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To cite this article: Jean Gagnon, Grahame Kenneth Simpson, Glenn Kelly, Denis Godbout, Michel Ouellette & Jacques Drolet (2016) A French adaptation of the Overt Behaviour Scale (OBS) measuring challenging behaviours following acquired brain injury: The Échelle des comportements observables (ÉCO), *Brain Injury*, 30:8, 1019-1025, DOI: [10.3109/02699052.2016.1148197](https://doi.org/10.3109/02699052.2016.1148197)

To link to this article: <http://dx.doi.org/10.3109/02699052.2016.1148197>



Published online: 16 May 2016.



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ORIGINAL ARTICLE

A French adaptation of the Overt Behaviour Scale (OBS) measuring challenging behaviours following acquired brain injury: The Échelle des comportements observables (ÉCO)

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Abstract

Purpose: To develop a French version of the Overt Behaviour Scale (OBS) and examine some of its psychometric properties.

Methods: The scale was adapted and validated according to standard guidelines for cross-cultural adaptation of questionnaires (Échelle des comportements observables; ÉCO). The reliability and construct validity of the ÉCO were studied among 29 inpatients and outpatients who sustained an acquired brain injury. The instruments were administered by 12 clinicians located at eight rehabilitation centres and the local brain injury association.

Results: The ÉCO provided behaviour profile descriptives much like the original scale. It showed excellent reliability and good convergent and divergent validity, as reflected by significant associations with other measures that contained similar behavioural items and by the absence of significant correlations with broader constructs such as physical and cognitive abilities.

Conclusion: This study provides evidence that the ÉCO behaves much like the original OBS, has promising initial findings with respect to reliability and validity and is a valuable research and clinical instrument to assess the severity and typology of challenging behaviour after an acquired brain injury and to monitor the evolution of behaviours after intervention in French and bilingual communities.

Keywords

Challenging behaviour, behavioural disturbance, acquired brain injury, assessment instrument, French adaptation

History

Received 30 July 2015
Revised 25 January 2016
Accepted 26 January 2016
Published online 14 May 2016

Introduction

Behavioural disturbance, referred to as challenging behaviour, is a common sequelae of acquired brain injury (ABI) [1]. A recent multi-centre study indicated that the overall prevalence rate of challenging behaviour was 54% among community-dwelling adults with severe traumatic brain injury, with 35% of the sample displaying more than one challenging behaviour [2]. There is strong evidence that these challenging behaviours are enduring and some of them (e.g. aggression) can worsen over time in unstructured environments where behaviours are not well managed [3–5]. Challenging behaviour may have a deleterious effect on the person's rehabilitation programme, social reintegration and long-term accommodation [6–16]. Moreover, challenging behaviours are a key factor in caregiver burnout, especially when they come in the form of aggression, sexually inappropriate behaviours or lack of initiation [17–20]. Within this context, there is a strong need for comprehensive, reliable and valid

instruments measuring challenging behaviour [16]. Indeed, assessing the breadth of behavioural disturbance with a reliable measure is important in planning appropriate interventions and evaluating their efficacy with objectivity [9,21–25].

There are numerous scales addressing issues related to specific diagnostic groups (e.g. psychiatric patients, e.g. Overt Aggression Scale [26]) or specific behavioural domains (e.g. Agitated Behaviour Scale [27]), but the usefulness of such scales is limited because behavioural disturbances after ABI typically occur concurrently across several behavioural categories such as aggression and sexualized behaviours [2,9,16,28]. The Overt Behaviour Scale (OBS) has been developed by Kelly et al. [16] with the aim to provide an instrument capable of capturing a broad range of challenging behaviours, suitable for different types of ABI, applicable in different environments spanning inpatient and community settings and providing critical clinical information for effective assessment and intervention.

One of the key advantages of the OBS is the level of detail about overt behaviour that it provides to the clinician. The OBS includes the original four aggression categories of the OAS-MNR [29] and an additional five categories, resulting in nine categories overall. The original genesis of the additional categories derived

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from the review of 500 referrals made to a specialist ABI behavioural consultancy service in Victoria Australia [16]. The nine categories of the OBS accounted for ~ 90% of all behaviours referred to the service. Each category contains between three and six hierarchical levels of behaviours, ordered in increasing severity: Verbal aggression (four levels; see Table I); Physical Aggression against objects (four levels); Physical Acts against self (four levels); Physical Aggression against people (four levels); Inappropriate sexual behaviour (six levels); Perseveration/repetition (three levels); Wandering/absconding (three levels); and Inappropriate social behaviour (five levels). The one exception to this structure is Lack of Initiation, which has one level only [16]. A full description of the scale is provided by Tate [30] and can also be found on the Centre for Outcome Measurement in Brain Injury website (<http://www.tbims.org/combi/obs/index.html>).

The OBS is a clinician rated scale. Although there is one example of the scale being used to chart behaviours as they occur [31], it is most commonly used on a time sampling basis, providing a summary of behaviours that have occurred over the previous 3 months. It can be administered by the clinician alone (i.e. direct observation) or with the help of an informant who has a thorough knowledge of the client. The OBS produces three indices that measure the presence of challenging behaviour. The Cluster score refers to the number of behaviour categories (e.g. verbal aggression) within which a behavioural descriptor is endorsed (range = 0–9). The Total Severity score is the number of behavioural descriptors that are endorsed across all behaviour categories (range = 0–34). Each behavioural descriptor has an associated weight reflecting that some behaviours are more serious than others. The Total Clinical Weighted Severity score is the sum of the weights associated with each behavioural descriptor endorsed (range = 0–84).

In addition to the three indices and for clinical purposes only, the OBS also includes a frequency of behaviour and an impact of behaviour scale, respectively (Administration guidelines are available at www.diverge.org.au).

The OBS has been shown to be reliable and valid for community-dwelling adults with ABI [16]. In a sample

consisting of 30 clients with traumatic-brain injury exhibiting challenging behaviour, results revealed excellent inter-rater reliability (OBS Cluster: $r = 0.99$; OBS Total Severity: $r = 0.97$) and good test–re-test reliability (1 week; Cluster: $r = 0.72$; Total Severity: $r = 0.77$). Content validity demonstrated clearly defined categories with high agreement on rating behaviours on the Cluster ($k = 0.88–0.94$) and Total Severity ($k = 0.63–0.90$) scales. In addition, the concurrent/convergent validity was established with other measures that contained behavioural items, such as the Mayo Portland Adaptability Inventory version 3 (MPAI-III) [32], which measures adaptive functioning after brain injury (MPAI-III Total score with OBS indices: $r = 0.39–0.59$; for domain scores: $r = 0.36–0.61$). Divergent validity was demonstrated by the lack of relationship with measures that did not contain behavioural items, such as MPAI–Physical/Medical and Everyday Activities sub-scales ($r = ns$).

Other studies have demonstrated the usefulness of the OBS in determining the type and severity of challenging behaviours among brain-injured persons as well as the behaviour profiles associated with aetiology of brain injury [9]. A recent study has provided a point-prevalence estimate of challenging behaviours across a statewide network of 11 community rehabilitation brain injury services [2]. Furthermore, it has demonstrated significant responsiveness, with people with ABI treated for challenging behaviours recording significant decreases in OBS scores over a 4-month period [16].

Among its practical benefits, the OBS categories are designed to be administered in a set order so that a behaviour that may fit multiple categories is counted only once and its duration of administration is diminished by a screening question within each category. Thus, the OBS has a number of strengths for clinical practice as well as for research. The OBS, however, exists only in an English-language format, but a French version would aid rehabilitation efforts in French and bilingual communities, allowing for consistent evaluation and monitoring of patients across time, services

Table I. Descriptors used in the 4-level verbal aggression subscale of the OBS [16] and ÉCO.

Clinical weighted severity	OBS	ÉCO
1	Shouts angrily, makes loud noises, is clearly not directed at some other person (e.g. 'bloody hell')	Fait des bruits intenses, crie avec colère, ce comportement n'est clairement pas dirigé vers une autre personne (p. ex., 'Maudite merde!', etc.).
2	Makes mild personal insults clearly directed at some other person but does not include swearing/offensive sexual comments (e.g. 'you are stupid', 'idiot')	Profère des insultes personnelles légères, clairement dirigées envers autrui, mais n'incluant pas de jurons/des commentaires sexuels offensants (p.ex., 't'es con, imbécile').
3	Swearing, use of foul language, moderate threats clearly directed at others or self (e.g. 'F*** off you bastard').	Sacre, utilise un langage grossier, fait des menaces modérées clairement dirigées envers autrui ou envers soi-même (p. ex., 'Va te faire foutre enfant de chienne!').
4	Makes clear threats of violence directed towards others or self (e.g. 'I'm going to kill you!' or 'I'm going to finish myself!') or requests help to control self (i.e. expresses anxieties that they will engage in aggressive act beyond own control unless someone makes some immediate intervention). This includes suicidal threats.	Fait clairement des menaces de violence dirigées envers autrui ou envers soi-même (p. ex., 'Je vais te tuer!' ou 'Je vais me tuer!') ou demande de l'aide pour se contrôler soi-même (c.-à-d., exprime des inquiétudes de commettre des gestes agressifs sans le vouloir vraiment, à moins que quelqu'un intervienne immédiatement). Cela comprend les menaces suicidaires.

Note: This table shows descriptors for one of the nine sub-scales. The full ÉCO scale is available at (<http://www.tbims.org/combi/>).

and clinicians. The goal of this study was to develop a French version of the OBS (Échelle des comportements observables; ÉCO) and to conduct a preliminary investigation into some of its psychometric properties.

Methods

Development of the French version of the OBS

The design used in this study is based on guidelines proposed by Jones et al. [33] for cross-cultural adaptation of questionnaires. The method consists of two committees assessing each other's work in the translation process. Each committee was composed of three bilingual experts who had a minimum of 7 years' experience in the field of behaviour management after brain injury. The authors of the original OBS were also involved in the last steps of the adaptation. The original version was first translated from English into French by one professional translator and then the translation was revised by the experts with the aim of achieving consensus on the wording of all nine categories of behaviour and their levels of severity. Then, a backward translation of this version was done by a professional translator and submitted to the authors of the original OBS. Finally, the gaps between backward and original versions were discussed and resolved by consensus to ensure the quality of the French adaptation. This method led to the elaboration of the French version of the OBS: ÉCO.

Initial testing of psychometric properties of the ÉCO

Participants

Participants were recruited to the study from seven rehabilitation centres and a brain injury association in Montreal. Inclusion criteria were age between 18–70; to have sustained an acquired brain lesion and to exhibit some degree of challenging behaviour according to the impact of the behaviours on several domains of functioning [34]. Patients with dementia or in post-traumatic amnesia according to the information in their medical records were not eligible for the study. The recruitment and behavioural rating of the clients was conducted by 12 bilingual clinicians, each with a minimum of 2 years of experience with ABI patients. The data were collected between August 2010 and February 2012.

Measures

The *Mayo-Portland Adaptability Inventory, 4th version* (MPAI-4) [35] was selected as a validating measure. In the original OBS psychometric study [16], the Mayo Portland Adaptability Inventory-III had been employed to test the pattern of convergent and divergent validity. However, the MAPI-4 was subsequently published (<http://www.tbims.org/combi/>) and, given that a French translation was available, it was selected for the current study.

The MPAI-4 measures adaptive functioning after brain injury and comprises 36 items rated on a 5-point scale describing the level at which the person experiences problems (0 = none to 4 = severe problem). The scale measures three domains: Abilities (items 1–12), Adjustment (items 13–24) and Participation (items 22–29). A sub-scale score is derived for

each domain by summing selected items and a Total score is obtained by summing the three sub-scales (omitting items 22–24). A supplementary score for post-injury severe behaviour problems can be obtained by summing four additional items (alcohol use, drug use, psychotic symptoms and law violations), but these items do not contribute to the three sub-scale scores or total score. MPAI-IV scores have been shown to predict job placement after a vocational rehabilitation programme and independent living outcomes after a comprehensive rehabilitation programme [36]. The 4th version of the scale has good internal consistency for Total score and Abilities, Adjustment and Participation sub-scales scores, with alpha coefficients of 0.79, 0.80, 0.76 and 0.83, respectively [37]. The inter-rater agreement is satisfactory [37].

Procedures

A consent form to participate in the study was completed by clinicians, informants and participants with ABI. For the validation study, the bilingual clinicians rated the participant on both the English (OBS) and French (ÉCO) versions of the scale. For both scales, the levels of severity (e.g. behavioural description with realistic examples) within each category were presented in a random order as opposed to the original hierarchical order. This procedure was adopted to ensure that the clinician's choice was based on the severity descriptors.

All clinicians received a 2-hour training workshop on the instrument, then rated both OBS and ÉCO. The administration of the majority of OBS/ÉCO protocols (24/29) involved the help of an informant who was a person with thorough knowledge of the participant with ABI (e.g. a family member or another clinician). Afterwards, the clinician then completed the MPAI-4. The duration of protocol administration was ~ 50 minutes.

Data analysis

Data were entered into SPSS Version 21. There were some small amounts of missing data on the MPAI-IV (< 5% of responses) and these gaps were completed using the respective mean sample sub-scale score. Given the measurement characteristics of the data overall (i.e. the sums of counts), non-parametric statistical procedures were used for bivariate analyses.

One way to establish the construct validity of a translated scale is to examine the pattern of scores with those generated from the original scale based on the culture of origin [33]. Therefore, descriptive statistics for each variable and category of behaviour of the ÉCO were computed to provide a profile of study participants. This profile was compared to an Australian sample that also selected participants on the basis of the presence of challenging behaviour [9]. This sample ('OBS-Challenging Behaviour') consisted of 190 community-dwelling individuals in Victoria, Australia. All were aged 18–65 years and had ABI from mixed aetiologies. All had been referred to specialist service for treatment of challenging behaviours [9].

Given the mixed aetiology of the samples, it was difficult to establish their similarity by reference to injury severity, because the community-based nature of the samples meant

that initial injury severity data were not always available. However, in terms of functional status, both samples displayed substantial levels of disability. In the ÉCO sample, approximately two-thirds required supported decision-making for financial and health and lifestyle decisions. In the OBS-Challenging Behaviour sample, more than 80% of all clients scored in the moderate bands of the Disability Rating Scale (DRS) [38] or above and more than 80% were unemployed. Furthermore, based on the Care and Needs Scale (CANS) [39] scores, more than 60% of all clients required daily support.

Furthermore, the ÉCO profile was contrasted to a rehabilitation sample ('OBS-Rehabilitation'). Admissions to the rehabilitation service system from which this sample was drawn were based on the presence of a brain injury alone. Therefore, it was a more heterogeneous group (a mix of clients with no challenging behaviours and then among the clients who did display challenging behaviours, a broad range from very mild to extremely severe behaviours). In order to be consistent with the ÉCO and the OBS-Challenging Behaviour sample, only the sub-set of clients who displayed challenging behaviours were selected. However, because of the greater range of severity of challenging behaviours, it was expected that the OBS scores for the OBS-Rehabilitation sample would be significantly lower than for the ÉCO and the OBS-Challenging Behaviour samples.

The OBS-Rehabilitation sample comprised clients of the New South Wales Brain Injury Rehabilitation Programme (BIRP). The BIRP conducted a major study into challenging behaviours among all active clients of the 11 adult community rehabilitation teams that are part of the BIRP [2]. All clients with a challenging behaviour of any severity ($n = 350$) from this larger study comprised the OBS-Rehabilitation sample.

The clients in the sample ($n = 350$) were aged 18–65 years and sustained a primary traumatic brain injury. The OBS-Rehabilitation sample did not appear to be as disabled as the ÉCO and the OBS-Challenging Behaviour samples. A substantially smaller proportion (37.2%) was considered moderately disabled or more on the DRS and only a third (33.2%) required daily support of some level on the CANS. Three separate one-way between-groups (ÉCO, OBS-Challenging Behaviour and OBS-Rehabilitation samples) ANOVAs were conducted on the three OBS global indices (Cluster, Severity and Total Clinical Weighted Severity).

Second, frequencies for the number of challenging behaviours displayed by each participant were also calculated, as well as the frequencies with which each category of behaviour was observed across the sample. In addition, Sabaz et al. [2] devised a cut-off (challenging vs non-challenging) based on the three criteria generated from the OBS Total Severity, Frequency and Impact indices. The same criteria were applied to the current ÉCO sample to examine whether all participants would be classed as 'challenging'. Finally, the mean scores of the OBS and ÉCO were inspected and reliability coefficients calculated using Intra-Class Correlations (two-way-mixed effect) to test the level of agreement between the OBS and ÉCO.

To further test the validity of the ÉCO, in accordance with the original study [16], convergent and divergent validity were assessed by using correlations to examine the level of association

between the ÉCO indices and the total and sub-scales scores of the MPAI-4. Given the modest sample size, a set of five planned analyses was devised [40]. It was hypothesized that support for convergent validity would be demonstrated by the presence of significant associations between selected ÉCO sub-scales and the sub-scales of the MPAI-IV that contained similar behavioural items. Therefore, the planned comparisons tested the significance of the relationship between: (1) the ÉCO aggression sub-scales and MPAI-4 Adjustment sub-scale containing an irritability, anger and aggression item; (2) ÉCO aggression sub-scales and MPAI-4 Behaviour supplementary items; (3) ÉCO aggression sub-scales and MPAI-4 total score; and (4) ÉCO Lack of initiation sub-scale and MPAI-4 Participation sub-scale containing an initiation item. With regard to divergent validity, it was hypothesized that none of the ÉCO indices would show a significant association with the MPAI-4 sub-scale that contained no behavioural items. Hence, the last comparison was (5) between the ÉCO sub-scales and MPAI-4 Abilities sub-scale containing no behavioural items.

Results

The study sample comprised 29 ABI subjects (21 men, eight women) whose average age was 40.55 (SD = 14.10; range = 21–68 years) and average years of education was 10.95 (SD = 2.82; range = 2–17 years). The participants consisted of 11 inpatients, 16 outpatients and two participants were living in the community after the completion of rehabilitation. The marital status was as follows: 19 single, eight married or in a relationship and two divorced or in the process of separation. More than half of the subjects (19/29, 65.5%) were deemed to require support for decision-making with regard to financial management and issues related to health and lifestyle.

The sample was mainly composed of traumatic brain injured subjects (72%, 21/29) who sustained a severe ($n = 17$) or moderate ($n = 4$) head injury. The remaining participants had other forms of acquired brain injury (stroke, 17%, 5/29; neurodegenerative disease, 7%, 2/29; and brain tumour, 4%, 1/29).

Table II shows descriptive statistics for the global indices and sub-scales of the ÉCO. In comparison to the two Australian samples, the results from the ÉCO sample closely matched that of the OBS from the OBS-Challenging Behaviour sample. Indeed, one-way between-groups ANOVAs revealed a statistically significant difference between groups on the three OBS global indices (OBS Cluster: $F(2, 681) = 32.40, p < 0.0001$; OBS Severity: $F(2, 70.82) = 116.55, p < 0.0001$; OBS CWS: $F(2, 70.41) = 133.02, p < 0.0001$). Post-hoc comparisons using Tukey HSD test indicated that the three mean scores for the ÉCO sample were significantly different from the ones of the OBS-Rehabilitation sample. However, the ÉCO sample did not differ significantly from the OBS-Challenging Behaviour sample on these OBS indices. This also suggests that the translated tool has behaved very much like the original. Furthermore, scores obtained using the ÉCO were uniformly higher than those reported in the OBS-Rehabilitation cohort (with one exception of Lack of initiation; INI), also to be expected given that all were admitted due to sustaining TBI, regardless of the presence vs absence of challenging behaviours.

Table II. Descriptive statistics for the ÉCO and OBS.

	ÉCO sample		OBS-CB sample ^a		OBS-Rehabilitation sample ^b	
	Mean	SD	Mean	(SD)	Mean	(SD)
Global indices						
OBS Cluster	3.90	1.82	3.88	1.57	2.82	1.65
OBS Total Severity	5.83	3.62	7.02	3.57	2.84	2.63
OBS Total Clinical Weighted Severity	14.00	9.19	15.71	8.16	5.43	6.22
Sub-scale severity scores						
VA	1.55	1.09	2.08	1.27	0.85	0.92
PAO	0.52	0.87	0.59	0.97	0.29	0.63
PAS	0.10	0.31	0.06	0.28	0.07	0.25
PAP	0.45	0.87	0.68	0.93	0.26	0.60
SEX	0.41	0.87	0.51	0.99	0.15	0.46
PER/REP	0.52	0.51	0.34	0.49	0.28	0.47
WAN/ABS	0.28	0.53	0.17	0.44	0.06	0.26
SOC	2.00	1.58	1.98	1.28	0.87	0.86
INI	1.70	1.98	2.25	2.05	2.06	1.94

VA, verbal aggression; PAO, physical aggression against objects; PAS, physical acts against self; PAP, physical aggression against people; SEX, inappropriate sexual behaviour; PER/REP, perseverative/repetitive behaviour; WAN/ABS, wandering/absconding; SOC, inappropriate social behaviour; INI, lack of initiation.

For INI Subscale Severity Scores, the prompting score (which is actually the CWS) has been used.

^a OBS-CB, OBS-Challenging Behaviour sample previously reported in Kelly et al. [9].

^b OBS-Rehabilitation sample drawn from Sabaz et al. [2].

The ÉCO Cluster scores (i.e. the number of challenging behaviour categories endorsed) are displayed in Table III. The most frequent behaviours, by rank order, were verbal aggression (82.8%, 24/29), inappropriate social behaviour (79.3%, 23/29), perseveration/repetitive behaviour (51.7%, 15/29), lack of initiation (48.3%, 14/29), aggression against objects (37.9%, 11/29), aggression against others (27.6%, 8/29), sexually inappropriate behaviour (27.6%, 8/29), wandering/absconding (24.1%, 7/29) and physical acts against self (10.3%, 3/29). These findings on Cluster scores and rank order of behaviour frequency closely matched the results the the original validation study based on the sample drawn solely from the challenging behaviour service [9].

As expected, correlation coefficients were very strong between the three overall indices of the ÉCO with each other (Cluster with Total Severity: $r = 0.891$, $p < 0.01$; Cluster with Total Clinical Weighted Severity: $r = 0.796$, $p < 0.01$, Total

Table III. Cumulative percentage of number of challenging behaviour categories endorsed (Cluster score) on the Échelle des comportements observable (ÉCO; $n = 29$).

Number of ÉCO domains of challenging behavior	<i>n</i>	%	Cumulative %
One	2	6.9	6.9
Two	6	20.7	27.6
Three	4	13.8	41.4
Four	7	24.1	65.5
Five	5	17.2	82.8
Six	2	6.9	89.7
Seven	2	6.9	96.6
Eight	1	3.4	100.0

Severity with Total Clinical Weighted Severity: $r = 0.919$, $p < 0.01$). The mean average OBS and ÉCO scores obtained from the bilingual clinicians were quite similar (OBS: Cluster: 3.62 (SD = 2.03); Total Severity: 5.31 (SD = 3.83); Total Clinical Weighted Severity: 12.96 (SD = 9.33); ÉCO: Cluster: 3.90 (SD = 1.82); Total Severity: 5.83 (SD = 3.62); Total Clinical Weighted Severity: 14.0 (SD = 9.19). The reliability coefficient between OBS and ÉCO were very strong for all three indices (Clusters: ICC = 0.936, $p < 0.0001$; Total Severity: ICC = 0.933, $p < 0.0001$; Total Clinical Weighted Severity: ICC = 0.956, $p < 0.0001$). Finally, 96.5% (28/29) of this sample met the criteria for challenging behaviour [2]. The final participant displayed behaviours that rated on the ÉCO, but simply not to the degree that met the classification of 'challenging'.

Regarding convergent validity, as predicted, the ÉCO aggression sub-scales' scores were positively and significantly correlated with the MPAAI-4 Adjustment sub-scale score (Verbal Aggression; $r = 0.511$, $p < 0.05$), the Severe behavioural problems supplement scale score of the MPAAI-4 (Physical aggression against objects; $r = 0.545$, $p < 0.05$) and the MPAAI-4 total score (Physical aggression against others; $r = 0.545$, $p < 0.05$). Contrary to expectation, the ÉCO Lack of initiation sub-scale score was not significantly correlated with the MPAAI-4 Participation sub-scale score. Regarding divergent validity, as predicted, none of the three ÉCO sub-scale scores were related to the MPAAI-4 Abilities scale score (which has no behavioural items).

Discussion

The goals of this study were to develop a French version (ÉCO) of the Overt Behaviour Scale (OBS) and to conduct an initial examination of some aspects of reliability and validity. The development of the ÉCO was based on a rigorous method of cross-cultural adaptation of questionnaires [33]. The strong correlations found between the French and English versions (OBS/ÉCO) on the three overall indices show promise for the reliability of the ÉCO. Moreover, supporting construct validity, the descriptive statistics for the global indices and sub-scales of the ÉCO showed that the results from the ÉCO sample match very closely that of the OBS from the OBS-Challenging Behaviour Australian sample and indicate that the French version of the OBS produces very comparable scores to the original.

The ÉCO was also found to have promising initial support for convergent validity with significant correlations between the ÉCO aggression sub-scales and the three MPAAI-4 sub-scales containing aggression items or severe behaviour problems (Adjustment, Behaviour Supplementary items and Total score). These results clearly support the association of the ÉCO with other instruments that contained behaviour items. There was a lack of correlation between the ÉCO Lack of initiation score and the MPAAI-4 Participation score, two indices containing an initiation item. One explanation for this lack of association might relate to the fact that both indices assess related but slightly different constructs—the ÉCO item is about the number of prompts required by the person, regardless of the domain of activity, whereas the MPAAI-IV is about the degree to which the lack of initiation is interfering with his/her

activities. Otherwise, in the OBS, Initiation is a standalone item, but in the MPAI, the Initiation question (item 22) is one of several in the Participation sub-scale. This difference of coverage between the two sub-scales might have contributed to lower their relationship. Alternatively, since the MPAI-4 participation sub-scale includes multiple items referring to activity in various domains such as self-care and social contact, it may be that clients engage in these activities to some extent, despite initiation difficulties—particularly where external supports (family members, support staff) can compensate for initiation issues.

Overall, the results suggest associations between some categories of challenging behaviour and adaptive functioning. For example, verbal aggression relates to the MPAI-4 Adjustment sub-scale, which contains emotional dysregulation (anxiety, depression, anger and irritability), inappropriate social interactions and lack of self-awareness items. This result suggests that verbal aggression could be an important behavioural expression of adjustment problems resulting from emotional dysregulation, impulsivity and lack of recognition of personal limitations. This is consistent with the result of a previous study, which indicated that impulsive verbalizations (vs impulsive gestures) were associated specifically with poor social interactions [41]. Verbal aggression could also be seen as a response to the limits imposed by other people when the client is not self-moderating. Results for divergent validity were strong, with support for predicted outcomes. None of the ÉCO sub-scale indices were related to the MPAI-Abilities sub-scale score, suggesting that the constructs measured by the ÉCO are more specifically related to behaviour-related items than to physical and cognitive skills-related items.

Finally, these results support the growing body of evidence concerning the typology of challenging behaviours following ABI [2,9]. Indeed, verbal aggression and inappropriate social behaviours are among the most frequent behavioural sequelae after an ABI. The distribution of ÉCO cluster scores exhibited by ABI participants in the present sample was very similar to those of the precedent studies [9,16] and underscore the point that most subjects display a broad challenging behaviour profile, supporting the need for a tool measuring more than one domain—which the OBS and ÉCO are doing. The high percentage (96.5%) of this sample that were classified as displaying challenging behaviour reflects the inclusion criteria for the study and should not be seen as an estimate of the prevalence of such behaviours among the general rehabilitation population of people with ABI within Quebec.

Regarding the strengths and limitations, the present study demonstrated that the data collected with the ÉCO are clearly consistent with those obtained with the original version of the OBS. The correlations between the ECO and others psychometric instruments support the concurrent and divergent validity of the ÉCO. Finally, test–re-test reliability of the ÉCO remains to be evaluated as well as its sensitivity to change (after a behavioural intervention, for example). Future studies should be conducted with larger and more representative sample of the population of survivors of ABI (of different aetiology and chronicity) with and without challenging behaviour to establish norms in order to facilitate the interpretation of the data collected with this instrument.

Conclusions

The results of this study support that the French version (ÉCO) of the OBS has good reliability, convergent and divergent validity. It provides a valuable tool to both clinicians and researchers in the field of challenging behaviour following acquired brain injury. The usefulness of this instrument has been shown not only to identify the typology of behaviours (using the nine categories), but also to objectively assess the severity of challenging behaviours and inform intervention. As challenging behaviours are among the main obstacles to rehabilitation and social participation following ABI, the ÉCO will be a relevant instrument for future studies among French populations. In clinical settings, the ÉCO will assist rehabilitation efforts in French and bilingual communities by enabling assessment and monitoring of a client, with a consistent measure across time, services and clinicians.

Acknowledgements

We wish to express our appreciation to the Centre for Interdisciplinary Research in Rehabilitation of Greater Montreal for its support during the research and all the clinicians who collaborated in the data collection. The authors would like to thank Maysaa Daher for her assistance with data collation.

Declaration of interest

This study was supported by a research grant to DG and JG from the Réseau provincial de recherche en adaptation–réadaptation (REPAR). The authors report no conflicts of interest. The findings reported in this manuscript have not been previously published and the manuscript is not being simultaneously submitted elsewhere. Original research procedures were consistent with the principles of research ethics, published by the American Psychological Association.

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