Social cognition in neuropsychology: A nationwide survey revealing current representations and practices

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Abstract

As a key domain of cognition, social cognition abilities are altered in a wide range of clinical groups. Accordingly, many clinical tests and theories of social cognition have been developed these last decades. Contrasting this abundant development from a research perspective, recent evidence suggests that social cognition remains rarely addressed from a clinical perspective. The aim of the present research was to characterize the current practices, representations, and needs linked to social cognition from the perspective of professional neuropsychologists and graduate students. A nationwide survey allowed us to determine the classical field conception of social cognition and its associated symptoms or notions. It also allowed us to quantify practice activities and the uses of the different clinical tools available. Finally, this study revealed that neuropsychologists lack confidence regarding social cognition assessment and its rehabilitation, and that students are in demand for more knowledge and training. Suggestions of change in practices and dissemination of knowledge are discussed. Considering the importance of social cognition, an extension of initial and continuous training alongside an enrichment of interactions between researchers and clinicians were key recommendations to formulate, as well as the need for a consensual lexicon of current concepts.

Keywords: Social Cognition, Neuropsychology, Current Practices, Theory of Mind, Emotion, Empathy

Introduction

The last few decades saw the striking growth of clinical neuropsychology (Grote & Novitski, 2016) occurring in parallel to significant psychological science advances as well as an increased awareness of the health conditions affecting the brain. Although the prevalence and impact of these brain disorders is quite similar throughout the world, the development of neuropsychology has mostly taken place in rich countries such as in Europe, Australia or North America (Hessen et al., 2017). In France for example, from 2000 to 2016, the number of postgraduate trainings authorized to deliver the title of psychologist with a specialization in neuropsychology rose from 4 to 25 (Cazin, 2013, Bronco-lopes et al., 2021). As a consequence, the latest estimation of the number of neuropsychologists in France performed by the French National Association of Neuropsychologists was approximately 5,000 in 2016 (Ponchel, 2016) which globally corresponds to a tenth of all French psychologists (Schneider & Mondiere, 2017).

In parallel, the development of experimental efficiency tests relevant to interpersonal skills significantly increased by the end of the last century (e.g. Baron-Cohen et al., 1997, Young et al., 1996; see Quesque & Bertoux, 2022 for an historical perspective). Twenty years later, some have been adapted to clinical practice and used to quantify social cognition. Social cognitive abilities have been found to be altered among different clinical groups (Cotter et al., 2018) and appropriate measures could have a key role in measuring adaptive social behavior in varied populations encompassing psychiatric, neuro-degenerative, developmental, and somatic conditions (Cotter et al., 2018; Kennedy & Adolphs, 2012). The systematization of the evaluation of social cognition abilities during neuropsychological assessments then appears to be of utmost importance. This is especially true as deficits in this domain lead to varied interpersonal difficulties that have been recognized as potentially more incapacitating than traditionally assessed cognitive deficits (Fett et al., 2011; Henry et al., 2016), often deeply impacting both the patient's and their relatives' quality of life. The psychiatric and neurologic literature indeed reported that lower emotion recognition skills predict depressive, anxiety and psychotic symptoms (Santamaria-Garcia et al., 2020) and are significantly related to caregivers' burden in a context of early Alzheimer's disease or mild cognitive impairment (Spitzer et al., 2016). After a traumatic brain injury, patients' caregivers' satisfaction was also found to be significantly predicted by patients' score on the faux pas test, assessing mentalizing abilities (Bivona et al., 2015).

Staying up to date with the emerging knowledge, theories, practices, and instruments is a fundamental and universal competency of neuropsychologists (Hessen et al., 2017). In turn, researchers and academics should stay aware of the actual clinician's practices, representations, knowledge, needs and constraints to adequately tailor their research findings' dissemination. To date, however, how neuropsychologists apprehend social cognition in its theoretical and practical dimensions is unclear. One can observe that the neuropsychological assessment in applied settings focuses mostly on memory, executive functions and visuo-motor abilities (Piotrowski, 2017; Zucchella et al., 2018; Schroeder et al., 2019; Harvey et al., 2019),

therefore neglecting the social aspects of cognitive abilities, as well as emotional functioning (see also Priluck & Fedio, 2020). As an example, only 16% of US neuro-psychologists endorsed assessing social cognition after a brain injury (Kelly et al., 2017). While the relative rise of the social cognitive domain may be an obvious explanation to the latency observed in the shift of practice, it is unclear if, in the last twenty years, social cognition has gained in interest and importance in neuro-psychologists' training. Its inclusion by the DSM-5 (APA, 2013) as a principal domain of cognition may encourage practices to evolve, but it appears important to identify the major obstacles that may subsist for social cognition to be given the same weight than to any other domains in neuropsychology.

Indeed, beside its relative novelty, the explanations for this tendency to overlook social cognition abilities in classical neuropsychological practices remain unclear. Some hypotheses can be formulated. First, the field suffers from a lack of consistency of how social cognition is defined at the theoretical level, which could result in discrepancies among clinicians' represent-tations as well as practical difficulties regarding the assessment and rehabilitation in this domain. Supporting this claim, the structure of social cognition in all its complexity remains largely unknown, despite recent attempts (Happé, Cook, & Bird, 2017; Etchepare & Prouteau, 2018). This insufficient understanding of the functional architecture of social cognition is complexified by a highly heterogeneous vocabulary (different terms are used to depict a single process, e.g. "Theory of Mind", "Mentalizing", "Mindreading", etc.) which is nonspecific (a single term can also be used to depict distinct processes, e.g. "Empathy", see Cuff et al., 2016), preventing any easy compelling of the evidence available. In addition, the assessments are also heterogeneous and nonspecific (Quesque & Rossetti, 2020), and sometimes, widely used tasks (e.g. The "Ekman's faces", Ekman & Friesen, 1976 and the Reading the Mind in the Eyes test, Baron-Cohen et al., 2001) supposed to assess different abilities (e.g. "emotion recognition" and "mentalizing" respectively) actually address the same underlying psychological component (see Etchepare et al., 2020). Finally, there could be some structural limit that would impede to the evolution of practices addressing social cognition: the link between universities (where the knowledge is produced) and hospitals (where it is applied) is sometimes tenuous, the time allowed for updated training is rare for clinicians, continuing education could not be mandatory, there are important time constraints for the assessment (especially in hospital setting), dissemination from the scientific literature to clinical reco-mmendations may not be smooth, etc.

To date, little is known regarding the impact of these hypothesized limits from a field perspective. It is unclear how neuropsychologists apprehend social cognition, and what are their representations, beliefs and actual practices relevant to this domain. The aim of the present study was to address these questions in France, from the perspective of trained neuropsychologists and neuropsychology postgraduate students. These two groups were considered as it allowed us to explore the evolution of training and representation over time. A survey was designed to estimate the relative influence of

theoretical issues, tools availability, and habits in neuropsychological assessment on the evaluation of social cognition. Finally, this allowed us to quantify the relative use of the different socio-cognitive assessment tools available in the country, and to identify the obstacles to the development of social cognition assessment and rehabilitation.

Method

Participants

A total of 375 French psychologists specialized in neuropsychology (mean number of years of practice: 7.4, sd=5.8), and 127 French master students specialized in neuropsychology (57 in 4th year and 70 in 5th year degree in neuropsychology) responded to the survey. In France, a neuropsychologist is a specialized psychologist, who obtained a graduate degree in psychology (3 years, "Licence") in addition to a post-graduate degree in neuropsychology (2 years, "Master"). The full training therefore involves 5 years of academic courses alongside a minimum of 500 hours of clinical internship. 'Neuropsychologist' is not a title protected by law in France, and 'psychologist' is the only profession regulated by the Ministry of Higher Education and Research. Among the psychologists who responded to the survey, 81.3% worked with adults, 29,1% with adolescents, and 29.9% with children (some worked with two or three populations). Regarding the clinical contexts in which they practiced, 33.6% worked in the field of psychiatry, 41.8% in neurology, and 27.5% in geriatrics (some worked in two contexts). Finally, 62.6% worked in a hospital, 14.4% were self-employed, and 7.2% worked in a medico-social institution. The remaining 15.8% worked in other institutes (e.g. schools, nonprofit organizations, etc.). In this article, we will refer to psychologist participants indistinctively as neuropsychologists or psychologists. In our analyses, we contrasted the responses of recently trained (≤ 5 years of experience, i.e. the sample's median) and more experienced (>5 years) neuropsychologists, to estimate the potential impact of experience. We also delineated the responses obtained from the neuropsychologists working exclusively in psychiatry (n=79), neurology (n=90) and gerontology (n=49) to explore the impact of their context of practice, as referred to as "specialties".

Materials

All items of the survey can be found at: https://www.scann.fr/consultation-nationale. Overall, the questionnaire was divided in 5 sections: *"What is social cognition?", "What are the symptoms of social cognition impairments?", "Training and confidence.", "Clinical tests of social cognition.",* and *"Limits to the use of social cognition tests"*. Specifically, at the beginning of the survey, participants were invited to report all the keywords, theories, authors, functions, cognitive processes, tools, etc., that could be spontaneously evoked by the terms "social cognition". Seven additional statements addressed the cognitive structure and basic neural associations of "social cognition" and participants had to choose between "yes", "no" and "I don't know". Participants were then requested to evaluate whether - or not - proposed clinical signs were linked to social cognition impairment or were possible repercussions of this impairment. As

our goal was to quantify participant's representations, some of the proposed clinical signs were cardinal symptoms of social cognition difficulties and some could be considered as related or not to social cognition depending on the theoretical conception one adopts. The third section encompassed questions about participants' initial university training and level of self-confidence when assessing social cognition abilities. In the fourth section, an exhaustive list of the published francophone social cognition tests was presented to participants. For each test, participants had to report the frequency at which they use it through a five-points scale ranging from "never" to "daily use". Finally, in the last section, the neuropsychologists had to rate (through a scale ranging from 1, « is not a limit » to 5, « is a very important limit ») 16 potential limits regarding the use of current social cognition tests that were a priori formulated. The last two sections were only displayed to the neuropsychologists and not to the students.

Procedure

The survey was developed and administered online using Google_Questionnaire© forms at the beginning of 2020 (from mid-February to mid-June). Email invitations were sent by the French National Association of Neuropsychologists (*Organisation Française des Psychologues spécialisés en Neuropsychologie*, http://ofpn.fr/), which advertised the survey on its website. Promotion for the survey was also supported through social networks advertising. Responses were anonymous. The estimated time to complete the survey was approximately 15 min, and responses were automatically collected.

Statistics

The proportions of each response type were compared across categories through a Pearson Chi-square test or a Fisher exact test in case of very small proportions. In addition, we explored statistical differences for a given response between the neuropsychologists' and students, between psychologists' specialties or between populations, through two-by-two comparisons using , with P1 and P2 corresponding to respective probabilities of a response within the two compared groups, P denoting the mean probability associated to this response, n1 and n2 denoting the respective total sample size of the compared groups. The significance criterion was set at α=.05. To draw multiple comparisons, the threshold was corrected by using a Bonferroni Correction (i.e. threshold = α/number of comparisons).

Results and Discussion

Considering the unusual nature of this study, results will be reported and discussed sequentially, following the order of the different sections of the questionnaire (reported above). All results will then be addressed in a subsequent general discussion section in which practical perspectives will also be considered.

What is social cognition? Sixty-six different concepts evoked by the terms "social cognition" were spontaneously reported by psychologists (mean = 4.28 terms per participants, standard deviation = 2.44) and

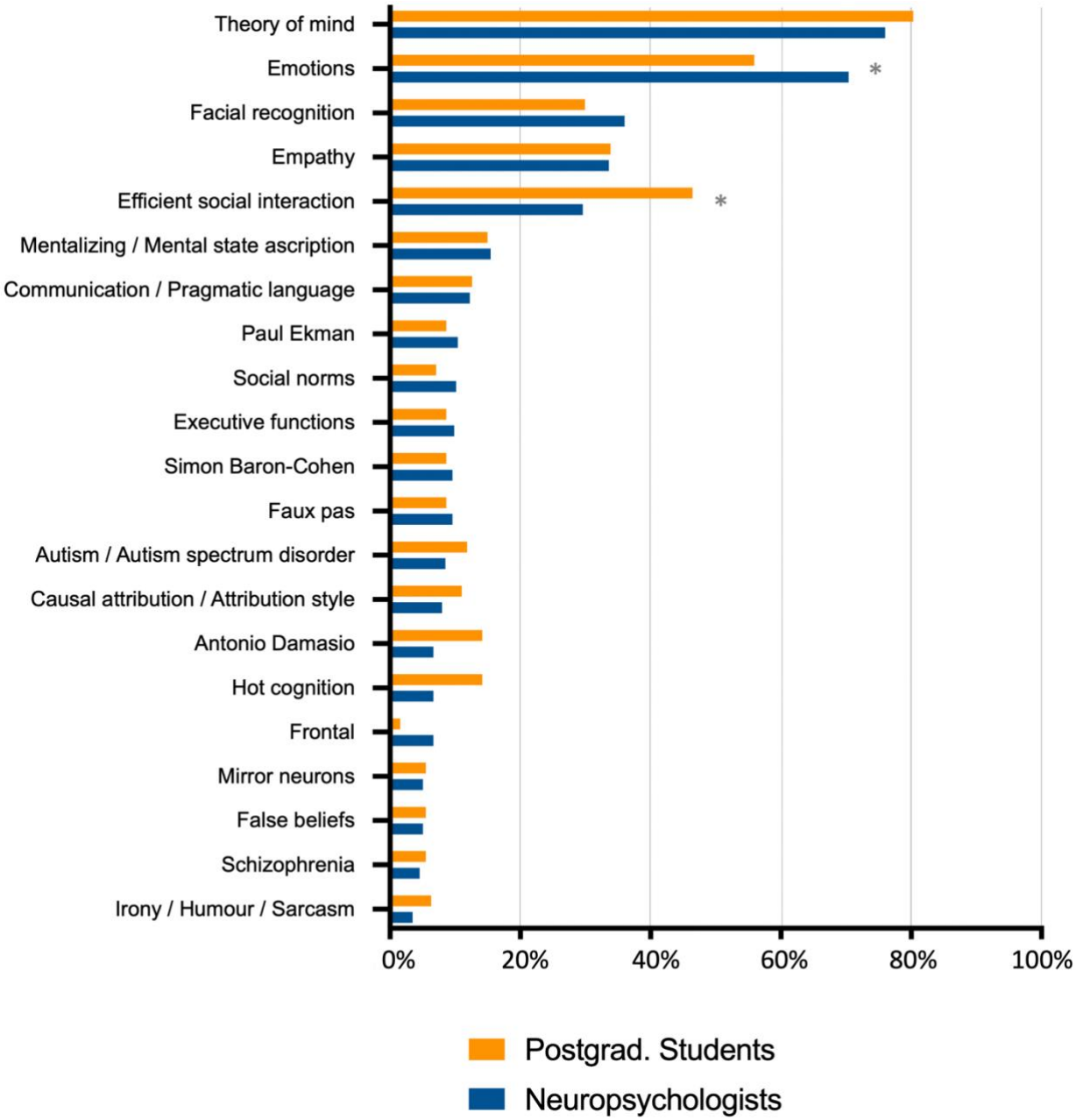

Figure 1. Answers that were spontaneously evoked by the term "social cognition" for postgraduate students specialized in neuropsychology (in orange) and trained neuropsychologists (in blue), and their corresponding proportion of respondents who reported these terms. Only the 20 most frequently reported answers are presented on the figure. Highly connected (e.g. Irony / Humour / Sarcasm) or very similar terms (e.g. Autism / Autism Spectrum Disorder) were combined during this analysis. * indicates significant differences between students and neuropsychologists at the .05 threshold, corrected for multiple comparisons (corrected threshold = $\alpha/21$).

86 by students (mean = 4.79 terms per participants, sd = 2.55).

The twenty additional terms reported by the students were mostly researcher names. The 10 most represented concepts were, in decreasing order (with percentage for psychologists vs students), "Theory of Mind" (76% vs 80.3%), "Emotions" (70.4% vs 55.9%),

"Suitable social interaction" (29.6% vs 46.5%), "Empathy" (33.6% vs 33.9%), "Facial recognition" (36% vs 29.9%), "Mentalizing / Mental states ascription" (15.5% vs 15%), "Communication / Pragmatic language" (12.3% vs 12.6%), "Frontal (i.e. the frontal lobe)" (6.7% vs 14.2%), "Hot cognition" (6.7% vs 14.2%), "Autism / Autism spectrum disorder" (8.5% vs 11.8%). Figure 1 represents all the concepts that have been spontaneously evoked by more than 5% of participants, and the relative proportion of participants who reported them. Neuropsychologists' and students' responses were relatively homogeneous as proportions only differed for two of the reported concepts only (corrected threshold = $\alpha/21$, see Fig. 1). No differences according to the psychologists' level of experience were noticed. Differences regarding psychologists' specialties & populations are reported on Supplementary Material 1.

Responses to the yes/no questions related to cognitive structure and basic neural associations are presented in Table 1. For the majority of participants, a rather clear division seemed to exist between social cognition and other cognitive domains, executive functioning in particular (though ≈25% of respondents agreed with opposite statements). Although the majority of respondents agreed to the importance of the frontal lobe for social cognition, the highest agreement was reached for the proposal stating that a larger network supports this domain. Finally, most of the students agreed with the statement asserting that women have on average better social cognition skills than men whereas most of the neuropsychologists responded that they do not know if such a difference exists. No differences existed across specialties or according to psychologists' populations.

Intermediary discussion. The recording of keywords spontaneously evoked by the terms "social cognition" allowed us to observe that, in addition to a relative homogeneity in the frequency of responses given among both groups of respondents, two concepts dominated the responses: "theory of mind" and "emotions", as they were the sole responses given by more than 50% of respondents. The yes/no statements confirmed that the frontal lobes were considered to be central to social cognition (this also was the only anatomical region mentioned by participants in the spontaneous evocation) but they also revealed a more complex picture regarding the cognitive and neural boundaries of social cognition. The discrepancies across these last responses were high for all statements. We believe that they originated from the current coexistence of two different definitions of "social cognition" in the psychological literature, i.e. a cognitive domain composed of specific abilities and supported by specific brain regions (as classically conceived in neuropsychology) *versus* any cognitive processing that is contextually social (as classically conceived in social psychology, see Quesque & Bertoux, 2022).

What are the symptoms of social cognition impairments? Overall, almost all the symptoms were unambiguously categorized, and a high convergence was observed between the neuropsychologists' and the students' judgements: the proportions of answers significantly differed for two clinical signs only (corrected threshold = $\alpha/23$, see Figure 2). Judgements made for 4 items led to balanced responses (percentage of agreement or disagreement <80%) for both students and psychologists. These items were "Behavioral stereotypies", "Difficulties to get motivated to perform daily tasks", "Difficulties to speak" and "Difficulties to recognize familiar faces". Responses were independent of the psychologists' population they work with. However, important divergences were found across specialties for some items. These divergences specifically concerned symptoms that have a social impact, though not traditionally considered

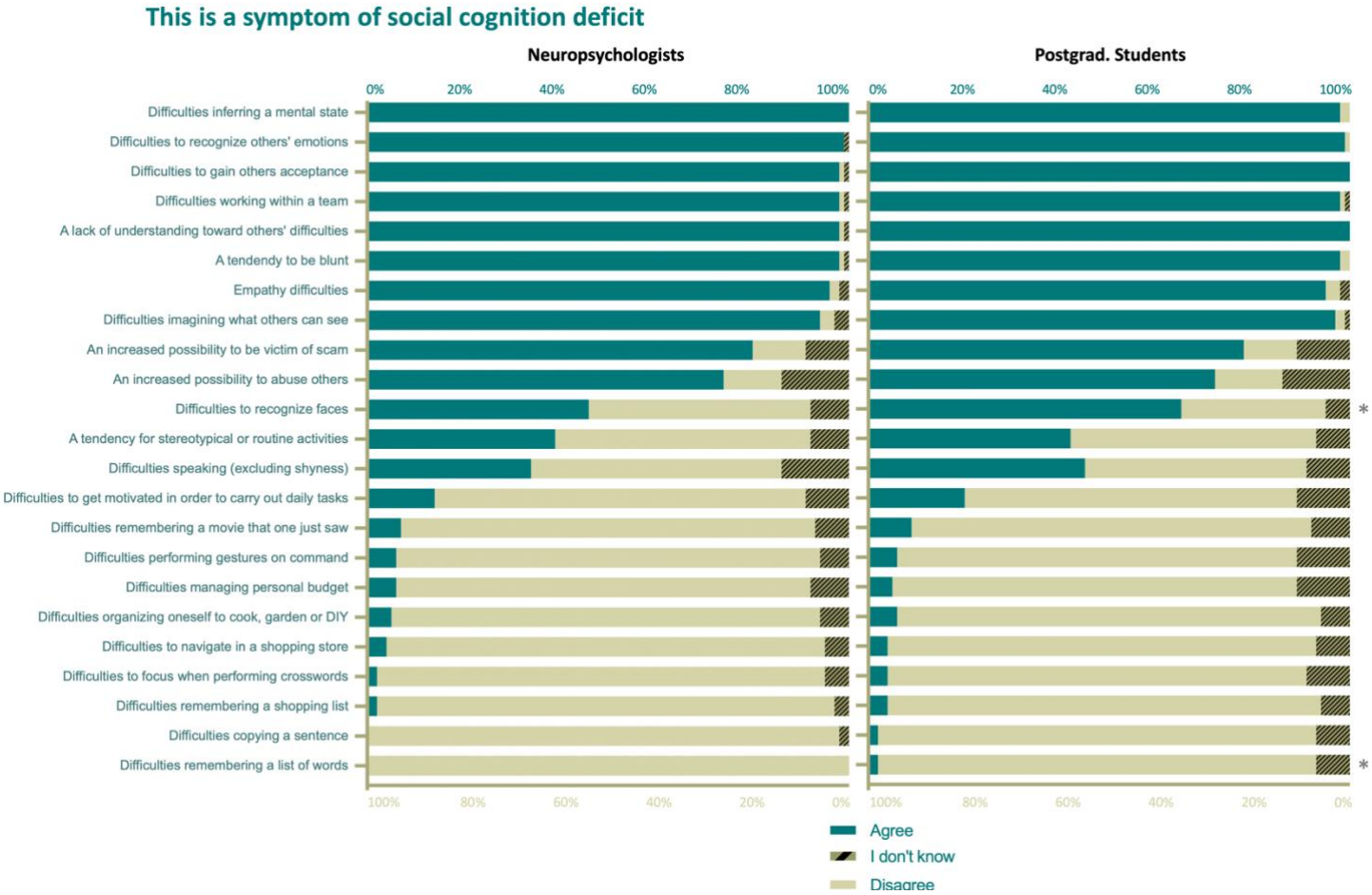

Figure 2. Averaged percentage of participants' agreement (blue), disagreement (beige) or "I don't know" response (bared grey) about what are the symptoms of a social cognition impairment / what are the possible impacts of a social cognition impairment in daily activities. Neuropsychologists' judgments are presented on the left and Postgraduate student's specialized in neuropsychology judgements on the right. * indicates significant differences between neuropsychologists & students at a .05 threshold, corrected for multiple comparisons (corrected threshold = $\alpha/23$). To ease the reading, percentages are indicated above (normal scale, corresponding to percentage of agreement) and below (inverted scale, corresponding to percentage of disagreement) the graphical illustration.

part of the social cognition domain. For example, “Difficulties to speak” was significantly less associated with social cognition among psychologists working in gerontology (16.3%) than in those working in psychiatry (41.8%) or neurology (35.6%). Similarly, “Difficulties to recognize familiar faces” was significantly less associated with social cognition among psychologists working in gerontology (32.7%) than in those working in psychiatry (62%). Psychologists working in neurology were 50% to associate this symptom to social cognition (n.s. with other groups). Finally, “Increased possibilities to be a victim of scams” was less associated with social cognition among psychologists working in gerontology (67.3%) than those working in psychiatry (89.9%) and in neurology (74.4%, n.s. with other groups). Results according to specialties are presented in Supplementary Material 2.

Intermediary discussion. In our opinion, the ambiguity observed across respondents for some items as well as the differential profiles of response across the different specialties reflect a significant influence of syndromic approaches and traditional cognitive taxonomy among neuropsychologists and students, as well as specialties’ specificities. Attributing “behavioral stereotypies”, or “lack of motivation for daily tasks”, to social cognition deficits (which was observed in 40.3% and 17.3% of respondents respectively) might be related to a localizationist approach in which social cognition is considered to be mainly supported by the frontal lobe, echoing previous results of this survey. We believe that this approach is even more vivid in French neuropsychology, which is deeply impacted by French neurology and its concepts. In French neurology, social behavioral disturbances, stereotypies and lack of motivation have been foremost envisaged as parts of the “frontal syndrome” (e.g. Derouesné & Backchine, 2000) and although this simplistic localizationist approach evolved with the years, it persists as an imprecise framework where social or affective cognitive impairments, frontal lesions, abnormal behavior and dysexecutive functioning are all considered together (e.g. Godefroy et al., 2018). Another argument for this syndromic influence is that both stereotypies and lack of motivation could be concomitant to interpersonal difficulties observed in some clinical conditions (e.g. behavioral frontotemporal degeneration, Rascovsky et al., 2011). Regarding the tendency for “Difficulties to speak” or “Difficulties to recognize familiar faces” to be mostly considered as moderately linked to social cognition in respondents (52% and 46% in general), we believe that the high rate of disagreement retrieved among the responses may be rooted in the opposition between two different conceptions of what social cognition is, or, in other words, the opposition between a taxonomy based on demarcated domains of cognition *versus* a socially contextualized cognition (a “neuro-” vs a “social-” psychological perspective). While spoken language and face recognition deficits would be mostly classified as impairment of the language and visuo-perceptive domains respectively according to the first conception, both symptoms reflect a deficit of social cognition in the second framework. Perhaps the dissociation classically made between language and social cognition (such as the one made in the DSM-5) is the best illustration of the limits inherent to the domain-specific taxonomy. Language is indeed intrinsically

social and although some components of language, such as irony, sarcasm or humor, are increasingly studied through the prism of social cognition (e.g. Clark et al., 2016), the strict but arbitrary distinction existing between the two cognitive domains is well installed, both at the theoretical (e.g. DSM-5, academic fields, etc.) and practical levels (e.g. in France, the specialized assessment and reeducation of language are made by speech-therapists and not neuropsychologists).

In addition, it should be noted that in participants specialized in gerontology, a greater association was found between executive and social cognition symptoms. We think that this reflects the frequent co-existence of these symptoms in the "older old" in which cognitive deficits are more severe and poly pathologies or mixed diagnoses could be more frequently observed. Finally, the high rate of respondents working in psychiatry that considered "Increased possibilities to be a victim of scams" to be a repercussion of social cognition dysfunction illustrates that psychologists in this field could be more vigilant to the social vulnerability of their patients.

Training and confidence. When questioned about their initial university training, 57.1% of the neuropsychologists reported that they received at least one course linked to social cognition. This actually covers a more complex reality, as this number fall to 35.7% among professionals who graduated more than 5 years ago and increase to 77.9% among those who graduated more recently (≤ 5 years), which reflect a recent change in academic contents, $\chi^2(1)=68.19$, $p < .001$. Following this trend, 81.1% of the students reported having beneficiated from teachings addressing social cognition. However, 55.9% of them specified that they were unsatisfied with the amount of time dedicated to this topic, and 69.8% were in demand for more teachings dedicated to social cognition. As a potential consequence to the previous point, in the following questions of the survey, 66.9% of the students reported that they felt insufficiently trained about social cognition, whereas only 9.1% and 11.6% of them shared this feeling when being respectively questioned about "memory" and "executive functions", $\chi^2(4)=175.3$, $p < .001$. In the same vein, psychologists were instructed to report their level of confidence when assessing social cognition abilities using a 5-points Likert scale (ranging from 1 = "not confident at all", to 5 = "absolutely confident"). Mean psychologists' confidence was of 2.7 (sd = 1), contrasting with the higher values observed, i.e. 4.25 (sd = 0.7) and 4.31 (sd = 0.59), when asked about their confidence about the assessment of "memory" and "executive functions" respectively (see Figure 3). Regarding the rehabilitation of social cognition abilities, the mean psychologists' confidence was of 2.24 (sd = 1.01), compared to 3.7 (sd = 0.87) for "memory" and 3.88 (sd = 0.77) for "executive functions". Differences observed on the psychologists' levels of confidence regarding the assessment or rehabilitation of social cognition as compared to other domains were both statistically significant, respectively $F(2, 1118)=499.4$, $p<.001$ and $F(2, 825)=283.3$, $p<.001$. Interestingly, the number of years of practice seemed to have no significant influence in the psychologists' confidence regarding assessment or rehabilitation although a trend was observed for the former, $t=1.59$, $p=.06$.

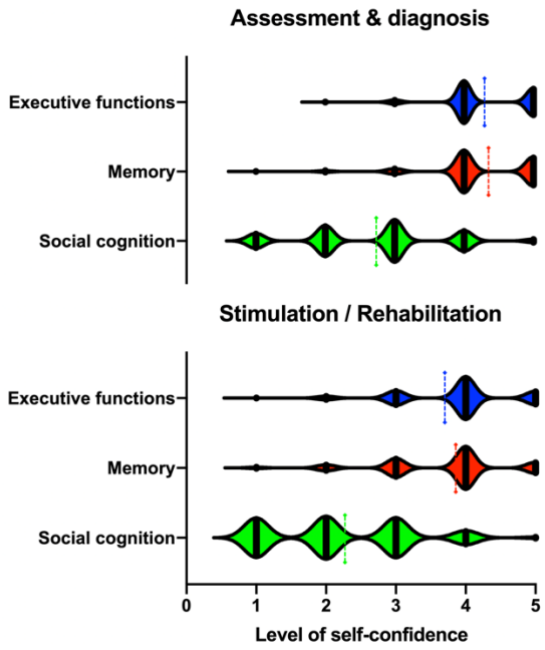

Figure 3. Graphic representation through violin plots of the level of self-confidence of psychologists regarding the assessment & diagnosis (up) or stimulation / rehabilitation (bottom) of social cognition (green), memory (red) and executive functions (blue) abilities. The black central lines represent the means and the whiskers correspond to the standard deviation. Black lines represent individuals' responses (taller means larger). Means are indicated by colored discontinued lines.

Psychologists' confidence however varied according to their specializations, for both the assessment, $F(2, 215)=13.19$, $p<.001$, and the rehabilitation of social cognition, $F(2, 155)=13.89$, $p<.001$. Precisely, neuropsychologists working in psychiatry were more confident regarding the assessment and rehabilitation of social cognition than those working in neurology, respectively $t=3.29$, $p<.05$ and $t=2.7$, $p<.05$, and in gerontology, respectively $t=2.264$, $p<.001$ and $t=5.23$, $p<.001$. No difference was observed between the two other specializations concerning the assessment of social cognition, but psychologists working in neurology reported greater confidence regarding rehabilitation. We believe that this general greater confidence for the evaluation and rehabilitation of social cognition in psychiatry might be the consequence of the recent development of validated programs in this field (e.g., Gaïa, TomRemed, RC2S) that may not be suitable for an older population.

Although the majority of future and current neuropsychologists declared that they received teachings related to social cognition, 43% of neuropsychologists did not (this increased to 64.3% for those who graduated more than 5 years ago). It is thus not surprising that regarding their assessment and rehabilitation of social cognition (by contrast to memory or executive functioning) neuropsychologists were closer to "I am not comfortable" than to "I consider myself an expert" in their level of confidence. There will be an increase in the proportion of psychologists who benefited from academic teachings related to social cognition in the years to come as this proportion was higher in students. However, at the time of the survey, 18.9% of master students did not receive any social cognition teaching. In addition, a majority of students were unsatisfied with the amount of teachings related to this topic during their academic training and expected more, and 2 out of 3 considered that they were insufficiently trained in social cognition (which is in stark contrast with their judgment regarding memory or executive functioning). Interestingly, although we noticed an increase of academic teaching on social cognition over time, this does not seem to drastically impact the students' understanding of this domain given the similarity of responses between students and neuropsychologists retrieved in our survey.

Clinical tests of social cognition. Figure 4 illustrates the 20 most used tasks of social cognition in psychologists-respondents, in decreasing order (a full list of all tasks and associated responses is available as supplementary material). Three tests and one battery were used by more than half of the participants: the « faux pas » task (Stone et al., 1998), the Epreuves de Théorie de l'Esprit (Nader-Grosbois & Thirion-Marissiaux, 2011), the Tom-15 (Desgranges et al., 2012), and the mini-SEA (Social cognition & Emotional Assessment, Bertoux et al., 2012). The associated frequency of use was moreover relatively low with only 22.1% of psychologists who declared to use at least one of these 4 tests on a daily or frequent basis. This value (which raises to 28.5% when considering all the tests) might appear to be particularly low but is however congruent with recently reported statistics concerning the use of emotion tasks in brain injury (Kelly et al., 2017). Additionally, the fact that only 8% of participants use a social cognition test on a daily basis is particularly striking as our survey also reveals that the vast majority of our participants (92.8% of psychologists and 92.9% of students) agreed with the following statement: "in a neuropsychological examination, social cognition has the same importance than other cognitive domains (e.g. memory, executive functions, visuo-spatial functions...)". This last result should however be interpreted with caution as social desirability might have driven participants' answers considering the general topic of the survey.

Regarding the influence of specialization (gerontology, neurology and psychiatry) on the use of assessment tools, the most striking difference was the mere absence of frequent use of any social cognition tests/batteries in neuropsychologists working in gerontology. Only 4.1% of neuropsychologists in this field daily or frequently use a test assessing social cognition (when considering all the listed tasks), by contrast to 56.9% in psychiatric and 15.5% in neurological contexts (Fisher's Exact Test $p's < .001$). A significant difference in the frequency of use of social cognition tests was also observed between the two later contexts, $\chi^2(4)=90.58$, $p < .001$. Regarding the tests employed, few differences were observed between psychiatric and neurological contexts (gerontology was not considered because of the rare use of social cognition tests in this context). In both contexts the « faux pas » task, the "Theory of mind test", the Tom-15, and the mini-SEA, were the most used tests/battery (with respectively 72.2%, 68.4%, 62%, 49.4% of participants using them in psychiatry and 67.8%, 57.8%, 66.7%, 61.1% in neurology). Interestingly, the Intentions Attribution Task (Tâche d'Attribution d'Intentions - Brunet et al., 2003; Sarfati et al., 1997) and the Faces Test (Baron-Cohen et al., 1997; Etchepare et al., 2014) also represent frequently used tests in psychiatry only (with respectively 54.4% and 51.9% of users). Finally, we observed that the frequency of use of two batteries (i.e. the NEPSY II and mini SEA) differed depending on the population with whom the psychologists worked (see Supplementary Material 4). This last result was however largely expected as these batteries have originally been designed for the assessment of children and adults, respectively.

Intermediary discussion. Taken together, the rather low frequency of use of tests exploring social cognition abilities reveals that there is

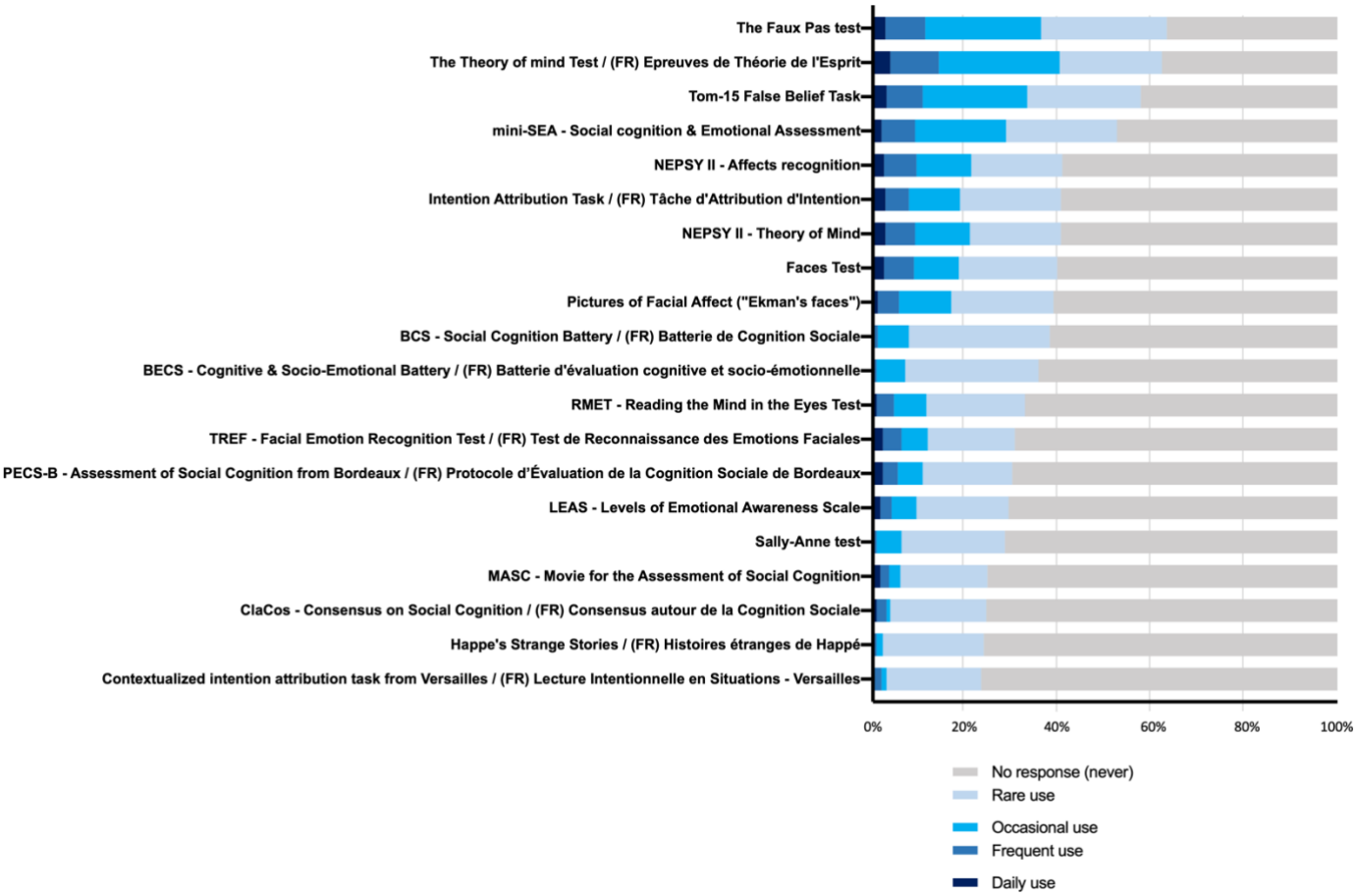

Figure 4. Illustration of the 20 most used tasks of social cognition by the French neuropsychologists. Tasks are organized from the most frequently used to the least frequently used. Original French names are available in Supplementary Material 5.

room for improvement to give social cognition the same importance given to other cognitive domains during the neuropsychological assessment. While overall, it seems that there was a relative convergence of practices across neurology and psychiatry in terms of instrument coverage, the use of such tests remains marginal in gerontology. We believe that the more frequent (and diverse) use of social cognition tests in psychiatry could be related to a higher awareness by neuropsychologists working in this field about the presence of social cognitive deficits in psychiatric populations. For example, "diminished emotional expressions" is a diagnostic criterion for schizophrenia, and "social cognition disorders", an associated feature. By contrast, in neurology, although "lack of empathy" is a diagnostic criterion for behavioral variant frontotemporal dementia, current diagnosis criteria do not involve a formal social cognitive assessment (Rascovsky et al., 2011). Similarly, social cognition is absent from the diagnostic criteria of Huntington or Parkinson's diseases although they have been extensively described (Allain et al., 2011; Bora, Velakoulis & Walterfang, 2016). In addition, considering that the populations encountered in psychiatry are younger than in gerontology (focused on older-old) and in neurology (the average age of examinees in neurology is 62.7 years old – Ellie, 2014), social cognition could be more frequently assessed in this context given that

it could have a more obvious or critical impact on daily work functioning, parenting, reintegration, etc. This is in line with the hypothesis that the psychiatric context may be more favorable for a more extensive cognitive assessment. Indeed, while the neuropsychological evaluations in neurology and gerontology are mostly focused on orienting the clinical diagnosis, in psychiatry, functional assessments are rather performed, which are dedicated to identify underlying cognitive factors that contribute to the strengths and weaknesses of the patients' functioning across settings. In this context, it is not surprising that social cognition is more frequently integrated in the more in-depth psychiatric assessment. We can, however, regret that it is not the case in other specialties.

Limits to the use of social cognition tests. The ratings presented in Figure 5 show that the limits to the use of social cognition tests with the highest ratings were the lack of information about the French tests available, as well as the absence of French translations (all ratings > 4). Then, were identified as relatively important limits (3 ≤ ratings ≤ 4) the absence of French normative data, and unknown tests' psychometric properties, the length of the tests, their price, the lack of information related to social cognition in general and social cognitive processes in particular, and non-suitability for the age of patients. Finally, limits relative to the specificities (culture, difficulty of tests, patients' language deficits) of the populations encountered by the respondents were rated as the less significant limits (mean < 3). Overall, a limited variability was observed between the different clinical specialties. For the 3 following items however, some variations could be found. The difficulty and non-appropriateness of the tests were indeed stronger limits in gerontology (means = 3.72 and 3.89 respectively) than in psychiatry (respective means = 2.14 and 2.51) or neurology (respective means = 2.52 and 2.67), with $F(2, 200)=22.83$, $p<.001$ and $F(2, 196)=16.28$, $p<.001$ respectively. In addition, the fact that social cognition evaluation is not required by the institution was rated as a relatively important limit by psychologists working in gerontology (mean = 3.17) while this item was significantly rated as a less significant limit among psychologists working in neurology (mean = 2.18) or psychiatry (mean = 1.73), $F(2, 205)=14.64$, $p<.001$.

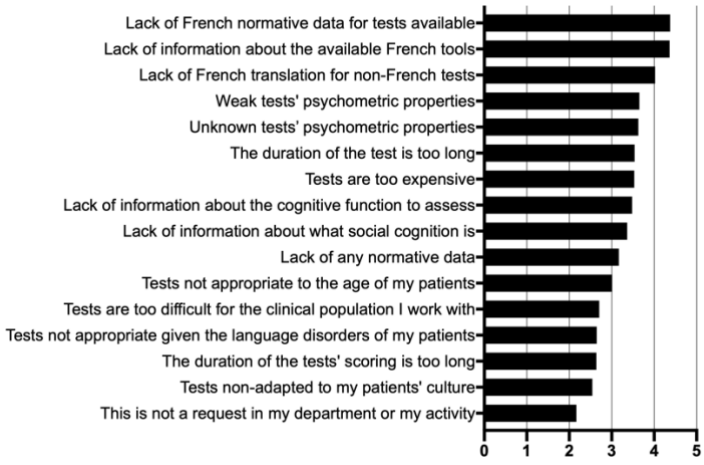

Figure 5. Illustration of the mean ratings attributed by psychologists to the proposed limits regarding the use of current social cognition tests (scale range: 1 - « is not a limit », 5 - « is a very important limit »).

Intermediary discussion. Overall, although contextual institutional demands, time available and appropriateness of the tests were acknowledged as limits to the use of social cognitive tests, the most frequent limits acknowledged seem to be related to the lack

of information about the tests available, the abilities to assess or the lack of data for these tests, either normative references or psychometric properties. This confirms the need for an enrichment of the academic training regarding the clinical aspects of social cognition, as well the necessity of stronger efforts from academics to disseminate the theoretical and scientific knowledge among students. This also underlines the need for continuing education among psychologists. In France, the FIR (Formation, Information, Recherche) statutory system allows psychologists to dedicate one day and a half of their weekly working time to training, information and research. However, past surveys have shown that although used by full-time civil servants, the FIR system could be inexistent in the private sector and difficult to use in public institutions among professionals working part-time (Jehel et al., 2018). In all cases, only 8% of French neuropsychologists could dedicate one day and a half for training and research weekly.

General Discussion

In the present article, we attempted to understand how social cognition was conceptualized by French neuropsychologists as well as graduate students and aimed to quantify the importance given to this domain in academic training and clinical practice. To this end, we questioned neuropsychologists and students specialized in neuropsychology about their knowledge, training, practices, tests and encountered limitations regarding the clinical approach of social cognition.

Overall, the survey revealed a relative consistency between neuropsychologists and students in the way social cognition was conceptualized. Theory of mind and emotions were the two cardinal dimensions evoked by most of the respondents when they had to spontaneously define it. Binary statements regarding its cognitive and neural correlates together with forced categorization of symptoms suggested the importance of syndromic approaches as well as traditional cognitive taxonomy regarding how social cognition is framed. It also revealed a conceptual confusion between the neuro- and social-psychological approaches. Neuro-psychologists rated their self-confidence to deal with social cognition lower than for the other domains, and students expressed their dissatisfaction regarding the amount of training dedicated to this domain. We were able to quantify the use of the different tests available in French, and observed the low frequency of their use in daily practice. Finally, some limits to the use of these tests were quantified. In the last section of this article, we will cover these points and make some recommendations that we consider to be important for research, training and practice activities to evolve.

While the present study revealed small discrepancies in the respondents' conceptions of social cognition, both neuropsychologists and students were rather homogeneous when they had to name what abilities compose it, narrowing the whole domain to emotional processing and theory of mind skills. These abilities are consensually considered as the "core components" of social cognition (Henry et al., 2016; Cotter et al., 2018) and have been widely explored by validated tests. For example, the Picture of Facial Affect test (Ekman & Friesen, 1976), the Reading the Mind in the Eyes (Baron-Cohen et al., 2001)

and the Faux pas test (Stone et al., 1998), which tap into these "core" mechanisms, are the most used tasks to assess social cognition among neuropsychiatric populations (Eddy, 2019). These tests, as well as their clinical adaptations or similar tools, have been used in a wide diversity of clinical contexts from frontotemporal degeneration to chronic low back pain (e.g. Bertoux et al., 2012; Kumfor & Piguet, 2012; El Grabli et al., 2021). We believe that this tendency to reduce social cognition to these two components is very common in the field of neuropsychology and originates from multiple factors among which the lack of unity at the theoretical level and the clinical tests available play an important role. Both elements should therefore receive specific attention, but in a discipline where clinical practices are based on theoretical models, a clarification of the definition of the psychological processes and abilities covered by the terms "social cognition", which is currently lacking, would be first needed. We believe that this heterogeneity at the theoretical level originates from at least two distinct factors, which can both be observed in the current training. First, "social cognition" refers to either a cognitive domain (as it is the case for memory, attention, etc.) or to a field of research, depending on the discipline in which it is discussed (Quesque & Bertoux, 2022). Cognitivists, as well as people interested in psychopathology, define social cognition as a specific set of abilities whereas social psychologists define it as a particular state of cognition in social contexts (e.g. Fiske & Taylor, 1991). It then appears of particular importance (a) to systematically define and delimitate social cognition when referring to this concept and (b) to not try to conciliate all findings using this common term in an over-integrative manner. Second, and aside from these disciplinary variations, given the highly heterogeneous and nonspecific vocabulary for socio-cognitive abilities (Quesque & Rossetti, 2020), the emergence of an international consensual lexicon is needed to largely contribute to clarify the existing debates.

Although we showed that the time dedicated to social cognition university training seems to increase with the years, our study revealed a clear students' demand for more teachings related to social cognition, associated with an important dissatisfaction with the current time dedicated to this topic in their training. Congruently, neuro-psychologists, who received less training on this topic on average, reported that they felt significantly less confident when assessing social cognition abilities or regarding its rehabilitation, compared to memory or executive functions. Overall, these results advocate for the need to increase teaching, research and practice training related to social cognition in French universities. We believe that adding a three-years programme leading to a Doctorate in clinical neuropsychology to the training of neuropsychologists in France would allow more time to deepen the theoretical and clinical training regarding the topics that could be currently neglected or differently addressed across universities, such as social cognition. Such considerations are currently discussed at the national level (OFPN, 2019). In order to reduce the risk of exacerbating social inequalities, this additional training time should however be accompanied by systematically remunerated internships, similarly to what is practiced in medicine school, as well as prolonged scholarships allocated on social criteria. Salary

grids will also have to evolve to reflect this new level of training. The FIR system should also be strengthened for all (neuro) psychologists in France, as it could ensure that a significant time is dedicated to continuous training all along clinical careers.

Our findings also question the researchers' traditional dissemination strategies, especially in non-English speaking countries, given that this dissemination is mostly in English. As an illustration, "interoception", which refers to the prediction of homeostatic signals that describes the physiological state of the body and that is critically involved in the formation of affects, hasn't been named once during the spontaneous evocation of terms associated with social cognition. Interoception is however one key ingredient of emotions and has been a trending topic in social or affective neurosciences over the last few years (Barrett & Satpute, 2019). The rather narrow definition of social cognition retrieved in our study points out that barriers to the dissemination of important concepts in non-English literature (or academic training) should not be neglected. It would be important to understand why such barriers exist and how to overcome them. In French universities, the law introducing the possibility to deliver courses in English created a vivid polemic (Le Monde, 2013) and was perceived as a threat to French culture. French society has a marked cultural identity that has been described as resulting in a certain isolation from external currents of thought (Houzel, 2018), as it could have been recently observed (New York Times, 2021). Proficiency in English is therefore not a criterion to become a psychologist in France. In this context, it is probable that published English written scientific articles fail to keep clinicians up to date with novel discoveries and debates in their field. This point would again support the recommendation to increase the length of the clinical training in France, with a more advanced teaching *in* and *of* English during the future neuropsychologists' training. This also stresses out that, meanwhile, alternatives to English scientific publications (e.g. books and review papers published in national language) should be further considered by academics as a necessary medium to disseminate knowledge. The mandatory attendance to national scientific or clinical congresses should be another option, if the employer could help financing both congresses and registration fees. Overall, a significant effort in dissemination from academics should then be made in this direction.

Our survey revealed that currently, only 11.3% of psychologists declared to use at least one test of social cognition on a daily basis. This surprisingly low number stresses out the need to highlight the importance of social cognition. While its clinical relevancy is consensual in specific clinical context such as in Autism (Lai et al., 2014), frontotemporal degeneration (Johnen & Bertoux, 2019), schizophrenia (Green et al., 2015), Huntington's or Parkinson's diseases (Allain et al., 2011; Bora et al., 2016), social cognition stays classically overlooked in clinical populations that are not traditionally known to be characterized by social cognitive difficulties. However, mild to severe impairments have been retrieved in these very diverse populations, ranging from Alzheimer's disease (Bertoux et al., 2015) to somatic diseases (e.g. in rheumatoid arthritis, see Gwinnutt et al., 2021). We believe that, as

it is the case for other cognitive domains such as memory or executive functioning, the evaluation of social cognition should be systematized. It constitutes a fundamental aspect of a person's life and, more than other cognitive domains, predicts patients' functional outcomes (Fett et al., 2011). Impaired social cognitive performances are related to social withdrawal, disengagement, or isolation (Maat, Fett & Derks, 2012; Porcelli et al., 2019; Ubukata et al., 2014), and ultimately lead to a faster cognitive decline and higher mortality (Friedler et al., 2015; Bzdok & Dumbar, 2020). As observed during the covid-19 crisis, social isolation in patients with cognitive difficulties could increase the severity of psychological and behavioral symptoms as well as the burden of carers (Dos Santos Azevedo et al., 2021; Boutoleau-Bretonnière et al., 2020). Finally, even subtle deficits could lead to an increased vulnerability to social exploitation and scams (Han et al., 2016). For these different reasons, social cognition abilities should no longer be overlooked during neuropsychological examination, in any clinical context. While this view seems to be shared by a majority of neuropsychologists and students who participated in this survey, this has to be concretely translated into a shift in practices, which is – given what our findings reveal – clearly not the case today.

The survey was also designed to understand why this shift was difficult and what were the limits to the use of current tests available to the clinicians. It turned out that increasing the communication about the already existing tests and functions targeted seem critical, as the lack of information, normative data, psychometric properties or knowledge about the functions assessed were pointed out by the neuropsychologists. As experts of the domain, and considering the strong focus of clinicians on emotions and mentalizing, we also believe that it is fundamental for researchers to develop new tests which should cover a larger spectrum of processes. Recent initiatives have been engaged to create novel tasks assessing social norms, emotional fluency or emotional concepts (e.g. Rankin, 2021; Etchepare et al., 2014; Duclos et al. 2017; Bertoux et al. 2020) and these efforts need to be increased. This also implies to translate, adapt and validate existing tools addressing varied abilities (e.g. kinematic processing, face recognition) within local samples of participants, so that each tool could be culturally adapted for diverse populations. Significant cultural variability at some of the most used tests of social cognition have indeed been recently reported and should not be regarded as clinically meaningless (Quesque et al., 2022). It should however be noted that validation or normalization studies are not valorized from an academic perspective and generally prevent publications in the most prestigious scientific journals despite that it represents an absolute necessity to improve clinical knowledge and practices in psychology and medicine, which will have immediate consequences on patients and caregivers' life. As a consequence, funding programs should more extensively support normative or psychometric studies directly applied to the field's concerns, and not exclusively "groundbreaking" projects, which might overlook direct applications. Finally, both test development and validation should involve professional neuropsychologists in every stage of these projects, given the divergences existing between theoretical and clinical

methods and needs. This points to the absolute need to foster relations between researchers and psychologists. In this vein, the co-supervision of students could offer the optimal conditions for test validation studies. Better incentives for psychologists to join local research teams should also be envisaged.

Despite this reasonable number of participants, our sample may not have been sufficient to explore subtle statistical differences between specialties and led us to remain at a descriptive level some of the time. The sample size of the present study was however comparable to those of previous national survey (e.g. Branco Lopes et al., 2021; Jehel et al., 2018; Malvy et al., 2019) and included a tenth of all French neuropsychologists and around half of the French postgraduate students in neuropsychology. In order to have a more global picture, future works could investigate how social cognition is represented and clinically addressed within and across other fields (e.g. clinical psychology, speech therapists, physicians working in mental health contexts).

The present study characterizes current French practices and representations and although most interpretations could be applied to the field of neuropsychology, internationally, some are specific to the French context. An international study aiming to compare the practices and representations across countries could therefore usefully complement the present findings. In this vein, our data will be open to any international projects, on request. Regarding our national context, the present findings offer a basis to draft national recommendations for better practices relevant to the training, assessment, and rehabilitation of social cognition by French neuropsychologists. Ideally, we believe that such a project should be conducted collectively, involving both clinicians and academics, with the support of the main French professional organizations.

Disclosure statement

The authors declared that they had no conflicts of interest with respect to their authorship or the publication of this article.

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Table 1. Proportion of participant' agreement with general statements about the cognitive and neural structure of social cognition, for professional neuropsychologists and master students specialized in neuropsychology.

	Neuropsychologists			Students			
Do you think social cognition is…	**Yes**	**No**	**IDK**	**Yes**	**No**	**IDK**	**Significant Difference**
An executive function (or a set of executive functions)	24%	62%	14%	20%	69%	11%	n.s.
A distinct cognitive domain (such as memory, language, executive functions)	64%	26%	10%	66%	24%	10%	n.s.
A mix of general (non-social) and specifically social functions	45%	28%	27%	50%	28%	22%	n.s.
On average better in women than in men	29%	30%	41%	44%	28%	28%	0,021
From an anatomical point of view, do you think social cognition is…	**Yes**	**No**	**IDK**	**Yes**	**No**	**IDK**	**Significant Difference**
A frontal function	54%	30%	16%	60%	32%	8%	n.s.
Supported by a specific network	41%	37%	22%	37%	46%	17%	n.s.
Widely distributed in the brain	74%	9%	17%	80%	12%	9%	n.s.

Note: Statistical differences (corrected for multiple comparisons, corrected threshold = $\alpha/7$) between neuropsychologists' and students' proportions of response are reported in the last column. n.s. stands for "non significant". IDK: I don't know.