	3,8
Clinical Group	Full-Time Employed	6	11,8
	Self-Employed	1	2,0
	Part-Time Employed	6	11,8
	Student	25	49,0
	Working Student	12	23,5
	Unemployed	1	2,0
Subclinical Group	Full-Time Employed	8	5,3

	Self-Employed	2	1,3
	Part-Time Employed	19	12,6
	Part-Time Employed and Self-Employed	1	0,7
	Student	88	58,3
	Working Student	32	21,2
	Unemployed	1	0,7
Healthy Population	Full-Time Employed	22	9,3
	Self-Employed	2	0,8
	Part-Time Employed	13	5,5
	Part-Time Employed and Self-Employed	1	0,4
	Student	133	56,1
	Working Student	56	23,6
	Unemployed	5	2,1
	Retired	5	2,1

Appendix D

Results One Sample T-Tests

Table 1

Descriptives of the One-Sample T-Test

Therapists	Clinical Group	Subclinical Group		N	Mean	Std. Deviation	Std. Error Mean
0	,00	,00	PU	237	67,4051	18,19641	1,18198
			PEOU	237	64,8326	16,40678	1,06573
			BI	237	65,0267	21,85612	1,41971
		1,00	PU	151	66,0464	18,43483	1,50021
			PEOU	151	65,6843	17,16926	1,39721
			BI	151	66,0839	20,69257	1,68394
	1,00	,00	PU	51	69,0523	17,49163	2,44932
			PEOU	51	65,8366	14,07873	1,97142
			BI	51	68,2222	19,61662	2,74688
1	,00	,00	PU	80	66,1875	20,84784	2,33086
			PEOU	80	67,3375	19,52923	2,18343
			BI	80	67,7375	20,50047	2,29202

Note. Perceived ease-of-use is abbreviated as PEOU, perceived usefulness is abbreviated as PU and behavioural intention is abbreviated as BI. The healthy population is represented where Therapist= 0, Clinical group= 0, and Subclinical group= 0.

Table 2

Results One-Sample T-Test

				Test Value = 50						
						Significance			95% Confidence Interval of the Difference	
Therapists	Clinical Group	Subclinical Group		t	df	One-Sided p	Two-Sided p	Mean Difference	Lower	Upper
0	,00	,00	PU	14,725	236	<,001	<,001	17,40506	15,0765	19,7337
			PEOU	13,918	236	<,001	<,001	14,83263	12,7331	16,9322
			BI	10,584	236	<,001	<,001	15,02672	12,2298	17,8236
		1,00	PU	10,696	150	<,001	<,001	16,04636	13,0821	19,0106
			PEOU	11,225	150	<,001	<,001	15,68433	12,9236	18,4451
			BI	9,551	150	<,001	<,001	16,08389	12,7566	19,4112
	1,00	,00	PU	7,779	50	<,001	<,001	19,05229	14,1327	23,9719
			PEOU	8,033	50	<,001	<,001	15,83660	11,8769	19,7963
			BI	6,634	50	<,001	<,001	18,22222	12,7050	23,7395
1	,00	,00	PU	6,945	79	<,001	<,001	16,18750	11,5480	20,8270
			PEOU	7,940	79	<,001	<,001	17,33750	12,9915	21,6835
			BI	7,739	79	<,001	<,001	17,73750	13,1753	22,2997

Note. Perceived ease-of-use is abbreviated as PEOU, perceived usefulness is abbreviated as

PU and behavioural intention is abbreviated as BI. The healthy population is represented where Therapist= 0, Clinical group= 0, and Subclinical group= 0.

Table 3

Effect Sizes One-Sample T-Test

Therapists	Clinical Group	Subclinical Group			Standardizer[a]	Point Estimate	95% Confidence Interval	
							Lower	Upper
0	,00	,00	PU	Cohen's d	18,19641	,957	,802	1,110
				Hedges' correction	18,25449	,953	,799	1,106
			PEOU	Cohen's d	16,40678	,904	,752	1,055
				Hedges' correction	16,45915	,901	,750	1,051
			BI	Cohen's d	21,85612	,688	,545	,829
				Hedges' correction	21,92589	,685	,544	,826
		1,00	PU	Cohen's d	18,43483	,870	,682	1,057
				Hedges' correction	18,52765	,866	,679	1,051
			PEOU	Cohen's d	17,16926	,914	,722	1,102
				Hedges' correction	17,25570	,909	,719	1,097
			BI	Cohen's d	20,69257	,777	,594	,958
				Hedges' correction	20,79676	,773	,591	,954
	1,00	,00	PU	Cohen's d	17,49163	1,089	,738	1,433
				Hedges' correction	17,75959	1,073	,727	1,411
			PEOU	Cohen's d	14,07873	1,125	,770	1,473
				Hedges' correction	14,29440	1,108	,758	1,451
			BI	Cohen's d	19,61662	,929	,597	1,255
				Hedges' correction	19,91713	,915	,588	1,236
1	,00	,00	PU	Cohen's d	20,84784	,776	,524	1,025
				Hedges' correction	21,04841	,769	,519	1,015
			PEOU	Cohen's d	19,52923	,888	,627	1,145
				Hedges' correction	19,71712	,879	,621	1,134
			BI	Cohen's d	20,50047	,865	,606	1,120
				Hedges' correction	20,69769	,857	,600	1,110

Note. Perceived ease-of-use is abbreviated as PEOU, perceived usefulness is abbreviated as PU and behavioural intention is abbreviated as BI. The healthy population is represented where Therapist= 0, Clinical group= 0, and Subclinical group= 0.

[a]. The denominator used in estimating the effect sizes.

Cohen's d uses the sample standard deviation.

Appendix E

Results Exploratory Analysis

Table 1

Descriptive Statistics Six Stakeholder Groups

Stakeholder Groups		N	Min.	Max.	Mean	Std. Deviation
Healthy Population	PU	237	,00	98,33	67,4051	18,19641
	PEOU	237	,00	100,00	64,8326	16,40678
	BI	237	,00	100,00	65,0267	21,85612
	Valid N (listwise)	237				
Therapists	PU	56	12,33	100,00	68,9524	20,21875
	PEOU	56	22,00	100,00	71,2024	18,19165
	BI	56	13,33	100,00	71,1667	19,39020
	Valid N (listwise)	56				
Therapists with a Diagnosis	PU	12	1,33	100,00	56,1667	27,12131
	PEOU	12	10,00	100,00	54,3333	25,23426
	BI	12	1,00	100,00	55,9444	26,53903
	Valid N (listwise)	12				
Therapists with Strong Cognitive Complaints	PU	12	46,67	82,00	63,3056	13,57840
	PEOU	12	47,00	87,33	62,3056	12,62870
	BI	12	50,00	87,33	63,5278	14,25345
	Valid N (listwise)	12				
Individuals with a Diagnosis	PU	51	20,33	100,00	69,0523	17,49163
	PEOU	51	36,67	94,67	65,8366	14,07873
	BI	51	8,67	100,00	68,2222	19,61662
	Valid N (listwise)	51				
Individuals with Strong Cognitive Complaints	PU	151	3,67	100,00	66,0464	18,43483
	PEOU	151	18,33	100,00	65,6843	17,16926
	BI	151	7,00	100,00	66,0839	20,69257
	Valid N (listwise)	151				

Note. Perceived ease-of-use is abbreviated as PEOU, perceived usefulness is abbreviated as PU and behavioural intention is abbreviated as BI.

Table 2

Hypothesis Test Summary Kruskal Wallis Test

	Null Hypothesis	Test	Sig. [a,b]	Decision
1	The distribution of PU is the same across categories of Independent_groups.	Independent-Samples Kruskal-Wallis Test	,283	Retain the null hypothesis.
2	The distribution of PEOU is the same across categories of Independent_groups.	Independent-Samples Kruskal-Wallis Test	,044	Reject the null hypothesis.
3	The distribution of BI is the same across categories of Independent_groups.	Independent-Samples Kruskal-Wallis Test	,176	Retain the null hypothesis.

Note. Perceived ease-of-use is abbreviated as PEOU, perceived usefulness is abbreviated as PU and behavioural intention is abbreviated as BI.

[a]. The significance level is ,050.

[b]. Asymptotic significance is displayed.

Table 3

Independent Samples Kruskal Wallis Test Summary

	PU	PEOU	BI
Total N	519	519	519
Test Statistic	6,243[a]	11,414[a]	7,660[a]
Degree of Freedom	5	5	5
Asymptotic Sig. (2-sided test)	,283	,044	,176

Note. Perceived ease-of-use is abbreviated as PEOU, perceived usefulness is abbreviated as PU and behavioural intention is abbreviated as BI.

[a]. The test statistic is adjusted for ties.

Table 4

Pairwise Comparison of Six Stakeholder Groups for Perceived Usefulness

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
Therapists with a Diagnosis-Therapists with a Diagnosis-Individuals with Strong Cognitive Complaints	-24,542	61,221	-,401	,689	1,000
Therapists with a Diagnosis-Healthy Population	-64,623	44,977	-1,437	,151	1,000
Therapists with a Diagnosis-Individuals with a Diagnosis	77,961	44,372	1,757	,079	1,000
Therapists with a Diagnosis-Therapists	-89,603	48,114	-1,862	,063	,938
Therapists with Strong Cognitive Complaints-Individuals with Strong Cognitive Complaints	90,905	47,703	1,906	,057	,850
Therapists with Strong Cognitive Complaints-Healthy Population	-40,081	44,977	-,891	,373	1,000
Therapists with Strong Cognitive Complaints-Individuals with a Diagnosis	53,419	44,372	1,204	,229	1,000
Therapists with Strong Cognitive Complaints-Therapists	-65,061	48,114	-1,352	,176	1,000
Individuals with Strong Cognitive Complaints-Healthy Population	66,363	47,703	1,391	,164	1,000
Individuals with Strong Cognitive Complaints-Individuals with a Diagnosis	13,338	15,614	,854	,393	1,000
Individuals with Strong Cognitive Complaints-Therapists	24,980	24,287	1,029	,304	1,000
	26,282	23,463	1,120	,263	1,000

Healthy Population-Individuals with a Diagnosis	-11,642	23,148	-,503	,615	1,000
Healthy Population-Therapists	-12,944	22,281	-,581	,561	1,000
Individuals with a Diagnosis-Therapists	1,302	29,026	,045	,964	1,000

Note. Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same.

Asymptotic significances (2-sided tests) are displayed. The significance level is ,050.

Significance values are the values of Dunn's test.

[a]. Adjusted significance values have been adjusted by the Bonferroni correction for multiple tests.

Table 5

Pairwise Comparison of Six Stakeholder Groups for Perceived Ease-of-Use

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
Therapists with a Diagnosis-Therapists with Strong Cognitive Complaints	-41,542	61,220	-,679	,497	1,000
Therapists with a Diagnosis-Healthy Population	77,304	44,371	1,742	,081	1,000
Therapists with a Diagnosis-Individuals with a Diagnosis	-79,674	48,113	-1,656	,098	1,000
Therapists with a Diagnosis-Individuals with Strong Cognitive Complaints	-88,161	44,976	-1,960	,050	,750
Therapists with a Diagnosis-Therapists	133,313	47,702	2,795	,005	,078
Therapists With Strong Cognitive Complaints-Healthy Population	35,763	44,371	,806	,420	1,000

Therapists With Strong Cognitive Complaints-Individuals with a Diagnosis	-38,132	48,113	-,793	,428	1,000
Therapists with Strong Cognitive Complaints-Individuals with Strong Cognitive Complaints	-46,620	44,976	-1,037	,300	1,000
Therapists with Strong Cognitive Complaints-Therapists	91,771	47,702	1,924	,054	,816
Healthy Population-Individuals with a Diagnosis	-2,370	23,147	-,102	,918	1,000
Healthy Population-Individuals with Strong Cognitive Complaints	-10,857	15,614	-,695	,487	1,000
Healthy Population-Therapists	-56,008	22,281	-2,514	,012	,179
Individuals with a Diagnosis-Individuals with Strong Cognitive Complaints	-8,487	24,287	-,349	,727	1,000
Individuals with a Diagnosis-Therapists	53,638	29,025	1,848	,065	,969
Individuals with Strong Cognitive Complaints-Therapists	45,151	23,462	1,924	,054	,815

Note. Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same.

Asymptotic significances (2-sided tests) are displayed. The significance level is ,050.

Significance values are the values of Dunn's test.

[a]. Adjusted significance values have been adjusted by the Bonferroni correction for multiple tests.

Table 6

Pairwise Comparison of Six Stakeholder Groups for Behavioural Intention

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
Therapists with a Diagnosis-Therapists with Strong Cognitive Complaints	-29,750	61,221	-,486	,627	1,000
Therapists with a Diagnosis-Healthy Population	71,200	44,372	1,605	,109	1,000
Therapists with a Diagnosis-Individuals with Strong Cognitive Complaints	-79,574	44,977	-1,769	,077	1,000
Therapists with a Diagnosis-Individuals with a Diagnosis	-88,924	48,114	-1,848	,065	,969
Therapists with a Diagnosis-Therapists	109,214	47,703	2,289	,022	,331
Therapists with Strong Cognitive Complaints-Healthy Population	41,450	44,372	,934	,350	1,000
Therapists with Strong Cognitive Complaints-Individuals with Strong Cognitive Complaints	-49,824	44,977	-1,108	,268	1,000
Therapists with Strong Cognitive Complaints-Individuals with a Diagnosis	-59,174	48,114	-1,230	,219	1,000
Therapists with Strong Cognitive Complaints-Therapists	79,464	47,703	1,666	,096	1,000
Healthy Population-Individuals with Strong Cognitive Complaints	-8,374	15,615	-,536	,592	1,000
Healthy Population-Individuals with a Diagnosis	-17,724	23,148	-,766	,444	1,000
Healthy Population-Therapists	-38,014	22,281	-1,706	,088	1,000

Individuals with Strong Cognitive Complaints-Individuals with a Diagnosis	9,350	24,287	,385	,700	1,000
Individuals with Strong Cognitive Complaints-Therapists	29,641	23,463	1,263	,206	1,000
Individuals with a Diagnosis-Therapists	20,290	29,026	,699	,485	1,000

Note. Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same.

Asymptotic significances (2-sided tests) are displayed. The significance level is ,050.

Significance values are the values of Dunn's test.

[a]. Adjusted significance values have been adjusted by the Bonferroni correction for multiple tests.

Table 7

Descriptive Statistics Six Stakeholder Groups Without Outliers

Independent_groups		N	Minimum	Maximum	Mean	Std. Deviation
Healthy population	PU	234	,00	98,33	67,0826	18,08539
	PEOU	234	,00	97,33	64,3818	16,01625
	BI	234	,00	100,00	64,8134	21,90916
	Valid N (listwise)	234				
Therapists	PU	54	12,33	100,00	67,8025	19,65963
	PEOU	54	22,00	98,33	70,1358	17,63436
	BI	54	13,33	100,00	70,2099	19,07123
	Valid N (listwise)	54				
Therapists with a diagnosis	PU	11	1,33	88,33	52,1818	24,48508
	PEOU	11	10,00	81,67	50,1818	21,74722
	BI	11	1,00	93,33	51,9394	23,72800
	Valid N (listwise)	11				
Therapists with strong cognitive complaints	PU	12	46,67	82,00	63,3056	13,57840
	PEOU	12	47,00	87,33	62,3056	12,62870

	BI	12	50,00	87,33	63,5278	14,25345
	Valid N (listwise)	12				
Individuals with a diagnosis	PU	51	20,33	100,00	69,0523	17,49163
	PEOU	51	36,67	94,67	65,8366	14,07873
	BI	51	8,67	100,00	68,2222	19,61662
	Valid N (listwise)	51				
Individuals with strong cognitive complaints	PU	150	3,67	100,00	65,8356	18,31308
	PEOU	150	18,33	97,67	65,4556	16,99429
	BI	150	7,00	100,00	65,8578	20,57388
	Valid N (listwise)	150				

Note. Perceived ease-of-use is abbreviated as PEOU, perceived usefulness is abbreviated as PU and behavioural intention is abbreviated as BI.

Table 8

Hypothesis Test Summary Kruskal Wallis Test Without Outliers

	Null Hypothesis	Test	Sig.[a,b]	Decision
1	The distribution of PU is the same across categories of Independent_groups.	Independent-Samples Kruskal-Wallis Test	,158	Retain the null hypothesis.
2	The distribution of PEOU is the same across categories of Independent_groups.	Independent-Samples Kruskal-Wallis Test	,025	Reject the null hypothesis.
3	The distribution of BI is the same across categories of Independent_groups.	Independent-Samples Kruskal-Wallis Test	,105	Retain the null hypothesis.

Note. Perceived ease-of-use is abbreviated as PEOU, perceived usefulness is abbreviated as PU and behavioural intention is abbreviated as BI.

[a]. The significance level is ,050.

[b]. Asymptotic significance is displayed.

Table 9

Independent Samples Kruskal Wallis Test Summary Without Outliers

	PU	PEOU	BI
Total N	512	512	512
Test Statistic	7,977[a]	12,810[a]	9,115[a]
Degree of Freedom	5	5	5
Asymptotic Sig. (2-sided test)	,158	,025	,105

Note. Perceived ease-of-use is abbreviated as PEOU, perceived usefulness is abbreviated as PU and behavioural intention is abbreviated as BI.

[a]. The test statistic is adjusted for ties.

Table 10

Pairwise Comparison of Six Stakeholder Groups Without Outliers for Perceived Usefulness

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
Therapists with a diagnosis-Therapists with strong cognitive complaints	-54,367	61,753	-,880	,379	1,000
Therapists with a diagnosis-Individuals with strong cognitive complaints	-92,539	46,212	-2,002	,045	,678
Therapists with a diagnosis-Healthy population	104,781	45,642	2,296	,022	,325
Therapists with a diagnosis-Therapists	111,604	48,938	2,281	,023	,339
Therapists with a diagnosis-Individuals with a diagnosis	-119,115	49,181	-2,422	,015	,232

Therapists with strong cognitive complaints-Individuals with strong cognitive complaints	-38,172	44,382	-,860	,390	1,000
Therapists with strong cognitive complaints-Healthy population	50,413	43,788	1,151	,250	1,000
Therapists with strong cognitive complaints-Therapists	57,236	47,214	1,212	,225	1,000
Therapists with strong cognitive complaints-Individuals with a diagnosis	-64,748	47,465	-1,364	,173	1,000
Individuals with strong cognitive complaints-Healthy population	12,242	15,474	,791	,429	1,000
Individuals with strong cognitive complaints-Therapists	19,064	23,478	,812	,417	1,000
Individuals with strong cognitive complaints-Individuals with a diagnosis	26,576	23,980	1,108	,268	1,000
Healthy population-Therapists	-6,823	22,334	-,305	,760	1,000
Healthy population-Individuals with a diagnosis	-14,334	22,862	-,627	,531	1,000
Therapists-Individuals with a diagnosis	-7,511	28,887	-,260	,795	1,000

Note. Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same.

Asymptotic significances (2-sided tests) are displayed. The significance level is ,050.

Significance values are the values of Dunn's test.

[a]. Adjusted significance values have been adjusted by the Bonferroni correction for multiple tests.

Table 11

Pairwise Comparison of Six Stakeholder Groups Without Outliers for Perceived Ease-of-Use

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
Therapists with a diagnosis-Therapists with strong cognitive complaints	-72,462	61,752	-1,173	,241	1,000
Therapists with a diagnosis-Healthy population	104,855	45,641	2,297	,022	,324
Therapists with a diagnosis-Individuals with a diagnosis	-110,594	49,180	-2,249	,025	,368
Therapists with a diagnosis-Individuals with strong cognitive complaints	-117,402	46,211	-2,541	,011	,166
Therapists with a diagnosis-Therapists	156,573	48,937	3,199	,001	,021
Therapists with strong cognitive complaints-Healthy population	32,393	43,787	,740	,459	1,000
Therapists with strong cognitive complaints-Individuals with a diagnosis	-38,132	47,464	-,803	,422	1,000
Therapists with strong cognitive complaints-Individuals with strong cognitive complaints	-44,940	44,381	-1,013	,311	1,000
Therapists with strong cognitive complaints-Therapists	84,111	47,213	1,782	,075	1,000
Healthy population-Individuals with a diagnosis	-5,739	22,861	-,251	,802	1,000
Healthy population-Individuals with strong cognitive complaints	-12,547	15,473	-,811	,417	1,000
Healthy population-Therapists	-51,718	22,334	-2,316	,021	,309
Individuals with a diagnosis-Individuals with strong cognitive complaints	-6,808	23,980	-,284	,776	1,000

Individuals with a diagnosis-Therapists	45,979	28,886	1,592	,111	1,000
Individuals with strong cognitive complaints-Therapists	39,171	23,477	1,668	,095	1,000

Note. Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same.

Asymptotic significances (2-sided tests) are displayed. The significance level is ,050.

Significance values are the values of Dunn's test.

[a]. Adjusted significance values have been adjusted by the Bonferroni correction for multiple tests.

Table 12

Pairwise Comparison of Six Stakeholder Groups Without Outliers for Behavioural Intention

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
Therapists with a diagnosis-Therapists with strong cognitive complaints	-59,473	61,754	-,963	,336	1,000
Therapists with a diagnosis-Healthy population	98,977	45,642	2,169	,030	,452
Therapists with a diagnosis-Individuals with strong cognitive complaints	-107,448	46,212	-2,325	,020	,301
Therapists with a diagnosis-Individuals with a diagnosis	-118,280	49,181	-2,405	,016	,243
Therapists with a diagnosis-Therapists	130,765	48,938	2,672	,008	,113
Therapists with strong cognitive complaints-Healthy population	39,503	43,788	,902	,367	1,000
Therapists with strong cognitive complaints-Individuals with strong cognitive complaints	-47,975	44,382	-1,081	,280	1,000

Therapists with strong cognitive complaints-Individuals with a diagnosis	-58,806	47,466	-1,239	,215	1,000
Therapists with strong cognitive complaints-Therapists	71,292	47,214	1,510	,131	1,000
Healthy population-Individuals with strong cognitive complaints	-8,472	15,474	-,547	,584	1,000
Healthy population-Individuals with a diagnosis	-19,303	22,862	-,844	,398	1,000
Healthy population-Therapists	-31,788	22,335	-1,423	,155	1,000
Individuals with strong cognitive complaints-Individuals with a diagnosis	10,831	23,980	,452	,652	1,000
Individuals with strong cognitive complaints-Therapists	23,317	23,478	,993	,321	1,000
Individuals with a diagnosis-Therapists	12,485	28,887	,432	,666	1,000

Note. Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same.

Asymptotic significances (2-sided tests) are displayed. The significance level is ,050.

Significance values are the values of Dunn's test.

[a]. Adjusted significance values have been adjusted by the Bonferroni correction for multiple tests.