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**Different methods for long-term systematic assessment of challenging behaviours in people with severe intellectual disability**

## Abstract

*Background* Challenging behaviours in people with intellectual disabilities can lead to personal damages, or those around them, limiting their potential. This justifies the need for a functional behavioural assessment in order to design an effective intervention that can reduce or eliminate challenging behaviours. The aim of this study was to compare the advantages and disadvantages of different behavioral assessment procedures with the aim of design a long-term assessment procedure that brings together the benefits observed. A behavioural assessment has been carried out with a first general level (Scatter Plot), a more specific level (ABC record sheets) and, finally, a very detailed level (The Observer XT).

*Method* The study involved four adults with severe and profound intellectual disabilities and severe behavioural problems. We conducted a comprehensive assessment of challenging behaviour of each participant, by reviewing bio-psychosocial records, interviewing family and direct-caregiver staff, as well as direct observation of behavior through mentioned three procedures.

*Results* It is shown a large inter-subject behaviour variability and instability of intra-subject behaviour, raising questions about the election of the period to evaluate. The first evaluation level highlighted information about stability of behaviour, the second level stand out the context in which it occurs and the third level detailed the different topographies of each behavioural category.

*Conclusions* The selection of the most appropriate assessment procedure depends on the behaviour stability. The results suggest the desirability of a continuous assessment by combining these three levels to adjust to the specific characteristics of behaviour. We suggest the need of designing a single behavioral assessment procedure that includes the benefits observed in each of the instruments used.

**Keywords** functional assessment, Observer XT, behaviour problems, intellectual disability.

**Introduction**

Challenging behaviours (self-injury, physical or verbal aggression, destruction of objects) are especially prevalent in adults with severe intellectual disabilities (ID), becoming one of the biggest challenges for researchers (Lowe et al. 2007) and for service providers. It has been estimated that the prevalence of challenging behaviours (CB) in people with ID has ranged from 10% (Emerson et al. 2001, Lowe et al. 2007) to 15% (Holden & Gitlesen, 2006), increasing the likelihood of CB with higher levels of intellectual disability (Janssen et al. 2002, McIntyre et al. 2002).

Depending on the severity, CBs in people with ID can be a serious threat to their health and safety, restricting the opportunities to integrate into community, producing stress in their families and care staff and drastically reducing opportunities to carry out an educational intervention (Verdugo & Gutierrez, 2009; Poppes et al. 2010). This justifies the importance of early and effective interventions to change behaviour. Horner et al. (2002) demonstrated that early behavioural intervention can reduce 80-90% of challenging behaviours. However, the lack of intervention against challenging behaviours tends to adversely affect people with disabilities, causing behavioural problems persistence in the individual repertoire and limiting social, environmental and educational experiences in adulthood (Murphy et al. 2005).

To implement an effective intervention, we must first conduct a functional behaviour analysis to gather and synthesize information, to define the behaviour problem, to identify the behaviour consequences and describe the environmental context associated with high and low rates of behaviour (Repp & Horner, 1999). This methodology has become the main strategy for behavioural assessment of current approaches (Hanley et al. 2003; Sigafoos et al. 2003; Brosnan & Healy, 2011). In any case, the behaviour problem analysis always requires a comprehensive assessment of their frequency, duration, intensity and context of appearance or nonappearance. For this purpose, The Observer XT has become a tool for researchers and practitioners, recently being applied in the methodology of studies related to autism and intellectual disability (Mossman, 2011; Hutman et al. 2012, Naber et al. 2008; Meirsschaut et al. 2011).

This paper shows three different methods of objective assessment and subsequent analysis of the behavior of four adults with severe ID and CB added, using a triangular system which analyzes the person, his environment and interactions. All this through an evaluation at three levels: (1) general assessment through Scatter Plot register, (2) evaluation by ABC record sheets, and (3) direct observation of behaviour through video recording and analysis using The Observer XT, Noldus Technology. Depending on the assessment level desired, different variables may be implemented to improve the reliability and validity of the study: Establishing a baseline period of observation, disclosure or withholding of the behavioral function, and whether or not a cost benefit correction is allowed.

**Methodology**

*Participants*

This study involved 4 males with severe and profound intellectual disability and serious CB added, aged between 32 and 42 years (table 1). Users with the most serious CB were chosen. The sample was selected from the Special Education Center *Vista- Hermosa*. This institution belongs to AFANAS-JEREZ Association, a non-governmental and non-profit organization, with forty-five years experience in assisting people with ID.

TABLE 1 HERE

CBs were operationally defined and the different topographies of each behavioral category were identified in each participant.

(1) Ivan, showed: (a) *self-injury behaviour* (banging his head, belly, chest, leg, hand and arm), (b) *physical aggressive behaviour* (kicking, head banging, hitting or punching), (c) *stereotyped or repetitive behaviours* (wandering, rocking and moving an object), (d) *social-offensive behaviours* (urinating in the classroom, get undressed in public), (e) *damage or destruction of objects* (throw materials) and (f) *disruptive behaviour* (escape from classroom). All these behaviours appeared very frequently, being present and having psychotropic drugs prescribed chronically since childhood. Neurosurgical intervention (bilateral criohypothalamotomy) was practiced twice to reduce CB. After interventions, behaviors problem decreased, but never disappeared. However, although several behavioral interventions were carried out with no effective results.

(2) Jose, showed: (a) *self-injury behaviour* (beating his chest, face, leg and head), (b) *physical aggressive behaviour* (slaps, punches and kicks), (c) *damage or destruction of objects* (throw material, hits the table, window and mat) (d) *stereotyped or repetitive behaviours* (waving a handkerchief, yelling) and (e) *compulsive acts* (turn on/off radio or TV, opening/closing windows or doors, order materials, turning lights on/off, separate legs crossed, pull up his socks and closed cans). Compulsive acts occurred more frequently than other behaviours, which are manifested with greater intensity. CBs have been present and have received chronic psychopharmacological treatment since childhood.

(3) Victor showed: (a) *self-injury behaviour* (head banging, clawing face), (b) *physical aggressive behaviour* (slaps, pinches, scratches, pulls hair, clothing and ear) and (c) *stereotyped or repetitive behaviours* (rocking, wandering, waving an object and rubbing the palate with the thumb). These behaviors occurred very frequently, have been present and have received chronic psychopharmacological treatment since childhood. These behaviors, at times, have resulted in wounds or scratches on his face or to others around him.

(4) The repertoire of Daniel behavior problems included: (a) *verbal aggressive behaviour* (insulting others), (b) *physical aggression behaviour* (jump over others around him, pinching or gripping tightly to others), (c) *self-injury behaviour* (drops to the floor with violence, banging his head against the wall). These behaviours have been present and have received chronic psychopharmacological treatment since childhood. There have been several attempts to treat the CB by physical restraints, medication change and modification of the environment with engaging activities. However, although there was a reduction in aggressive behavior, they still show.

In the study, parents were individually informed of the entire procedure which would take place, stating verbal consent on the adequacy of planned activities.

#### Instruments

(1) *Scatter Plot*. The CB log sheet was extracted from the computer system for tracking biopsychosocial people with ID (García González-Gordon, 2005). We focused only on the CB record sheet, which contains monthly data on the days when participants were involved in any CB episode (e.g. self-injury behaviour, physical aggression, disruptive, stereotyped and social-

offensive behaviour). Behaviours described fit the classification provided by the *Inventory for Client and Agency Planning* (ICAP) (Montero, 1996). With these records we can obtain continuous information about the evolution of CBs in which the user is involved, allowing us to verify the more or less frequency periods.

(2) *ABC Record Sheet*. This was used to collect the episodes of CBs, and it is based on the model proposed by O'Neill et al. (1997). With this system we recorded the *antecedents* (those stimulus conditions immediately preceding CBs), observed CBs, previously defined, and the *consequences* (those events that appear after the occurrence of CB). These recordings were made individually, taking into account the characteristics of each participant, based on information obtained through interviews and clinical records. This register system allows us to determine the frequency of CBs, patterns of occurrence and the absence of such behavior in the time periods observed.

(3) *The Observer XT version 10.0, Noldus Technology*. This software allows observing human behaviour, record and analyzing it through digital video recordings. The introduction of data requires a previous design of a template that includes topography details for each behavioural category and the contextual conditions that are considered relevant to include in the project. The recording of data in the observation module displays the video while coding behaviours manually, providing the possibility of slowing down the video, making comments, display filtered behaviours and exclude parts of the video which analysis is not useful. With these video files we can check behaviours in a systematic and exhaustive way, rigorously examine the frequency, duration and intensity of each selected behaviour, facilitating data entry, admitting the possibility of issuing reports and statistical charts quickly. This tool was selected because it offers the possibility to analyze comprehensively and as often as necessary video files. This software can be used for live observation (Kahng et al. 1998), and being, probably, despite its complexity and high cost, the most comprehensive computer software for the storage, handling and analysis of observational data, something that even supporters of other similar software have come to point (Maclin & Maclin , 2005).

*Procedure*

In the first phase of the study we gathered information on participants, through bio-psychosocial records review, re-viewing the results of CB assessment instruments (ICAP; Montero, 1996) and DASH II (Salvador et al. 2002) in order to know the repertoire and the intensity of them in the past. We also administered a semi-structured interview to direct-caregiver staff and family, collecting information concerning the history of CB, their development and interventions performed so far. Finally, we carried out a direct observation of behaviour problems of each participant at three different levels:

(1) At the first level, we asked direct-caregiver staff to write down daily in the Scatter Plot CBs episodes previously defined, so we could obtain a continuous record of the evolution of behaviour. The register also includes absence's days at Out-Patients Unit as well as events that could lead to major changes in routine. During this process, direct-caregiver staff registered on a manual sheet if, during the course of the day, it has appeared an episode of self-injury behaviour, physical aggression, social-offensive behaviour or destruction of objects. Subsequently, this information is transferred to the computer bio-psychosocial system. We analyzed an average of 28 months for each user, although a user recorded was not analyzed for

lack of reliability. Information was organized by years and then calculated the percentage of days in which the participant was involved in different CB categories.

(2) On a second level we used the ABC record sheets, containing individualized and more specific information about those CBs in which the user was involved and the possible antecedents and consequences that could explain their maintenance. Previous to configuration of ABC record sheets, operational definitions were obtained from information provided by family members and direct-caregiver staff. Then prevalence of different topographies of each behavioral category was calculated. In addition, we calculated the frequency of the different antecedents and consequences, obtaining quantitative information about the hypothesized functions that might explain the behaviour problems.

(3) At the third level, an external expert evaluator, observed continuously the behaviour, while were videotaping participants in the natural environment, doing different tasks, during the day at the Out-Patients Unit. These films were recorded and analyzed later by The Observer XT. We recorded the frequency of the different topographies of each behavioral category, including information concerning the context in which they operate, the days of the week and people surrounding the participant. Data collection was carried out for 15 non-consecutive days, to a total period of one month and a half, up to a total of 30 hours of video for each participant.

## Results

The assessment of participants' CBs was held through the three levels (Scatter Plot, ABC log sheets and The Observer XT). One participant Scatter Plot's recordings were not analyzed for lack of reliability, as well as another participant with ABC record sheets. Table 2 shows the type of behavioural observation record made with each participant and the time observed with each procedure.

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### TABLE 2 HERE

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Evaluation using the Scatter Plot reports about the days in which participants are involved or not in a CB's episode (verbal or physical aggression, self-injury, destruction of objects, socially-offensive behaviour) through years 2009, 2010 and 2011, without recording the frequency and context of CB's episodes. As seen in table 3, there was an extensive variability between behaviours, but not all participants presented verbal aggression or social-offensive behaviours. A large variability was found as well considering the frequency of shared behavioural categories. Similarly, the dispersion of CB's episodes over time makes assessment more difficult, as seen in the case of Daniel. CB's episodes were not very frequent over the 431 days recorded during 2009, 2010 and 2011.

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### TABLE 3 HERE

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The results of Scatter Plot's assessment of Ivan and Jose for three consecutive years (2009-2011) are presented in figure 1. This method allowed track the evolution of behavior through long periods of time. For Ivan figure shows a decrease of social-offensive behaviours and destruction of objects, until its complete disappearance in 2011. A reduction of 47% in the presence of physical aggressive behaviour and increasing 19% for self-injury was also noted. Jose achieved more stability in behaviour over time. The behavioural category most frequently observed through three years was destruction of objects (83%), physical aggressive behaviour (24%) and self-injury (7%).



FIGURE 1 HERE

Daniel's assessment using the Scatter Plot in 2010 and 2011 suggested that his behaviour was highly unstable, making more difficult direct observation because of the unpredictability in the occurrence of episodes. Figure 2 shows the results corresponding to 2011, broken down by months rather than years, to make clear the instability of episodes. On January, April and October there were no CB episode. However, in November and December a significant increase in CB episodes were found.

FIGURE 2 HERE

Table 4 shows the comparison of CB's episodes of Jose and Victor using two different procedures, ABC record sheets and The Observer XT. With both procedures 30 hours were evaluated during 15 days along March and April 2011. Evaluation with a procedure and another was conducted in two different periods of 15 days. For example, in the case of Victor, with the ABC procedure there was only one self-injury episode, having recorded 101 episodes with The Observer XT. Or, in the case of Jose, with the ABC procedure 16 hitting the table episodes were observed, while with The Observer XT no episodes were registered. These results show how different frequencies can be observed depending on the period evaluated and method used.

TABLE 4 HERE

The assessment carried out using The Observer XT allowed us to analyze different topographies of each behavioural category, giving us information about the frequency, mean, standard deviation and the rate per minute for each behavior (table 5). It also allows us to compare the differences between participants, in terms of categories of CBs and their specific topographies. All participants shared some CB categories (self-injury, stereotyped behaviours and physical aggression). However, there were differences between participants for disruptive behaviour and compulsive acts. For example, Jose was the only case with compulsive acts. There were also large differences in frequency of CB episodes between subjects.

TABLE 5 HERE

.This software also facilitated recording of the antecedents and consequences that may functionally explain the behaviour. It allowed us to obtain results about the frequency during behavioural assessment (table 6). In the case of Ivan, most of the CBs episodes can be explained because of lack of received attention, or because he was interrupted when he was doing something of his interest. We can also consider that self-stimulation had an important role in most self-injury episodes. For consequences, we noted that Ivan was involved in many CB episodes in order to gain attention.

TABLE 6 HERE



## Discussion

The aim of this study was to compare the advantages and disadvantages of different behavioral assessment procedures. The main practice objective was to design a system for long term assessment that brings together the benefits observed. It has been carried out a behavioural assessment by a first general level (Scatter Plot), a more specific level (ABC record sheets) and, finally, a very detailed level (The Observer XT).

The results proved that CB's episodes were unstable, varying over time, with periods of high rates of behaviour problems and periods in which only a few number of episodes were registered. Based on these results, selections of most appropriate recording system depend on the stability of episodes of CB. When episodes are infrequent but of high intensity, occurring sporadically, the Scatter Plot is more appropriate. For such profiles, The Observer XT is not useful for recording the behaviour when no events occur because it doesn't allow us to describe the environmental context associated with high rates of behavioural problems, wasting resources.

The instability of CB episodes in participants can be seen in both Scatter Plot results as in the comparison between ABC procedure and The Observer XT. This instability was higher for Daniel, but was also evident for other participants. Thus, when episodes of CB are unstable, sporadic and severe, as in the case of Daniel, the information provided by the Scatter Plot was useful, using the ABC record only when events occurred. In this case, the Observer XT procedure was not useful.

The ABC method was useful when recording continuously over time. Preferably, it should be conducted by an external observer, which involves a minimal effect on CB observed, although this requires the provision of human resources that are not always available to assisting agencies.

The Observer XT was useful for those participants who had frequent CB episodes throughout the day, as observed in Victor, Ivan and Jose. While difficult to perform because of the amount of time required, this method allowed us to get extensive information about events occurring in a natural context.

We consider that ABC and The Observer XT records must be personalized. We do not assume that a CB (e.g., head banging) is affected by the environment in the same way for all individuals (Mudford et al., 2008), and probably for the same individual at two different moments. Therefore, before data collection through direct observation we must operationally define behaviour problems and specify the antecedents and consequences provided by families or direct-caregiver staff during the interview.

Regarding the assessment's duration to provide a baseline, there is no criterion that defines the number of sessions in which we must make a direct observation of behaviour. Some authors (Franco, 1998) set a period of two or three weeks, and can be extended if necessary. In this study, the period of time was not sufficient in all cases, because the participants' behaviours considerably varied over time. There were days in which many episodes of behaviour problems occurred and days with no episodes.

As shown in the comparative results of ABC log and The Observer XT, the baseline obtained with each of these procedures seriously differed. We believe that these differences can be explained by the instability of the episodes, rather than the procedure used. Therefore, we propose a continuous behavioural assessment, covering as much time as possible, for a complete understanding of behavior.

After our experience using the 3 assessment procedures, some advantages and disadvantages could be considered (table 7). The advantages of the Scatter Plot highlights being a practical, easy to record, reporting on the stability of behavior. The ABC record sheets report on the frequency and context in which behaviour problems occur and one of the benefits of The Observer XT is the comprehensive analysis of the different topographies of each behavioural category. Referring to the disadvantages of the Scatter Plot highlights the simplicity of this procedure as it does not collect information on the frequency, duration and context of the episodes. Concerning the ABC recording, the highest disadvantage was that did not allow us re-check episodes because it is a live observation procedure. So, relevant information in order to know the behaviour context may pass unnoticed. In addition to this procedure, several authors recommend short experimental sessions to corroborate or refute the hypotheses derived from the ABC functional register (Hanley et al. 2003). Finally, despite the many advantages of The Observer XT, we can see many drawbacks that raise questions about the viability of the procedure in centers where resources and time are limited.

TABLE 7 HERE

In summary, taking into account the advantages and disadvantages posed by long-term behavioural observation registers and variability of behavior displayed by people with severe ID, we propose the following guidelines to select the most appropriate procedure: (a) For infrequent behaviours that occur with severe intensity, we can use the Scatter Plot and daily ABC record sheets only when an episode appears. (b) When behaviour problems occur with high frequency and are unstable, daily record by the ABC method provides accurate information on the frequency. (c) When behaviour problems occur with high frequency and are stable over time, The Observer XT is useful to provide comprehensive information on the different topographies of the behavioural categories. (d) Finally, if we are interested to know the duration of the behavior, the best choice is The Observer XT, because it can achieve high accuracy of the detailed analysis of the duration of behaviour.

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**Table 1.** Clinical information of the participants.

Participants	Age	Diagnosis	Challenging Behaviours
Iván	40	Profound ID, autism, controlled epilepsy, absence of speech-language.	Self-injury, physical aggression, stereotyped behaviour, socially-offensive behaviour, disruptive behaviour and damage or destruction of objects.
Jose	38	Profound ID, Down syndrome, autistic traits, obsessive-compulsive traits, slurred speech.	Self-injury, physical aggression, stereotyped behaviour, compulsive acts and damage or destruction of objects.
Víctor	32	Profound ID, controlled epilepsy, no speech-language	Self-injury, physical aggression and stereotyped behaviour.
Daniel	42	Severe ID, cerebral palsy, motor impairment, slurred speech.	Verbal and physical aggression, self-injury and damage or destruction of objects.

**Table 2.** Periods of time observed in each participant with different observation procedures.

Participants	Scatter Plot	ABC recording sheets	The Observer XT
Ivan	33 months	48 days (96 hours)	15 days (30 hours)
Jose	33 months	15 days (30 hours)	15 days (30 hours)
Victor	-	15 days (30 hours)	15 days (30 hours)
Daniel	18 months	-	15 days (30 hours)

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**Table 3.** Number and percentage of days in which yes / no show CB using the Scatter Plot during the years 2009-2011. CB if it is involved in episodes of behavioural problems. No CB if it is not involved in any episode of behavioural problems.

Challenging Behaviours	Number of days in which yes / no present CB evaluated by the Scatter Plot					
	Iván		Jose		Daniel	
	CB	No CB	CB	No CB	CB	No CB
Physical aggressive behaviour	256 (36%)	446 (64%)	135 (33%)	279 (67%)	86 (20%)	345 (80%)
Verbal aggressive behaviour	-	-	-	-	77 (18%)	354 (82%)
Self-injury	577 (82%)	125 (18%)	34 (8%)	380 (92%)	27 (6%)	404 (94%)
Destruction of objects	109 (16%)	593 (84%)	335 (81%)	79 (19%)	1 (0%)	430 (100%)
Social-Offensive behaviours	63 (9%)	639 (91%)	15 (4%)	399 (96%)	-	-
Assessment period (total number of days)	702		414		431	

**Table 4.** Data from Jose and Víctor's challenging behaviours episodes observed with ABC record sheets and The Observer XT.

Jose challenging behaviours	ABC recording sheets	The Observer XT
Compulsive acts	159	142
Turn on/off light	7	47
Open/close the door	42	43
Open/close the window	32	11
Order materials	47	23
Turn on the radio	13	1
Separate crossed legs	18	9
Self-injury	25	15
Hitting his face	21	7
Banging his head	4	0
Hitting his leg	0	7
Hitting his chest	0	1
Physical aggressive behaviours	14	19
Hitting others	9	16
Kicking others	5	3
Damage or destruction of objects	18	15
Hitting the table	16	0
Hitting the window	1	11
Hitting the mat	0	2
Hitting the wall	1	0
Throwing material	0	2

Victor challenging behaviours	ABC recording sheets	The Observer XT
Self-injury	1	101
Banging his head	1	100
Clawing his face	0	1
Physical aggressive behaviours	60	55
Pulling clothes	21	19
Hitting others	4	16
Pinching others	24	12
Pulling others hair	6	5
Scratching others	3	2
Pulling others ear	2	1



**Table 5.** Descriptive data of the challenging behaviors presented by Ivan, Jose and Victor obtained by The Observer XT.

Ivan challenging behaviours		Results obtained by The Observer XT				
	N	Min.	Max.	Mean	SD	Rate/min
<i>Total Self-injury behaviours</i>	391					
Hitting his leg	205	0	53	13.67	18.02	0.17
Banging his head	102	0	22	6.80	9.03	0.09
Hitting his hand	45	0	19	3.00	6.00	0.05
Hitting his arm	20	0	15	1.33	3.89	0.02
Hitting his belly	9	0	4	0.60	1.18	0.008
Hitting his face	6	0	3	0.40	1.06	0.005
Hitting his chest	4	0	3	0.27	0.80	0.003
<i>Total Physical aggression behaviours</i>	83					
Hitting others	61	0	20	4.07	5.81	0.05
Kicking others	13	0	4	0.87	1.51	0.01
Head banging others	5	0	3	0.33	0.90	0.004
Punching others	4	0	1	0.07	0.26	0.002
<i>Total Disruptive behaviours</i>	35					
Escaping from work room	35	0	9	2.33	2.72	0.03
Damage or destruction of objects	27					
Throwing material	27	0	6	1.80	2.43	0.02
<i>Total Socially-Offensive behaviours</i>	2					
Being naked in public	1	0	1	0.07	0.26	0
Urinating in classroom	1	0	1	0.07	0.26	0
<i>Total Stereotyped behaviours</i>	256					
Wandering	134	0	47	7.87	12.17	0.089
Rocking	110	0	33	7.33	9.5	0.073
Waving an object	12	0	12	0.80	2.83	0.008

Jose challenging behaviours		Results obtained by The Observer XT				
	N	Min.	Max.	Mean	SD	Rate/min
<i>Total Stereotyped behaviours</i>	303					
Shake scarf	246	2	49	16.40	11.48	0.18
Shout	57	0	13	3.80	4.07	0.08
<i>Total Compulsive acts</i>	144					
Turn on the light	33	0	9	2.20	2.15	0.03
Close the door	38	0	6	2.53	1.81	0.04
Order materials	20	0	4	1.33	1.29	0.23
Turn off the light	14	0	3	0.93	1.34	0.02
Separate legs crossed	9	0	3	0.60	1.06	0.03
Pulls up socks	9	0	2	0.60	0.83	0.02
Close the window	8	0	4	0.53	1.13	0.34
Open the door	5	0	4	0.33	1.05	0.03
Open the window	3	0	3	0.20	0.78	0.03
Open curtains	2	0	2	0.13	0.52	0.02
Turn on the radio	2	0	2	0.13	0.52	0.02
Close the pot	1	0	1	0.07	0.26	0.01
<i>Total Physical aggression behaviours</i>	19					
Hitting others	16	0	5	1.14	1.56	0.03
Kicking others	3	0	2	0.21	0.58	0.02
<i>Total Damage or destruction objects</i>	14					
Hitting the mat	10	0	5	0.73	1.43	0.04
Hitting the window	2	0	2	0.13	0.52	0.02
Throwing material	2	0	1	0.13	0.35	0.04
<i>Total Self-injury</i>	12					
Hitting his face	7	0	3	0.50	0.86	0.01
Hitting his leg	4	0	3	0.50	1.09	0.03
Hitting his chest	1	0	1	0.70	0.27	0.001

Victor challenging behaviours		Results obtained by The Observer XT				
	N	Min.	Max.	Mean	SD	Rate/min
<i>Total Stereotyped behaviours</i>	998					
Rubbing his palate with his thumb	421	2	84	23.39	20.21	0.36
Rocking	240	2	28	12.71	8.00	2321.34
Waving an object	263	6	52	15.41	12.67	0.22
Wandering	74	0	13	4.11	4.21	677.62
<i>Total Self-injury</i>	101					
Banging his head	100	0	46	5.56	11.16	0.16
Clawing his face	1	0	1	0.06	0.24	0.04
Physical aggression	54					
Pulls clothes	19	0	6	1.06	1.59	0.04
Hitting others	16	0	5	0.89	1.49	0.04
Pinching others	12	0	6	0.67	1.41	0.03
Pulling others hair	5	0	3	0.28	0.75	0.29
Clawing others	2	0	2	0.11	0.47	0.44

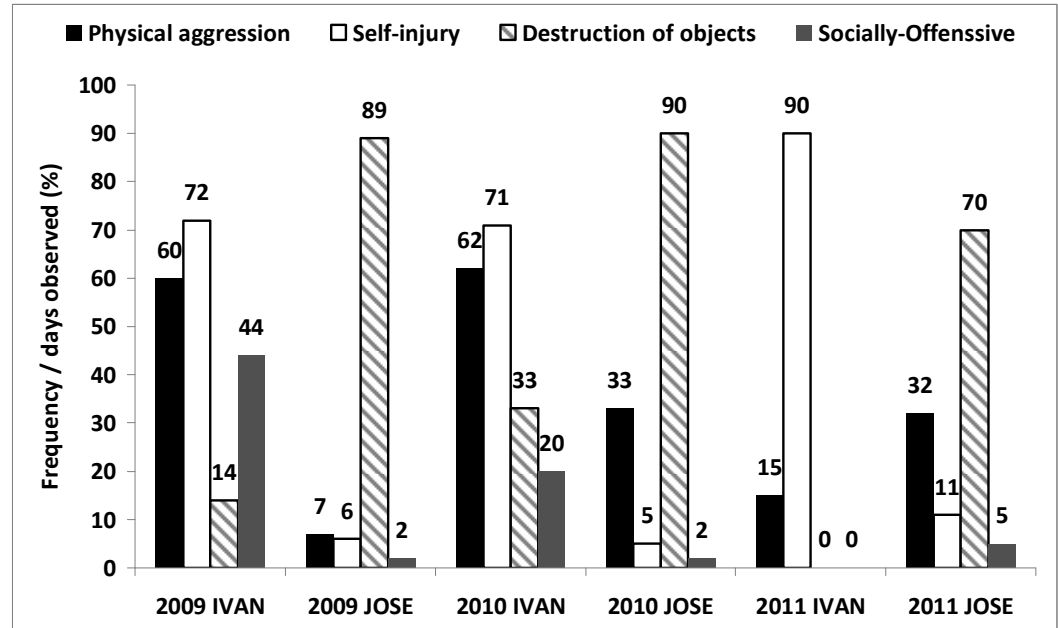
**Table 6.** Relationship between the antecedents, challenging behaviours and the consequences observed in episodes presented by Ivan.

	Self-injury							Physical aggression			Disruptive	Total	
	Hitting his leg	Banging his head	Hitting his hand	Hitting his arm	Hitting his face	Hitting his belly	Hitting his chest	Hitting	Punching	Kicking	Escaping	Throwing material	
<i>Antecedents</i>													
Not receiving attention	9	6	13	3	2	2	2	2	2	1	7	1	50
Interruption	1	1	5	-	-	-	-	7	1	2	1	1	19
Transition	-	-	-	-	-	-	-	-	-	-	1	-	1
Difficult task	1	2	-	-	-	1	-	2	-	-	-	-	6
Receiving an instruction	1	1	1	-	-	2	-	-	-	-	1	1	7
Communication attempt	-	-	-	-	-	-	-	1	-	-	-	-	1
<i>Consequences</i>													
Get self-stimulation	7	6	12	3	2	2	-	1	-	-	-	-	33
Get object/activity	1	1	3	-	-	-	-	2	-	-	2	-	9
Gain attention	1	-	1	-	-	1	1	2	2	1	8	1	18
Avoid instruction	1	-	2	-	-	2	-	2	-	-	-	1	8
Avoid activity	1	2	-	-	-	1	-	1	1	-	-	1	6
Avoid people	1	1	1	-	-	-	-	3	1	2	-	-	9

**Table 7.** Advantages and disadvantages of each behavioural assessment procedures used.

	Scatter Plot	ABC recording sheets	The Observer XT
<i>Advantages</i>			
Easy to register	X	X	
Allow displaying the episode several times			X
Reports on the evolution of behaviour	X		
Reports the context in which CB occur		X	X
Records the frequency of behaviours		X	X
Records the duration of behaviours			X
Generates advanced statistical results			X
<i>Disadvantages</i>			
Requires external evaluator		X	X
Requires previous training		X	X
Difficulty in recording			X
Require additional assessment	X	X	X
High economic cost			X

**Figure 1.** Percentage of days in which Jose and Ivan were involved in challenging behaviour episodes, evaluated by Scatter Plot through 2009, 2010 and 2011.



**Figure 2.** Number of days in which Daniel presents challenging behaviour episodes, evaluated by the Scatter Plot in 2011.

