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What Information Do Neuropsychologists Use to Guide their Clinical Decisions? A Survey on Knowledge and Application of Evidence-Based Practice in a French-Speaking Population

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Abstract

Objective: Evidence-based practice (EBP) is an approach that encourages clinicians to base their practice on evidence to improve the quality of patient care and reduce uncertainty in their clinical decisions. However, the state of knowledge and practice of neuropsychologists in French-speaking countries is still unknown. This study aimed to find out what these neuropsychologists know about EBP and whether they use it.
Method: A questionnaire with 39 questions for French-speaking neuropsychologists was distributed. The questions focused on neuropsychologists' knowledge and use of EBP and information that guide their clinical decisions.
Results: A total of 392 respondents started the survey. The data show that only 35% correctly defined EBP and there was confusion between this practice and the strict use of research data. In practice, their decisions are influenced by multiple factors, including the patient's difficulties and advice from peers. Regarding the research, a significant proportion of the sample stated that they did not search the scientific literature frequently. Barriers to accessing scientific information and ineffective article-reading behavior were highlighted.
Conclusion: A lack of knowledge of EBP among French-speaking neuropsychologists was observed. Furthermore, the factors influencing their decision-making do not clearly fit the definitions of EBP. Information-seeking behaviors show several weaknesses and barriers to the integration of scientific evidence into practice. These results are like those of other studies conducted among psychologists or in other health professions. We will discuss possible courses of action that could be implemented to improve the knowledge and use of EBP.

Keywords: Clinical practise; Evidence-based practice; neuropsychology

Introduction

The emergence of new assessment and intervention methods and the ever-increasing number of scientific publications confront the neuropsychologist with a large amount of information from various sources and of varying quality (Bilder, 2011). Based on this information, it is sometimes difficult to get an accurate idea of the effectiveness and clinical utility of these methods. In addition, there is not always a consensus among the different sources. For example, a neuropsychologist wondering whether a psychoeducational approach is appropriate in the acute phase after a mild traumatic brain injury (mTBI) may find both positive

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(e.g., Ponsford et al., 2002) and negative results (e.g., Belanger et al., 2015). This context creates an uncomfortable situation for clinicians. Evidence-based practice (EBP) is an approach that aims, among other things, to reduce clinicians' uncertainty in their clinical decisions.

EBP was initially developed in medicine (Evidence-Based Medicine Working Group, 1992; Sackett et al., 1996) and has rapidly become a topic of growing interest in the field of psychology (APA Presidential Task Force on Evidence-Based Practice, 2006). In neuropsychology, the use of EBP has been progressively advocated by several associations [such as the National Academy of Neuropsychology (Miller, n.d.); American Academy of Clinical Neuropsychology (Board of Directors, 2007); French Organization of Psychologists Specialized in Neuropsychology (OFPN)]. But what does this approach involve? This approach refers to a decision-making process that combines three or four types of sources of information, referred to as the "pillars of EBP" (Hoffmann et al., 2017; Satterfield et al., 2009; Straus et al., 2019). These pillars are scientific research and valid and clinically relevant findings; patient characteristics (difficulties, values, and resources but also treatment preferences); clinician expertise (accumulated knowledge, clinical experience, and critical thinking); and context (cultural, societal, economic, political, and environmental). These different types of data should not be considered independently but rather in a complementary, interlocking, and non-hierarchical way (Hoffmann et al., 2017).

Given the challenges involved in integrating the research pillar into clinical decision-making, this pillar has probably attracted the most attention. Some authors who have investigated and worked on EBP agree that, to be relevant and cost-effective, integration of this pillar requires the clinician to engage in a reflexive information-seeking process. To assist clinicians in implementing this process, some authors have proposed a five-step approach (Chelune, 2010; Dawes et al., 2005; Straus et al., 2011). EBP should not be reduced to this structured procedure. Rather, it should be seen as a reminder to operationalize some essential components of the research pillar. The first step (Ask) is to transform an uncertainty or clinical question (e.g., about a diagnosis, prognosis, or intervention) into a need for information. This need can then be translated into a structured literature search question, for example, using the classic PICO framework (Kloda & Bartlett, 2013; Richardson et al., 1995; Straus et al., 2011), where "P" stands for patients or problems, "I" for Intervention or test, "C" for comparison, and "O" for outcomes. This framework is easily adaptable to a variety of clinical issues. Applied to the field of neuropsychology, for example, in the case of a patient who has experienced brain damage after a road accident and is suspected of malingering, the clinician may need tests to adequately discriminate between malingering and a lack of effort resulting from a psychopathological state. From their general knowledge, the clinical neuropsychologist believes that certain recognition tests like the Test of Memory Malingering can be useful. To verify these beliefs, the neuropsychologist can translate the clinical question into the following structured question: Can a recognition test (I) discriminate with good specificity and sensitivity (O) between a patient who is malingering (P) and a patient who presents a lack of effort due to psychopathological difficulties (C)? This question can guide the clinician in selecting key words to begin the literature search.

In the next step (Acquire), the clinical neuropsychologist should consider what type of study design is most appropriate to answer their question. To reduce the amount of reading required, the type of design can be entered as a filter into databases or search engines (e.g., PubMed, NeuroBITE, PsycInfo, Trip). If the question is about pathogenesis factors (e.g., the involvement of cognitive biases in maintaining difficulties after mTBI) or a differential diagnosis (a task to distinguish frontotemporal dementia from another form of dementia), then the clinician will turn to cohort studies or discriminant validity studies, respectively (e.g., APA Presidential Task Force on Evidence-Based Practice, 2006; Heneghan & Badenoch, 2008). When a neuropsychologist has questions about an intervention, he/she can refer to the pyramid of evidence (Agoritsas et al., 2015; OCEBM, 2011). Hence, if the question pertains to general and habitual efficiency, a synthesis of several studies will be appropriate because it carries more weight than a primary study. A randomized controlled trial (RCT) will be more reliable than an uncontrolled case study or quasi-experimental or observational study. However, if the neuropsychologist is concerned about how to adapt a treatment in a particular situation, he/she may find more information in case studies than in a RCT (APA Presidential Task Force on Evidence-Based Practice, 2006). Furthermore, it is known in neuropsychology that controlled single-case studies are invaluable and they are often more informative than RCT. In addition, the ability of case studies to answer questions about the effectiveness of treatment for a particular patient has improved considerably (Perdices & Tate, 2009).

Critical evaluation of the collected data is another important step (Appraise). Lack of information, lack of blinding of participants and experimenters, poorly defined outcomes, poorly calculated sample size, or misinterpretation of results are all examples of biases that can affect the quality and reliability of a published study. Taking into account these limitations requires the neuropsychologist to possess analytical skills and knowledge of these methodological issues (Chelune, 2010; Greenhalgh, 2010). Several reporting guidelines exist, including the CONSORT statement (CONsolidated Standards Of Reporting Trials; Begg et al., 1996; Schulz et al., 2010), the STARD initiative (STAndards for Reporting of Diagnostic Accuracy; Bossuyt et al., 2003), and PRISMA (Preferred Reporting Items for Systematic reviews and Meta-Analyses; Liberati et al., 2009). Because much of the clinical research in neuropsychology is often based on quasi-experimental designs or observational studies in which randomization cannot be done, the STROBE statement (STrengthening the Reporting of Observational studies in Epidemiology;

Vandenbroucke et al., 2007; von Elm et al., 2007) is also relevant to the neuropsychologist. The SCRIBE grid is, of course, very interesting for experimental case study designs (Tate et al., 2016). These tools are good guides but are primarily intended for researchers in the publication process. Tools more specifically targeting clinician readers have also been created (CASP, critical appraisal tools of JBI; Greenhalgh, 2010). In the context of evaluation, clinical neuropsychologists can also find guides to assess the quality of their tools (Evers et al., 2013). Some authors even propose benchmarks in the interpretation of psychometric data based on the clinical question being addressed (e.g., Youngstrom et al., 2017).

The evidence from the literature search, appropriately analyzed, will guide the decision, not dictate it. In a fourth step (Apply), the clinical neuropsychologist will then have to make the decision by trying to integrate the different pillars of EBP. For example, to take the patient preferences into account, it is important to ask the patient what he/she thinks is good for her/him. Clinical decision-making in EBP is therefore based on building a shared understanding of the difficulties and a collaborative process of setting a therapeutic goal (Wilson & Betteridge, 2019). It also requires the clinician to analyze whether the outcomes of the studies correspond to the patient's objectives and to discuss with the patient the different treatment or assessment options and the potential costs and benefits of each one (APA Presidential Task Force on Evidence-Based Practice, 2006; Coulter & Collins, 2011; Spring, 2007). EBP is therefore a person-centered approach that promotes shared decision-making and the role of the patient-partner rather than the paternalization of care (Sackett et al., 1996). The involvement of the patient in the choice of treatment is fundamental because it improves motivation and compliance, and thus the chances of success (Cicerone et al., 2000; Wilson & Betteridge, 2019). The chosen treatment must also be in line with the context in which the intervention takes place, whether in the broad sense (e.g., reimbursement terms) or the narrower context (patient's ability to travel, care center's resources, clinician's schedule, etc.). Finally, the neuropsychologist's expertise is another crucial source of information. It will help them to regroup and adapt their treatment according to changes in the context and the patient's needs or reactions (Davison & Lazarus, 1995). Following the case-based approach proposed by Tonelli (2006), clinical judgement resides in the clinician's ability to evaluate the different data and adjust their relative weighting according to the specific case to be treated. Expertise allows for a fair balance between the various accumulated elements of evidence. Indeed, clinicians need to acquire and develop the skills to interpret and apply research evidence appropriately to the circumstances in order to do the right thing (Haynes et al., 2002). Sometimes a neuropsychologist may attach less weight to research by favoring a treatment that is necessarily the most effective one because it allows for adaptation to certain patient characteristics or preferences. For example, a clinical neuropsychologist and a child's parents may decide together to limit themselves to parental guidance and possibly delay attention training for a child who is unmotivated or already spends too much time on care at the expense of leisure activity.

The last stage is the evaluation of the practice (Assess). The neuropsychologist is encouraged to ask whether the treatment chosen was effective and whether the effects observed are indeed due to the treatment. This is also part of the clinician's expertise (Davison & Lazarus, 1995). Indeed, the clinical neuropsychologist may be subject to interpretation bias and pay attention to evidence that confirms their hypothesis of effectiveness of the intervention implemented (Kahneman et al., 2011). Baselines have been established to overcome this bias. A self-assessment by the neuropsychologist of the completeness of their approach and ability to implement the different steps is recommended. Although the EBP approach is often presented in a structured way, its daily use does not require the adoption of a formal and strict grid. For example, due to lack of time, uncertainty is sometimes only transformed into an information-seeking in hindsight.

Despite the popularity of EBP and the large number of articles and books in neuropsychology defining the principles summarized previously (e.g., Bilder, 2011; Bowden, 2017; Chelune, 2010), little is known about the knowledge, understanding, and implementation of this approach in everyday clinical practice, and to our knowledge, nothing has been published about EBP use by neuropsychologists specifically. However, some surveys have been conducted among psychologists as a whole, without specifically considering clinical neuropsychologists' knowledge and attitudes toward EBP in psychology. The first studies, dating from almost 20 years ago and carried out in the USA, showed that US psychologists were not yet familiar with the concept of EBP (Aarons, 2004) and could not give a precise definition of this approach (Wilson et al., 2009). There was confusion between EBP and the concept of empirically supported treatment (Pagoto et al., 2007; Spring, 2007; Wilson et al., 2009), which refers to intervention procedures created and tested for specific disorders (Westen et al., 2005). More recently, a study carried out in Australia indicated that only 60% of the psychologists surveyed could provide a comprehensive definition of EBP (Hamill & Wiener, 2018). Even less encouraging results were obtained in Europe. In Belgium, only 33% of the surveyed psychologists knew the definition of EBP and 33% had never heard of the approach (Blause et al., 2021).

A recent study found that engagement in EBP is a priority for mental health practitioners (Meyer et al., 2020). However, some clinicians express concern about the difficulty of implementing EBP in their practice (Wilson et al., 2009). Logistical difficulties, lack of training and lack of knowledge are often mentioned as barriers (Haider & Dunstan, 2019; Juriševič et al., 2019; Pagoto et al., 2007). This is particularly evident for the use of the research pillar, which, as we have just described, requires many skills related to literature searches and scientific research methodology (Rousseau & Gunia, 2016; Straus et al., 2019).

Clinicians report not having these skills and lacking access to resources (Blause et al., 2021; Echeburúa et al., 2010), which constitute barriers to the use of valid scientific data in the clinic (Barlow, 2005; Blause et al., 2021; Chan et al., 2013; Kazdin, 2008). Thus, psychologists base their practice and clinical decisions more on the experience and advice of their peers than on scientific articles (Gyani et al., 2014; Gyani et al., 2015; Stewart & Chambless, 2007).

However, these data have been obtained in other fields of psychology, and attitudes and knowledge toward EBP among clinical neuropsychologists remain unknown (or poorly known). Consequently, the aim of this study initiated by OFPN and supported by the Société de Neuropsychologie de Langue Française[1] (SNLF) (two professional and scientific associations for French-language neuropsychologists) is therefore to take stock of neuropsychologists' knowledge of EBP and its pillars. The aim was, first, to find out if neuropsychologists believe they use EBP in their daily practice and, second, to investigate if they really use it by questioning them about their information-seeking behaviors and recording the data that guide their decision-making. The use of the research pillar was investigated in order to obtain information on neuropsychologists' research, reading, and analysis behaviors as well as on the potential barriers they perceive. Exploratory analyses were also carried out to investigate potential links between knowing about EBP and thinking about using it, between thinking about using it and actually using it, and also between using the "research" pillar and perceiving barriers to using this pillar. Given that EBP in French-speaking psychology and thus in neuropsychology is relatively recent, we make the hypothesis that our results will be similar to those obtained during the first investigations carried out in the USA (Aarons, 2004; Pagoto et al., 2007; Wilson et al., 2009). However, given the scientifically based culture of neuropsychology, the question remains open.

Methods

Recruitment Procedure

Participants were recruited with a questionnaire distributed by email to French, Belgian, Swiss, and French-speaking Quebec neuropsychologists through the intermediary of various associations of neuropsychologists and psychologists (OFPN; SNLF; Quebec Association of Neuropsychologists; Swiss Association of Neuropsychologists; Belgian Association of French-Language Psychologists). The link to the questionnaire was also posted on the University of Liège's social networks and was emailed to neuropsychologists working with this university. The questionnaire was freely available; however, a description of the target audience was mentioned. The inclusion criteria were that the participants practice in French as neuropsychologists and hold at least a master degree. Note that in France and Belgium, the training of clinical neuropsychologist consists of a 3-year bachelor degree and a 2-year master degree. Contrary to the USA, the obtaining of a doctorate is not a requirement to exert clinical neuropsychology, the majority of the French and Belgian neuropsychologists having only a master degree. In Canada, in order to practice as a clinical neuropsychologist, the curriculum is completed within a 1-year clinical residency crowned by a clinical doctorate. In Switzerland, a supervised practice is required but does not give access to a doctorate. We did not include a criterion regarding the number of years of experience or the practice setting. The French-speaking neuropsychologists were invited to complete an electronic survey via an internal system at the University of Liège that complies with European data protection standards. The survey was available for 2 months (mid-December 2020 to mid-February 2021). At the beginning of the questionnaire, the participants gave their agreement for their responses to be used in this study. The ethical committee of the University of Liège gave its approval for this survey to be carried out (reference: 3482).

Questionnaire and Procedures

The questionnaire consisted of 39 multiple-choice questions (see Appendix). The first section contained 11 questions designed to obtain demographic information. A second section of 13 items concerned beliefs and knowledge about EBP and its pillars. A third section with 6 questions concerned the information consulted in clinical situations. The fourth and final part of this questionnaire focused on research behavior and critical reading of scientific data and contained nine questions. The questionnaire was designed by three researchers (S.W., G.W., and S.B.) based partly on two previous online surveys (Blause et al., 2021; Durieux et al., 2018). This survey was founded exclusively online and the validity has been assured theoretically. A pre-test was carried out by three researchers familiar with EBP to ensure that the questionnaire was complete and that there were no

1 The society for French-language neuropsychology.

operational or content-related problems. Given the exploratory nature of our work, our sample size was not determined a priori, simply hoping for the largest possible number of respondents.

Data Analysis

The data were directly exported in CSV format from the University of Liège electronic survey system. The results will be expressed in terms of amounts (*N*) and proportions (%).

In order to obtain additional information, six exploratory analyses will be carried out. For this purpose, the data of interest will be imported into the statistical software R and six exploratory statistical tests will be performed. A Pearson chi-square test with Yates' continuity correction will explore the relationship between knowledge of EBP (see question 29 of the questionnaire) and the feeling of using it (question 37). The same test was used to explore the relationship between the degrees of the respondents (PhD, Master, and PsyD) and the familiarity with the term of EBP (question 27). Three one-tailed Welch's two-sample *t*-tests will assess the possible differences between the feeling of use and the good practices of each pillar. If the normality of the data distribution is not respected, the non-parametric equivalent of these tests will be performed (Wilcoxon rank-sum test). Finally, a Pearson product–moment correlation will explore the relationship between good practices in the research pillar and the number of perceived barriers[2] (question 18).

To create a "good practice score," we selected the different items in the questionnaire that indicated behaviors in line with EBP principles and grouped them by pillar. The selection of these items was carried out by two of the authors (S.B. and S.W.), mastering the principles of EBP, based on a theoretical congruence. The items included in the good practice score for the "research" pillar are indicated in the questionnaire with an asterisk. The maximum score is 28 and the minimum score is 0 (e.g., "When you read a scientific article, do you usually read it in full?" or "Do you search (in English) a specialized database (e.g., PubMed) to find scientific articles?"). The items included in the good practice score for the "patient" pillar are indicated in the questionnaire with a double asterisk. The maximum score is 5 and the minimum score is 0 (e.g., "A patient's values influence my choice of treatments and tools" or "A patient's treatment preferences are paramount to the decision"). The items included in the good practice score for the "expertise" pillar are indicated in the questionnaire with a triple asterisk. The maximum score is 8 and the minimum score is 0 (e.g., "The clinician must take a scientific approach to observe whether treatments and tools work" or "The placebo effect is a factor to be considered in the outcome of the intervention"). For each selected item, a participant was given a score of 1 if they reported implementing this good behavior in their clinical practice and 0 if they did not. By adding up the different items, we obtained a "good practice score" for each pillar. The higher the "good practice score," the more the respondent reported using behaviors in line with EBP. It should be noted that a "good practice score" for "context" could not be calculated because there were too few items in our questionnaire relating to this pillar. In addition, only participants who answered all the items included in the calculation of the total score per pillar were retained in the analyses.

Results

The results of this study are presented in five parts. The first one concerns the respondents' profile. The second part will present the neuropsychologists' general knowledge and attitude toward EBP and its pillars. The third part concerns the information the neuropsychologists used in their daily practice. Hence, special attention is paid to scientific research. Neuropsychologists' research behavior and their reading and integration of scientific literature in their practice are the subjects of the fourth part. The fifth and final part deals with exploratory analyses.

Participants and Demographic Data

The survey was sent to neuropsychologists with the help of five professional associations and a total of 5,043 emails were sent. The university of Liège also sent 39 emails. However, as the survey was freely available on social networks, it is not possible to estimate precisely how many people had access to the survey. However, we know that 1,161 people clicked on the survey link to access general information about the study. Among these people, 392 neuropsychologists (representing 7.7% of affiliated neuropsychologists) opened and/or started to complete the survey. Only participants who answered more than the 11 demographic questions were included in this study. Participants who answered only the demographic questions or even fewer were excluded ($n = 7$).

2 A total score was calculated by counting the number of perceived barriers for each participant. Max score = 10; min score = 0.

Table 1. Demographic data on participants

Demographic data	*N*	%
Gender (n = 384)		
Female	322	84
Male	62	16
Number of years of practice in neuropsychology (n = 385)		
10 years or less	206	54
More than 10 years	179	46
Country of practice (n = 385)		
France	272	71
Canada	58	15
Belgium	41	11
Switzerland	16	4
Other	3	1
Diploma (n = 385)		
Master degree's in neuropsychology	293	76
Non-specialized master's in neuropsychology	27	7
DESS before 2000 and at least 10 years of practice in neuropsychology	14	4
PhD	72	19
Clinical PhD	17	4
Additional university degree	77	20
Other	17	4
Function (n = 385)		
Neuropsychological assessment	370	96
Neuropsychological rehabilitation	264	69
Expert reports	70	18
Coordination of a team of professionals	60	16
Teaching at university	115	30
Providing training	134	35
Supervisor	35	9
Training supervisor	223	58
Research	93	24

The first group of survey results pertained to respondents' personal demographic information and educational backgrounds. Of the people included in this study (Table 1), 84% were women and 16% were men. Most of the neuropsychologists interviewed worked in France (71%), while some worked in Quebec (15%) or Belgium (11%); the rest of the sample worked in Switzerland (4%) or in other French-speaking countries such as Luxembourg (1%). As regards the number of years of practice, 46% had been working for more than 10 years. Most of the sample had a master's degree in neuropsychology (76%), 4% had a clinical PhD, and 19% had also obtained a PhD. Concerning the type of clinical activity carried out within the practice, 96% of the neuropsychologists were involved in neuropsychological assessments, 69% in cognitive rehabilitation, and 18% in neuropsychological assessments to provide expert reports. Many were involved in student training (61% were clinical supervisors, 35% participate in training courses, 30% lecture at a university), 24% carried out research, and 16% coordinated a team of professionals.

Knowledge and Attitudes toward EBP and Its Pillars

As Table 2 shows, 34% of the respondents had never heard of EBP. Only 42% provided a correct definition of EBP, either by listing the four pillars included in the most recent definitions (37%) (Hoffmann et al., 2017; Satterfield et al., 2009; Straus et al., 2019) or by mentioning three of the four pillars (5%), as in the definition proposed in 2006 by the APA (APA Presidential Task Force on Evidence-Based Practice, 2006, p. 273). Furthermore, of those participants who were familiar with the term but did not recognize the full definition of EBP, most felt that EBP focuses mainly on the "research" pillar (46%). Furthermore, no link was found between knowledge of the term EBP and the degree obtained by the participants (PhD, Master, and Clinical PhD) ($\chi^2(2) = 4.615$, $p = .1$, V de Cramer = 0.125).

Participants' knowledge of the four pillars of EBP was then investigated after they were given a brief definition of EBP. First, participants were asked what they thought made up the "research" pillar. Only half of the sample was able to specify that different experimental designs can be used depending on the clinical question. Regarding the "clinician's expertise" pillar, of

Table 2. Participants' knowledge and attitudes

Questions about attitude and knowledge of EBP									*N*	*%*
Familiar with the term EBP (n = 330)	***France (n = 272)***		***Belgium (n = 41)***		***Switzerland (n = 16)***		***Canada (n = 58)***		Total	
	N	***%***	***N***	***%***	***N***	***%***	***N***	***%***		
Yes	178	65	35	85	15	94	46	79	219	66
No	94	35	6	15	1	6	12	21	111	34
EBP's main focus is on... (n = 219)										
Data from scientific research									101	46
Clinician's expertise									18	8
Patient's specificity									20	9
Context of care									7	3
The integration of the four previous elements in equal parts									122	56
The "evidence from scientific research" pillar can be understood as... (n = 319)										
Empirically based treatments									146	46
Randomized controlled trials									207	65
Clinical guidelines									123	38
Systematic review or meta-analysis									190	59
Chapter or book									36	11
Case studies									86	27
The whole of the scientific literature, as some types of studies are more adapted than others depending on the question asked									158	50
I don't know									17	5
The "practitioner's clinical expertise" pillar can be understood as... (n = 319)										
Accumulated scientific knowledge									215	67
Ability to use accumulated scientific knowledge taking into account the specificity of the situation									258	81
Practice and clinical experience in making a diagnosis and assessing the risks of an intervention									269	84
Ability to assess effectiveness of approach									218	68
Ability to question oneself									235	74
Ability to be aware of one's biases									246	77
Interpersonal skills									163	51
Statistical and psychometric skills									135	42
Ability to assess effectiveness of intervention									217	68
I don't know									14	4
The "patient characteristics" pillar can be understood as... (n = 319)										
His/her difficulties									293	92
His/her values									233	73
His/her situation									237	74
His/her preferences									213	67
His/her goals									278	87
I don't know									14	4
The "context" pillar can be understood as... (n = 319)										
Clinician's characteristics									189	59
Patient's characteristics									212	66
Financial resources available to the patient									156	49
Legislative framework									167	52
Social climate									184	58
Available infrastructures									203	64
Economic context and the financing of care									204	64
Patient's family context									207	65
I don't know									36	11
EBP is an approach that is... (n = 314)										
Indispensable									112	36
Interesting									87	28
Interesting but difficult to apply to the reality on the ground									51	16
Dangerous for the profession/not suitable for the profession of psychologist									0	0
I don't know enough about this approach to make a judgement									64	20
Attitude to EBP										
My daily practice can already be described as EBP *(n = 309)*									173	56
I intend to learn more about EBP by reading *(n = 309)*									250	81
I intend to train in EBP *(n = 307)*									163	53
I plan to adopt an EBP approach in my clinic *(n = 306)*									263	86
I plan to learn about EBP by reading within the next 12 months *(n = 309)*									237	77
I have the necessary resources for an EBP approach *(n = 308)*									156	51
I have the necessary knowledge to apply an EBP approach *(n = 309)*									155	50
I have the necessary know-how to apply an EBP approach *(n = 305)*									167	55

Continued

Table 2. Continued

Familiar with the term EBP (n = 330)		
Yes	219	66
No	111	34
EBP's main focus is on... (n = 219)		
Data from scientific research	101	46
Clinician's expertise	18	8
Patient's specificity	20	9
Context of care	7	3
The integration of the four previous elements in equal parts	122	56
The "evidence from scientific research" pillar can be understood as... (n = 319)		
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The whole of the scientific literature, as some types of studies are more adapted than others depending on the question asked	158	50
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EBP is an approach that is. . . (n = 314)		
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Interesting but difficult to apply to the reality on the ground	51	16
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I have the necessary resources for an EBP approach *(n = 308)*	156	51
I have the necessary knowledge to apply an EBP approach *(n = 309)*	155	50
I have the necessary know-how to apply an EBP approach *(n = 305)*	167	55

all the information that this pillar includes, experience (84%) and the ability to take into account the specificities of the situation (81%) were the most frequently reported. On the other hand, only 42% of the sample mentioned statistical and psychometric skills. For the "patient characteristics" pillar, the patient's difficulties (92%), goals (87%), situation (74%), and values (73%) were widely mentioned. The patient's treatment preferences were the least reported characteristic (67%). Finally, the "context" pillar seems to be relatively unknown and little understood. More than 66% of participants could not report any specific type of information provided under this pillar.

Table 3. Participants' decision-making

Questions about decision-making	*N*	%
Elements that guide choice of tools		
Patient's values *(n = 333)*	241	72
Patient's preferences *(n = 330)*	253	77
Patient's context *(n = 332)*	230	69
Nature of the patient and their difficulties *(n = 330)*	317	96
Patient's objectives *(n = 332)*	309	93
Prior learning (training) *(n = 331)*	232	70
Prior learning (university) *(n = 333)*	139	42
Peer advice *(n = 333)*	275	83
Personal judgement *(n = 329)*	200	61
Experience is the best guide *(n = 330)*	186	56
Scientific research *(n = 332)*	210	63
Clinical guidelines *(n = 332)*	254	77
Steps taken to obtain information in situations of uncertainty		
Training *(n = 360)*	295	82
Personal library *(n = 357)*	337	94
Generalized search engine (e.g., Google) *(n = 360)*	342	95
Specific database (e.g., PsycInfo, Medline) *(n = 357)*	268	75
Public library *(n = 351)*	25	7
University library *(n = 352)*	77	22
Peer exchanges *(n = 360)*	316	88
Discussions with colleagues *(n = 359)*	332	92
Discussions with expert colleagues *(n = 359)*	240	67
Discussions with university experts *(n = 350)*	84	24
Delegating research *(n = 352)*	54	15
Baselines if the uncertainty concerns an intervention *(n = 351)*	74	21

With regard to attitudes, a large proportion of the sample reported that they intended to learn about EBP (81%). Some also intended to train in it (53%). A significant number of participants wanted to adopt this approach in their practice (86%) and more than half of the sample considered that they were already using this approach (56%). However, only 36% of the participants considered that EBP is an essential part of good clinical practice.

Practice and Information-Seeking Behaviour

The participants were questioned about their clinical practice (Table 3). They were asked what elements guided their choice of clinical methods. Information about the patient was widely mentioned: the patient's difficulties (96%), their goals (93%), their preferences (77%), their values (72%), and their context (69%). Other widely used sources of information include advice from peers (83%), whereas reading scientific articles was cited by only 63% of the sample, more or less at the same level as for personal judgement (61%). Experience is seen as the best guide in deciding which tool to use by 56% of participants.

The neuropsychologists were also asked about the steps they took to answer their questions when they were uncertain. More than 90% of the participants consulted search engines such as Google (95%), looked for information in their personal library (94%), or sought advice from colleagues (92%). The use of specific databases such as Medline or PsycInfo was less cited (75%). In addition, only 21% of participants reported implementing efficiency measures when they were unsure about intervention outcomes.

The Place of Scientific Research in Practice and Critical Reading

In order to understand what might hinder and prevent neuropsychologists from making greater use of the scientific literature in their practice, the participants were asked about perceived barriers (Table 4). Only 10% did not perceive any barrier to obtaining relevant scientific information. Lack of time (59%) and lack of access to resources (51%) were the most reported barriers.

Next, how the neuropsychologists in this study read scientific articles was addressed. More than half (55%) did not read the entire article. The abstract was the most widely read part (92%), followed by the conclusion (76%) and the discussion (71%). However, few respondents reported reading the introduction (41%), the method (45%), or the description of the measuring instruments used (39%).

Table 4. Participants' reading of scientific articles

Questions about reading behaviors	*N*	%
Barriers to obtaining appropriate scientific information (n = 352)		
No barriers	34	10
Lack of time	207	59
Language	91	26
Lack of computer or internet	1	1
Lack of data in the field	65	18
Lack of useful data for practice	60	17
Lack of access to resources	180	51
Lack of mastery of research tools	58	16
Lack of knowledge of research tools available	58	16
Difficulties selecting relevant documents	77	22
Difficulties assessing the quality of information	76	22
Other	32	9
Reading scientific articles in their entirety (n = 349)		
Yes	158	45
No	191	55
What parts of scientific articles are read (n = 191)		
Abstract	176	92
Introduction	79	41
Method	86	45
Measurement tools	75	39
Results	100	52
Discussion	135	71
Final conclusion	146	76
When reading about an intervention, pay attention to. . .		
p*-Value *(n = 349)	261	75
Effect size *(n = 349)*	224	64
Confidence interval *(n = 347)*	233	67
When reading about an assessment tool, pay attention to. . .		
The composition of the norms *(n = 350)*	342	98
Age of the norms *(n = 349)*	337	97
Inter-rater reliability *(n = 347)*	217	63
Test–retest reliability *(n = 349)*	260	75
Internal consistency *(n = 348)*	215	62
Standard measurement error *(n = 346)*	230	66
Sensitivity and specificity *(n = 348)*	301	86
Theoretical validity *(n = 349)*	305	87
Presence of bias in research		
Aware of this bias *(n = 350)*	329	94
Faith in research *(n = 350)*	211	60
Importance of accounting for bias *(n = 350)*	344	98
Competence to identify them *(n = 349)*	175	50
Taking this into account *(n = 349)*	246	70
The results of scientific articles are. . . (n = 350)		
Directly usable and applicable in practice	20	6
Not directly usable and require work to deduce the implications in practice	144	41
Usable but a section on "clinical implications" would be useful	186	53

When participants were asked what they paid attention to when reading the results of an article about an intervention, 75% mentioned the *p*-value and only 64% said they paid attention to the effect size. When the subject of the article was assessment tools, more than 95% of the participants reported reading the composition and the age of the norms; many were also interested in the study's theoretical validity (87%), sensitivity and specificity (86%), and test–retest reliability (75%). The standard measurement error (66%), inter-rater reliability (63%), and internal consistency (62%) were less taken into account.

The participants in this survey were asked about biases in the scientific literature. Although 94% of the respondents were aware of such biases in research, only 70% tried to take them into account when reading a scientific article, 60% felt that they had to trust the researchers, and 50% reported that they did not have the skills to perform this analysis.

Regarding the perceived relevance of the results reported in scientific articles, 6% of participants considered information to be directly applicable in practice. For 41%, these results required personal work to deduce the possible applications. For 53%, a section in a study on clinical implications would be necessary.

Link between Knowing EBP and Using It

Knowing about EBP does not entail that participants think they use it, as indicated by Pearson's chi-squared test with Yates' continuity correction ($\chi^2 = 0.01$; $df = 1$; $p = .9$). Wilcoxon rank-sum test with continuity correction comparing participants who thought they used EBP and those who did not indicated a large and significant difference on "good practice score" for the "research" pillar ($n = 300$) (Thinkuse[3] $\mu = 20.87$, $\sigma = 3.99$; Thinkdontuse[4] $\mu = 18.03$, $\sigma = 4.55$; $W = 6{,}014$; $p < .001$; *Cliff's delta* = 0.501); a moderate and significant difference on the score for the "patient" pillar ($n = 327$) (Thinkuse $\mu = 4.18$, $\sigma = 1.09$; Thinkdontuse $\mu = 3.95$, $\sigma = 1.15$; $W = 6863.5$; $p < .001$; *Cliff's delta* = 0.337); and a moderate significant difference for the "expertise" pillar ($n = 310$) (Thinkuse $\mu = 4.88$, $\sigma = 1.35$; Thinkdontuse $\mu = 4.3$, $\sigma = 1.21$; $W = 7{,}643$; $p < .001$; *Cliff's delta* = 0.418). Finally, a significant negative correlation was observed between the "research" pillar practice score and the number of perceived barriers to obtaining relevant scientific information ($r = -.40$; $p < .001$).

Discussion

The objectives of this study were to learn more about neuropsychologists' knowledge and attitudes toward EBP and to obtain information about their perceptions and behaviors related to each pillar of EBP. In addition, information-seeking and scientific article-reading behaviors as well as the perceived barriers of our sample to this type of behavior were also investigated.

This survey suggests that evidence-based practice is still little known in our sample of 384 French-speaking neuropsychologists. These results are similar to what has been observed previously in surveys of psychologists (e.g., Aarons, 2004; Wilson et al., 2009). First, only one third of the sample was able to recognize that EBP represents the integration of different pillars, one third of the respondents had never heard of this approach, and the last third was simply familiar with the term without being able to fully define what it means. Second, a significant proportion of participants perceived research as having a more important role than the other pillars (for similar observations, see Luebbe et al., 2007; Pagoto et al., 2007; Spring, 2007; Wilson et al., 2009). This position is shared by several (e.g., Lilienfield et al., 2013) but not by all authors (Levant, 2004; Thyer & Pignotti, 2011). All emphasize close, thoughtful integration of the best available research data with clinical expertise and client preferences/values. In this regard, EBP differs from the empirically based treatment approach, which emphasizes the research pillar and treatment efficacy. In spite of this patchy knowledge, we observe a rather encouraging attitude in our sample. Indeed, as in other studies, although some of the respondents felt that EBP is difficult to implement in their daily practice, most considered EBP to be an interesting, even indispensable, approach (Meyer et al., 2020). The participants also expressed their desire to be informed and trained in this approach (for similar findings, see Blause et al., 2021). However, the participants were not yet really engaged in implementing change (Prochaska & DiClemente, 1984), because they seemed to be considering training but in the long term, rather than taking any current or short-term concrete actions.

We will now examine the perceptions and behaviors associated with each pillar. Regarding expertise, participants recognized that it is a multifaceted concept. They mentioned accumulated scientific knowledge and clinical experience (to make diagnoses and assess the risk of an intervention) as primary components. Three-quarters of the participants also identified the ability to question themselves and awareness of their own biases. Consistently, a significant number of participants also emphasized the ability to evaluate the effectiveness of an approach or intervention (68%). Surprisingly, we note that only 50% of the respondents selected interpersonal skills as an important part of this pillar. This again underscores the predominant place of research in the participants' view of EBP, yet this is a key element of expertise (Hoffmann et al., 2017). Finally, it might be surprising to find that psychometric and statistical skills are selected less often. These skills are recognized as being essential for the informed use of evaluation tools and critical reading of the literature (e.g., Chelune, 2002).

As regards the "patient" pillar, data inform us that the neuropsychologists understood that this pillar is not limited to the patient's characteristics and difficulties but also includes their values and goals. Many researchers and clinicians (Krasny-Pacini & Evans, 2018; Wilson & Betteridge, 2019) have emphasized the importance of developing goals early and throughout the care process. Nevertheless, patient preference is the characteristic our respondents reported least often, even though it is at the ethical heart of the EBP approach (Sackett et al., 1996). EBP and shared decision-making with the patient are interdependent. After finding and evaluating the evidence and integrating their findings into their expertise, neuropsychologists must attempt to make

3 Participants who are already thinking of using EBP in their practice.

4 Participants who think they do not use EBP in their practice.

a decision that achieves their patient's goals. This should be reflected both in treatment decisions and in neuropsychological assessment. The patient must be included in the reflection on what should be assessed, when and how, but also on the necessity of doing so. Discussing the advantages and disadvantages of carrying out several testing sessions or, conversely, of not assessing allows the patient to be included in the decision (cf. Gorske & Smith, 2009). This is probably the most complex step and requires a partnership with the patient and their family. Preferences and shared decision-making receive the least attention in the literature. This has led to a common criticism that EBP is moving away from a person-centered approach.

Finally, we shall focus on the "research" pillar, which a significant proportion of our participants perceived as being central to EBP. For most of them, this pillar involved referring only to certain types of experimental design (RCT: 65%; systematic review: 59%). Single-case studies were rarely selected as a relevant source of evidence (27%). This observation may result from a misinterpretation of the proposed hierarchies of levels of evidence (in which we find, for example, RCTs at the top of the pyramid for intervention) (Agoritsas et al., 2015; OCEBM, 2011; Greenhalgh, 2010). This type of ranking does not mean that data at the bottom of the pyramid are unusable. Depending on the question asked by the clinician, less controlled types of studies can sometimes be relevant to a given case. Uncontrolled case studies, for example, though not often cited by our sample, can be an appropriate resource and play an important role in evidence-based clinical practice in neuropsychology. Indeed, uncontrolled case studies allow can generate new hypotheses, or on the contrary challenge general theories. They can also inform the practitioner on how to proceed with a particular individual, apply known concepts in a new way, or illustrate unique situations (Davison & Lazarus, 2007). However, it is true that uncontrolled case studies have certain limitations, such as the fact that it is more difficult to generalize the results obtained, to establish a cause-and-effect relationship, and to control for the placebo effect. Some authors therefore suggest the use of controlled single-case experimental designs (SCEDs) to overcome these problems by opting for a more robust methodology (Perdices & Tate, 2009). Controlled case studies can be conducted in different ways that are constructed on the basis of rigorous scientific methodology (Lanovaz & Rapp, 2015; Manolov et al., 2014; Perdices & Tate, 2009). The basic principle of this type of study is that the effect of a treatment can be assessed by evaluating a reliable and repeated baseline. The validity of the results produced by well-designed SCEDs is increasingly accepted in many domains and reach the same level of evidence as other controlled studies (Davison & Lazarus, 1995; Hawkins & Axelrod, 2008; Tate & Perdices, 2015). In recent years, several journals have devoted special issues to single-case methodologies (e.g., Evans et al., 2014).

Now that the participants' knowledge of EBP is better understood, we shall examine the practices of the neuropsychologists surveyed and their information-seeking behaviors. As other studies have shown as well, of the different kinds of information that guide decision-making and are used in situations of uncertainty, scientific research often took a back seat to information from participants' practice such as discussions between colleagues, advice from peers or general internet research (Barlow, 2005; Blause et al., 2021; Chan et al., 2013; Kazdin, 2008). This emphasis on evidence from practice and peer experience is consistent with studies in other disciplines (Lenne & Waldby, 2010; McCurtin & Clifford, 2015). However, reasoning based on practice or experience should require careful interpretation, as it can be misleading (Lilienfield et al., 2013).

Difficulties in implementing EBP-suitable information-seeking behaviors in everyday life may be due to the perceived barriers to obtaining quality scientific information, especially lack of time and resources (for similar results, see Echeburúa et al., 2010). In addition, a negative correlation between correct scientific search use and perceived barriers suggests that the more one the correct information-seeking behaviors are mastered, the fewer barriers are perceived. One explanation could be that the people who perceive many barriers are also the ones who do not conduct appropriate searches, which can lead to false beliefs.

Beyond the search for scientific information, the critical reading of articles also seems questionable. Indeed, more than half of the sample did not read the articles they consulted entirely. Parts that are essential for understanding and critical analysis were often left out. Importantly, when the article is about an intervention, we found that participants paid less attention to the effect size than to the *p*-value, which alone provides little information about a study's clinical relevance. When scientific articles concern evaluation tools, we observe that essential data (APA: https://www.apa.org/science/programs/testing/standards) also tended to be ignored, such as the measurement error. These observations echo the results of Betz and coworkers (2013), who found that the psychometric quality of tests has little influence on the frequency of their use by speech-language pathologists.

Apart from the content of these articles, methodological biases exist in the scientific literature (lack of blinding, sample size calculation, random assignment, etc.). These can only have a detrimental impact on the quality of a study and its results. Being aware of the existence of these biases and taking them into account when reading articles is essential for understanding the implications of these articles for practice. Although almost the entire sample was aware that biases exist in the literature, they did not necessarily take them into account. Indeed, barely 50% of respondents felt they had the skills to do so. This observation is in line with our hypothesis that neuropsychologists are not trained to read articles critically. It should be noted that, in addition to this, a large proportion of the participants considered the scientific literature to be not entirely applicable to their practice.

To our knowledge, this is the first study to look at the place of EBP in neuropsychologists' practice. Overall, the results obtained in this study tend to show, like those of Pagoto and coworkers (2007), that the lack of knowledge and sometimes negative attitudes regarding EBP may be due to a lack of training in this practice.

Teaching EBP as part of continuing education seems important. However, it would also be interesting to explore university curricula in order to assess the place of this approach and the knowledge that future neuropsychologists will have and potentially suggest ways to flesh out the course programs by integrating EBP. This investigation seems all the more important given that the sample of this study contains many neuropsychologists involved in student training, which makes our results all the more worrying. The number of years of study and having a clinical or research doctorate seem unrelated to being familiar with EBP. EBP is not part of the compulsory fields to be taught in psychology or neuropsychology in Belgian, Swiss, and French universities. The knowledge of this practice is, however, required in Quebec to access the psychology accreditation. It should be noted that the Quebecers do not seem to be more familiar with the term EBP than the other participants in this study, even if their small number does not allow for further investigation (Table 2). Although our focus on French-speaking countries does not allow us to generalize our results, they nevertheless show the importance of including this approach in the neuropsychology courses (Principles for Training in Evidence-Based Psychology | Society of Clinical Psychology, 2014) and EBP could even be included, as it is in Canada, as a compulsory subject in university courses in all countries. Quality training would have a positive effect on health professionals' understanding, beliefs, and use of EBP (Babione, 2010; Bearman et al., 2015; Pagoto et al., 2007; Wilson et al., 2009). In particular, this study has enabled us to identify certain information-seeking and critical reading behaviors that do not yet seem to be well acquired or that are hampered by a number of barriers and that could therefore serve as a basis for improving training (with training courses on the use of specific databases, risk of bias analysis, interpretation of effect sizes, etc.) in the French-speaking world, but not only. Making scientific articles more freely accessible to clinicians would also help to improve these behaviors and reduce perceived barriers. It should also be noted that a study proving the interest of EBP in neuropsychology could also be interesting in order to have concrete evidence of the added value of this practice both for the neuropsychologist (reduction of the feeling of uncertainty, help in decision-making, etc.) and for the patient (improvement of care, inclusion of his/her opinion in clinical decisions, etc.). This could increase the motivation of neuropsychologists to learn more about this approach.

This study has several limitations. First, we do not have any information about neuropsychologists who received the link to the questionnaire but did not respond. Therefore, no response bias could be calculated. Furthermore, information about the practice of the participants was only obtained through multiple-choice questions. Therefore, we cannot say that what the participants say they do in their daily practice is what they actually do. Another limitation of multiple-choice questions is that we provide through the different options elements of answers that the respondents might not have been able to come up with on their own. This has the potential effect of overestimating the knowledge and practice of EBP in our sample. In addition, the use of EBP was assessed through good practice scores. These scores were reflected on after the survey was carried out and should, in the future, be reflected on beforehand in order to carry out a confirmatory factor analysis. Another limit is that the survey was online. Only people who had a computer and access to social network or to email could respond. However, given our population of interest and the importance of technology in the field of health care and in the interviewed country, the risk of sampling bias could not be so high. Another problem related to the fact that it is an online survey is that the sampling can be categorized as non-probability. Indeed, estimators of the population parameters cannot be calculated because it is not possible to know the inclusion probabilities and therefore to use probability sampling. Unfortunately, we could not overcome this limitation. We can also consider as a limitation the fact that we included in our sample neuropsychologists practicing in different countries. Although it is not uncommon to conduct a survey with different nationalities (i.e., Fontesse et al., 2021; Lemercier-Dugarin et al., 2021), it would be informative to conduct such a survey in each of the countries surveyed in this study in order to obtain more specific data. However, the aim of this survey was to obtain an overview, a general idea, of the knowledge and use of EBP among French-speaking neuropsychologists. Finally, with regard to the attitudes and behaviors of the neuropsychologists surveyed for this research, we focused in this study on what might explain the gap that exists between clinical practice and research. We have been able to obtain some answers on the steps that could be taken by and for neuropsychologists that can contribute to reduce this gap. Complementarily, it also obviously important to investigate what could be done on the research side.

To conclude, EBP represents an opportunity for clinicians to improve patient care. It is also an approach that can guide clinicians in situations of uncertainty and discomfort. However, this survey showed that there is a lack of knowledge about this approach. It also revealed that neuropsychologists have difficulty implementing behaviors consistent with EBP principles, especially in scientific research. These results are similar to those obtained in studies of psychologists. Furthermore, we could see that knowledge of EBP was not necessarily synonymous with applying it in one's daily practice. In light of these data and taking into account the participants' motivation to learn more about the subject, strengthening the initial academic program in neuropsychology and providing continuing education that is practical and coherent with neuropsychologists' needs seem relevant and essential. In addition, to help neuropsychologists overcome perceived barriers to the implementation of EBP in their practice,

the development and dissemination of EBP point-of-care resources should be considered. In particular, it would facilitate the implementation of the "research" pillar in clinicians' practice by providing summaries of the best available research data on a specific clinical topic (Banzi et al., 2010). Several EBP Point-of-Care resources already exist (UpToDate, BMJ Best Practice, JBI COnNECT+, Clinical Evidence, etc.) (Campbell et al., 2015). However, none of these resources specifically addresses neuropsychology. Filling this gap would be of real value for clinicians and their patients.

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Conflict of interest

None declared.

Author contributions

Sacha Blause (Data curation, Methodology, Writing—original draft), Ezio Tirelli (Methodology, Writing—review & editing), Stéphane Raffard (Conceptualization, Writing—review & editing), Grégoire Wauquiez (Conceptualization, Methodology, Project administration, Writing—review & editing), Vincent Didone (Formal analysis, Supervision, Writing—review & editing), and Sylvie Willems (Conceptualization, Methodology, Project administration, Writing—review & editing).

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Data availability

To obtain the complete data file, please contact Sacha Blause.

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