

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/235878943>

Functional properties of behaviour problems depending on level of intellectual disability

Article in *Journal of Intellectual Disability Research* · March 2013

DOI: 10.1111/jir.12025 · Source: PubMed

CITATIONS

19

READS

537

4 authors:



Kristen Medeiros

George Mason University

7 PUBLICATIONS 84 CITATIONS

SEE PROFILE



Johannes Rojahn

George Mason University

142 PUBLICATIONS 4,343 CITATIONS

SEE PROFILE



Linda Moore

Chrestomathy, Inc.

11 PUBLICATIONS 208 CITATIONS

SEE PROFILE



Daniel J Van Ingen

Chrestomathy, Inc.

12 PUBLICATIONS 227 CITATIONS

SEE PROFILE

Some of the authors of this publication are also working on these related projects:



behavior problems in ID/ASD [View project](#)



Emotion Recognition in Children with Prenatal Alcohol Exposure [View project](#)

Functional properties of behaviour problems depending on level of intellectual disability

K. Medeiros,¹ J. Rojahn,¹ L. L. Moore² & D. J. van Ingen²

¹ *Applied Developmental Psychology, George Mason University, Fairfax, VA, USA*

² *Chrestomathy, Inc., Minneapolis, MN, USA*

Abstract

Background Behaviour problems are common among individuals with intellectual disabilities (ID) especially in those with more severe forms. The determination of the functional profile of a targeted behaviour has important implications for the design of customised behavioural interventions.

Method We investigated the relationship between the level of ID and the functional profile of aggression, stereotypy and self-injurious behaviour (SIB) using the Questions about Behavioural Function (QABF). Two staff members at two time points completed the QABF for each of 115 adults with varying levels of ID participating in a day training and habilitation programme.

Results and conclusions Our results suggest that there is a differential relationship between the functions of behaviour problems and level of ID. While SIB is more often seen by raters to be maintained by escape of social demands and by attaining access to tangible items with the decline of the intellectual level, aggressive and stereotypic behaviours were identified more often as serving multiple functions equally across functioning level.

Keywords aggressive behaviour, behaviour problems, challenging behaviour, intellectual disabilities, self-injurious behaviour, stereotypic behaviour

Correspondence: Prof. Kristen Medeiros, Applied Developmental Psychology, George Mason University, 4100 University Drive, MSN 3F5, Fairfax, VA 22030, USA (e-mail: kmedeiro@gmu.edu).

Introduction

Intellectual disability (ID) is a severe and chronic condition that must manifest before the age of 18 years and that is defined by significant limitations in intellectual functioning and adaptive behaviour (American Psychiatric Association 2000). Individuals with ID have core deficits in cognitive or social-emotional self-regulation (Borkowski *et al.* 2007) leading to distinct profiles of abilities and patterns of behaviour problems (Brassard & Boehm 2007). Behaviour problems are generally defined as actions that significantly interfere with learning, skill performance and social interaction, and also potentially cause physical harm to the self or others (Emerson *et al.* 2001; Emerson 2005; Mudford *et al.* 2008). Common displays of behaviour problems include aggressive behaviour, self-injurious behaviour (SIB) and stereotypic behaviour.

Self-injurious behaviour can be defined as self-directed behaviour that causes or has the potential to cause physical damage, occurs repeatedly, or is relatively idiosyncratic, and requires intervention (Rojahn *et al.* 2008). It ranges in severity, frequency and topography, and positively correlates with severity of ID and with sensory and communication deficits (Rojahn *et al.* 2008). Some of the more common topographies include head banging, self-biting, self-scratching and self-hair pulling (Emberson & Walker 1990; Bodfish *et al.* 1995; Emerson *et al.* 2001; Rojahn *et al.* 2008). Prevalence rates of SIB vary widely in the literature, with esti-

mates reported as anywhere from 1.7% (Rojahn 1986) to 82% (Poppes *et al.* 2010).

Stereotyped behaviours are restricted and repetitive patterns of behaviour, interests and activities (American Psychiatric Association 2000) common among individuals with ID (Rapp & Lanovaz 2011). They are idiosyncratic repetitive behaviours that look unusual, strange or inappropriate to the average person. Although they can interfere with everyday functioning, disturbing the individual's quality of life (Jones *et al.* 1990), they are not physically damaging (Rojahn *et al.* 2001).

Aggressive or destructive behaviours are offensive actions or deliberate overt attacks directed towards other individuals or objects. They occur repeatedly in the same way over and over again, and they are characteristic for that person (Rojahn *et al.* 2001). Aggressive behaviour is more common in children with ID than in typically developing peers (Cooper *et al.* 2007; Singh *et al.* 2007; Farmer & Aman 2011; Rojahn *et al.* 2012).

Prevalence of behaviour problems

Although these behaviour problems are not only exhibited by individuals with ID, they are extremely common within this population (Matson *et al.* 2009; Poppes *et al.* 2010). Data on prevalence rates typically come from caretaker reports on questionnaires (with various operational definitions) of individuals without verbal abilities and self-reporting in retroactive studies from those with verbal abilities. Therefore, the wide variability in prevalence reports is due to differences in sampling and criteria for behaviour problems (Roeleveld *et al.* 1997).

Correlates of behaviour problems

Most studies report that behaviour problems are associated with levels of ID and IQ (Allen 2000; McClintock *et al.* 2003). McTiernan *et al.* (2011) found that lower IQ was associated with an increase in the frequency of aggression, stereotypy and SIB. Similarly, Holden & Gitlesen (2006) reported that behaviour problems were more common among those with greater levels of intellectual impairment. Jacobson (1982) found that level of functioning moderated the progression of behaviour problems, where individuals with severe and profound ID

increased behaviour problems in adulthood, and individuals with moderate and mild ID showed a stable exhibition of behaviour problems across age groups. Research also suggests that individuals with mild to moderate ID exhibit more sporadic, outwardly destructive behaviours, such as aggression, while those with severe to profound ID present with more continuous, self-directed behaviours, such as SIB and stereotypy (Koskentausta *et al.* 2007; Witwer & Lecavalier 2008; Cooper *et al.* 2009). However, some research has failed to find a relationship between behaviour problems and level of ID (Murphy *et al.* 2009).

Functions of behaviour problems

The most common and successful treatment approach to date for behaviour problems are those that involve principles of applied behaviour analysis, which in turn centre on the functional properties of the target behaviour. Assessing functional properties to produce individualised behavioural interventions that intervene at the antecedent or consequent level can be extremely successful at reducing any behaviour problems and increasing adaptive behaviour (Favazza 1989; Lloyd *et al.* 1998; Matson *et al.* 1999; Nock & Prinstein 2005; Rapp & Vollmer 2005; Reid *et al.* 2010). The functional properties refer to the contingencies of reinforcement that maintain a behaviour. Identifying the functional properties of a given behaviour allows the design of customised behavioural strategies that are rationally linked to those properties (O'Neill *et al.* 1997; Cooper *et al.* 2007).

Most assessments of function report four separate behavioural reinforcement categories: external positive, external negative, internal positive (automatic) and internal negative. For example, behaviour problems can serve to receive attention or a tangible item from an adult or caregiver (i.e. external positive reinforcement), escape a social demand or task (i.e. external negative reinforcement), elicit a physical sensation or self-stimulate (i.e. internal positive reinforcement), or reduce physical discomfort or pain (i.e. internal negative reinforcement).

Functional assessments include direct and indirect measures of the behaviour, such as observations and rating scales [e.g. Motivation Assessment

Scale¹ (MAS; Durand & Crimmins 1992)]; whereas, functional analysis involves the systematic and repeated manipulation of antecedents and consequences in a within-subject design. As functional analysis tends to be relatively costly and can sometimes create ethical dilemmas, functional assessment is typically the simpler, more feasible approach. Before the early 1980s, behaviour interventions were often selected on the basis of the form or topography of the behaviour problems; whereas, now, they are expected to be based on the functions (Iwata *et al.* 1994).

Different behaviour topographies tend to be associated with different functional profiles. For example, stereotypic behaviour is often referred to as 'stimming' (Nind & Kellett 2002; Cunningham & Schreibman 2008), which, in behavioural terms, means that it tends to be maintained by automatic reinforcement (Rapp & Vollmer 2005). In addition, the majority of the literature using our current assessment options suggests that automatic reinforcement maintains most stereotypy (Rapp & Vollmer 2005), and researchers often refer to the neurobiological source of stereotypy, using evidence from non-human studies (Rapp & Vollmer 2005). However, behaviour problems can also have multiple functions for an individual at a given time (Matson & Boisjoli 2007) or change in function over time (Vollmer & Iwata 1991; Lerman *et al.* 1994). A recent study by Rojahn *et al.* (2012) found that different functions maintain different behaviour problems, with SIB and stereotypy serving non-social functions more often than aggression.

Research on the prevalence rates of particular functions for behaviour problems varies widely (Iwata *et al.* 1994; Roscoe 2002). A large study by Iwata *et al.* (1994) summarised 152 functional analyses in attempt to create epidemiological intervals for each of these functions of SIB. This study resulted in the following prevalence estimates for the various functional categories: social-negative/escape = 38.1%, social-positive/attention or tangibles = 26.3% and automatic sensory = 25.7%. The

remaining cases had multiple reinforcers or had functional analyses that were either inconsistent or not interpretable.

Research on the specific prevalence of functional categories among different disability levels is scarce. Studies have attempted to determine factors that influence the tendency of an individual to endorse particular functions of behaviour problems. Research has found support for the notion that some diagnoses, mainly autism and pervasive developmental disorder, are closely associated with certain functions of behaviour problems (Barrera & Graver 2009). Deficits in specific competences, such as social skills, have also been identified as related to particular functions of maladaptive behaviour (Matson *et al.* 2002). However, research has shown the evident correlation between diagnostic categories and developmental skills with the level of disability of the individual. Therefore, the purpose of this exploratory study was to investigate the relationship between level of ID and the functions served by three behaviour problems: aggression, stereotypy and SIB.

Method

Participants

Data were collected from 115 adults with various levels of ID (*ns*: 21 mild, 29 moderate, 38 severe and 27 profound) engaged in a day training and habilitation programme located in Minnesota. The non-institutional programme provides behavioural support for adults with intellectual and developmental disabilities, tailoring activities towards each participant's unique needs. Age of participants ranged from 17 to 60 years old ($M = 30.15$, $SD = 9.95$), with 80 men and 35 women. The majority of the sample was Caucasian (81.7%), and the remainder was African American (11.3%), Asian (4.3%) and Hispanic (1.7%), with missing ethnicity data for only one individual.

Measures

Questions about Behavioural Function (QABF; Matson & Vollmer 1995)

The QABF is a 25-item questionnaire designed to assess the function of maladaptive behaviour by

¹ See <http://www.robertjasongrant.com/wp-content/uploads/MotivationAssessmentScale.pdf> for the full MAS, with items and scoring.

rating the frequencies of five functional sub-scales on a four-point scale (0 = never, 1 = rarely, 2 = some, 3 = often). Raters are also allowed to check 'does not apply'. The five sub-scales, each with five items, include: social positive/attention, social positive/tangibles, social negative/escape, automatic positive or negative/non-social, and pain attenuation or physical discomfort reduction/physical).² Each sub-scale frequency is summed, and the scale with the highest score is considered the likely cause of that target behaviour (Zimelman 2005). The QABF takes about 20 min to administer (Paclawskyj *et al.* 2000), and the scoring and interpretation of the scale are clearly described in the manual (Matson & Vollmer 1995). Overall, the QABF is a powerful substitute for functional analyses or Applied Behavior Analysis methods of assessment, which are more time consuming and costly, and require more training to administer (Zimelman 2005).

The QABF had acceptable test-retest (delay of 1–3 weeks) reliability, which was established with 34 staff members who were familiar with clients, producing spearman rank-order correlations from 0.65 to 1.0 for various sub-scales (Paclawskyj *et al.* 2000), and split half reliability ($r = 0.91$) (Dawson *et al.* 1998).

Zaja *et al.* (2011) found higher test-retest reliability with correlations between 0.81 and 0.82. Inter-rater reliability was established with acceptable per cent agreement (Paclawskyj *et al.* 2000; Nicholson *et al.* 2006; Zaja *et al.* 2011), with kappa values from 0.63 to 1, and internal consistency is high, with an alpha range of 0.89 to 0.96 for different sub-scales (Nicholson *et al.* 2006; Zaja *et al.* 2011).

An exploratory factor analysis of the scale produced a five factor solution that accounted for 76% of the variance in ratings, confirming the original factor structure put forth by the authors (Paclawskyj *et al.* 2000). A factor analysis by Nicholson *et al.* (2006) yielded a sixth factor, which held items related to the repetitiveness of the behaviours. A test of convergent validity of QABF, MAS, and an equivalent functional analysis in 13 individuals with behaviour problems showed that the QABF and functional analysis agreed on 56% of the cases,

whereas the MAS and functional analysis agreed on 44% of cases, and the QABF and MAS agreed 61% of the time (Paclawskyj *et al.* 2000). The QABF and Functional Assessment for Multiple Causality (FACT) had good convergent and discriminant validity (Zaja *et al.* 2011).

In the current study, inter-rater reliability varied among sub-scales from acceptable to good [$r = 0.51$ (Attention); $r = 0.54$ (Social Escape); $r = 0.58$ (Sensory stimulation); $r = 0.39$ (Pain reduction); $r = 0.62$ (Tangible reinforcement)], test-retest reliability was good to excellent [$r = 0.68$ (Attention); $r = 0.69$ (Social Escape); $r = 0.70$ (Sensory stimulation); $r = 0.59$ (Pain reduction); $r = 0.76$ (Tangible reinforcement)], and excellent internal consistency ($\alpha = 0.87$).

Behaviour Problems Inventory (BPI-01; Rojahn et al. 2001)

The original BPI was designed to be a 'narrow band' assessment of common behaviour problems seen in ID. The BPI-01 contains 49 items on three sub-scales: SIB (14 items), stereotypic behaviour (24 items) and aggressive or destructive behaviour (11 items). The behaviours are rated for frequency (0 = never, 1 = monthly, 2 = weekly, 3 = daily, 4 = hourly) and severity (0 = no problem, 1 = a slight problem, 2 = a moderate problem, 3 = a severe problem). The BPI-01 can be self-administered by a caregiver following online instructions (Zimelman 2005).

The norming sample consisted of 432 individuals with ID (54% male), ranging in age from 14 to 91 (primarily adults), who were in residential care, where 84.2% of participants had severe or profound ID. The BPI-01 was administered by four graduate students by means of interviews with staff who knew participants well. From this sample, a confirmatory factor analysis found the three factor structure to be appropriate (Rojahn *et al.* 2001). Factor validity was later supported with independent confirmatory and exploratory factor analyses, and the three factor structure fit the data well (Gonzalez *et al.* 2009).

Frequency and severity were found to be highly correlated across sub-scales ($r = 0.90$), and for SIB specifically, ($r = 0.93$) (Rojahn *et al.* 2001; Gonzalez *et al.* 2009). The internal consistency of the

² See <http://www.robertjasongrant.com/wp-content/uploads/QABF.pdf> for the full QABF, with items and scoring.

frequency of SIB has been reported as $\alpha = 0.61$ (Rojahn *et al.* 2001), $\alpha = 0.48$ (Gonzalez *et al.* 2009) and $\alpha = 0.71$ (Sturmey *et al.* 1995). Test-retest reliability (1-week delay) of the frequency scales was high with $r = 0.71$ (Gonzalez *et al.* 2009) and 96% agreement (Sturmey *et al.* 1993).

Inter-rater agreement was acceptable, with a kappa of 0.65 and 95% agreement (Sturmey *et al.* 1993). Criterion-related validity has been established in multiple situations. The BPI-01 was compared with the *Repetitive Behaviour Scale-Revised* (RBS-R), and correlated at $r = 0.77$ (Bodfish *et al.* 1999). The BPI-01 was compared with the *Aberrant Behaviour Checklist*, and the two assessments showed largely consistent results and converged and diverged appropriately (Rojahn *et al.* 2003). The BPI-01 was also compared with the *Autism Spectrum Disorders-Behaviour Problems for Intellectually Disabled Adults*, and the two instruments converged appropriately (Rojahn *et al.* 2010).

Overall, the BPI-01 has undergone several reliability and validity examinations, and has passed. The authors highlight multiple uses for the BPI-01 including clinical assessment, intervention planning, behaviour monitoring and scientific research (Rojahn *et al.* 2001).

Level of ID

The ID level for each participant was previously determined through evaluations conducted by licensed psychologists using standardised measures of cognitive ability (e.g. Stanford Binet Intelligence Scales), behavioural observations, parent and family interviews, and other psychological measures (e.g. the Vineland Adaptive Behaviour Scales). Psychological tests recorded at the day programme were

examined by the third author to ensure applicability with each participant and soundness of the assessment.

Procedure

Supervisory staff at the day programme who were knowledgeable with the client completed both the QABF and the BPI-01 on two separate occasions, with a 2-month delay. Two staff members completed two sets of assessments for each client. The target behaviour for the QABF was defined as the one with the highest BPI-01 frequency score; therefore, each participant had data on the function of only one type of behaviour problem. Average subscale scores for the QABF were obtained by adding the frequency scores from two raters at the two time points for each sub-scale (for a total of four scores per sub-scale) and dividing by four.

Results

Supervisory staff completed the QABF for aggressive behaviour for 58 individuals (50.4%), stereotypic behaviour for 25 of the individuals (21.7%) and SIB for 32 individuals (27.8%). These subsamples did not significantly differ on age [$F(2, 112) = 0.88, P > 0.05$], ethnicity [$\chi^2(114) = 6.59, P > 0.05$], gender [$\chi^2(115) = 1.28, P > 0.05$] or level of ID [$\chi^2(115) = 2.65, P > 0.05$] (Table 1).

Effects codes were created to represent the four levels of intellectual functioning: mild, moderate, severe and profound. For each behaviour problem, multiple regression analyses were conducted, with the effects codes of the levels of intellectual func-

Table 1 Demographic information by behaviour problem

Behaviour	n	Age in years (M, SD)	Gender (%)		Race (%)			
			Male	Female	Caucasian	African American	Hispanic	Asian
Aggression	58	31.24, 10.4	70.7	29.3	78.9	10.5	0.02	0.09
Stereotypy	25	29.92, 10.3	76	24	84	16	0	0
Self-Injury	32	28.34, 8.9	62.5	37.5	87.5	9.4	3.1	0

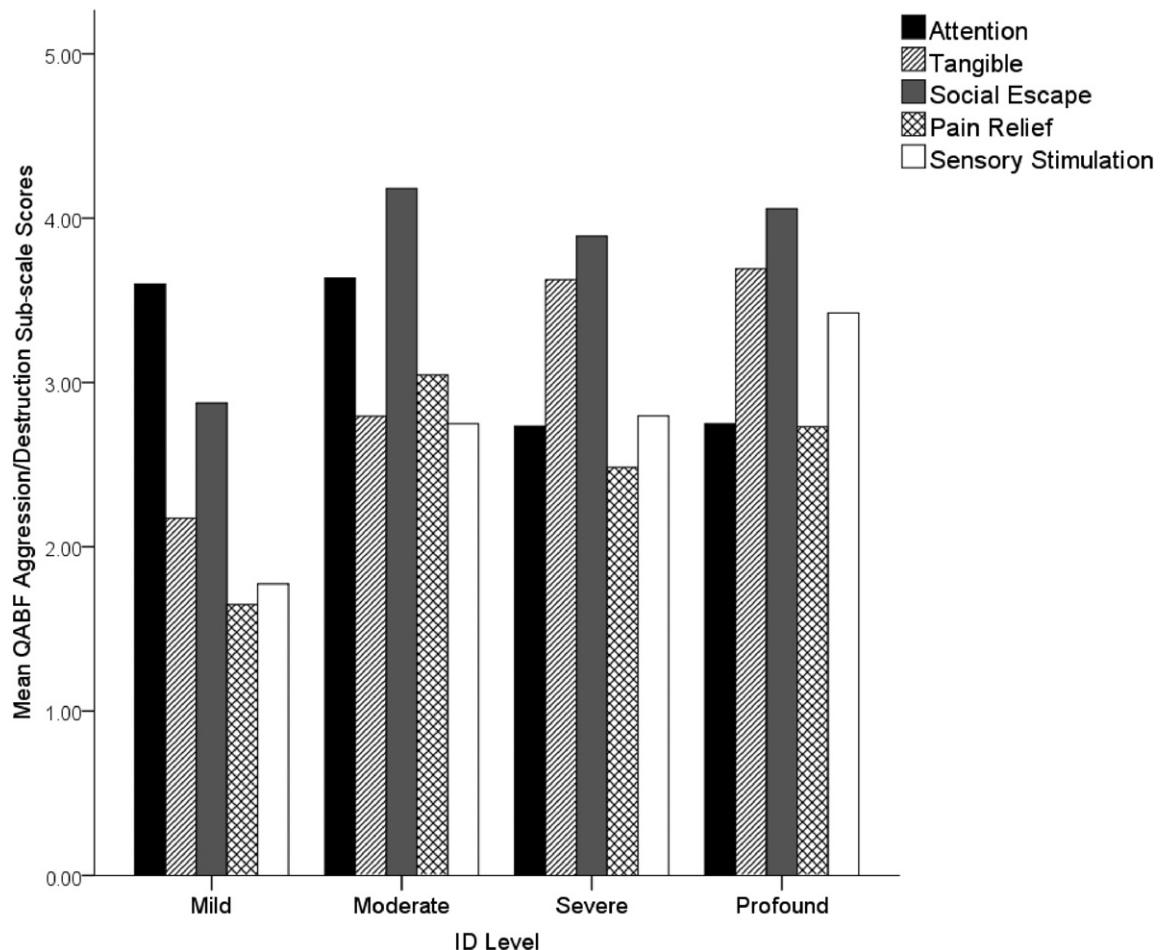


Figure 1 Mean Questions about Behavioural Function (QABF) sub-scale scores by intellectual disability (ID) for aggressive/destructive behaviour.

tioning as the independent variables and the QABF sub-scales as the dependent variables.

Results showed that, regardless of ID level, individuals exhibited aggression equally for attention [$F(3, 46) = 1.55, P > 0.05$], sensory stimulation [$F(3, 46) = 2.74, P > 0.05$], pain reduction [$F(3, 46) = 1.55, P > 0.05$], social escape [$F(3, 46) = 2.26, P > 0.05$] and tangible items [$F(3, 46) = 2.55, P > 0.05$] (Fig. 1).

Similarly, results showed that, regardless of ID level, individuals exhibited stereotypic problem behaviour equally for attention [$F(3, 21) = 0.08, P > 0.05$], sensory stimulation [$F(3, 21) = 1.27, P > 0.05$], pain reduction [$F(3, 21) = 1.15, P > 0.05$],

social escape [$F(3, 21) = 1.33, P > 0.05$] and tangible items [$F(3, 21) = 2.66, P > 0.05$] (Fig. 2).

However, ID level did provide information about the functioning of SIB. Results showed that individuals with mild ID exhibited SIB to attain tangible items significantly less often than the entire group ($\beta = -0.65, P < 0.01$), while individuals with severe ID exhibited SIB significantly more often to attain tangible items than the entire group ($\beta = 0.48, P < 0.05$). Similarly, individuals with mild ID used SIB to escape social demands significantly less often than the entire group ($\beta = -0.53, P < 0.05$) and individuals with severe ID used SIB to escape social demands significantly more often

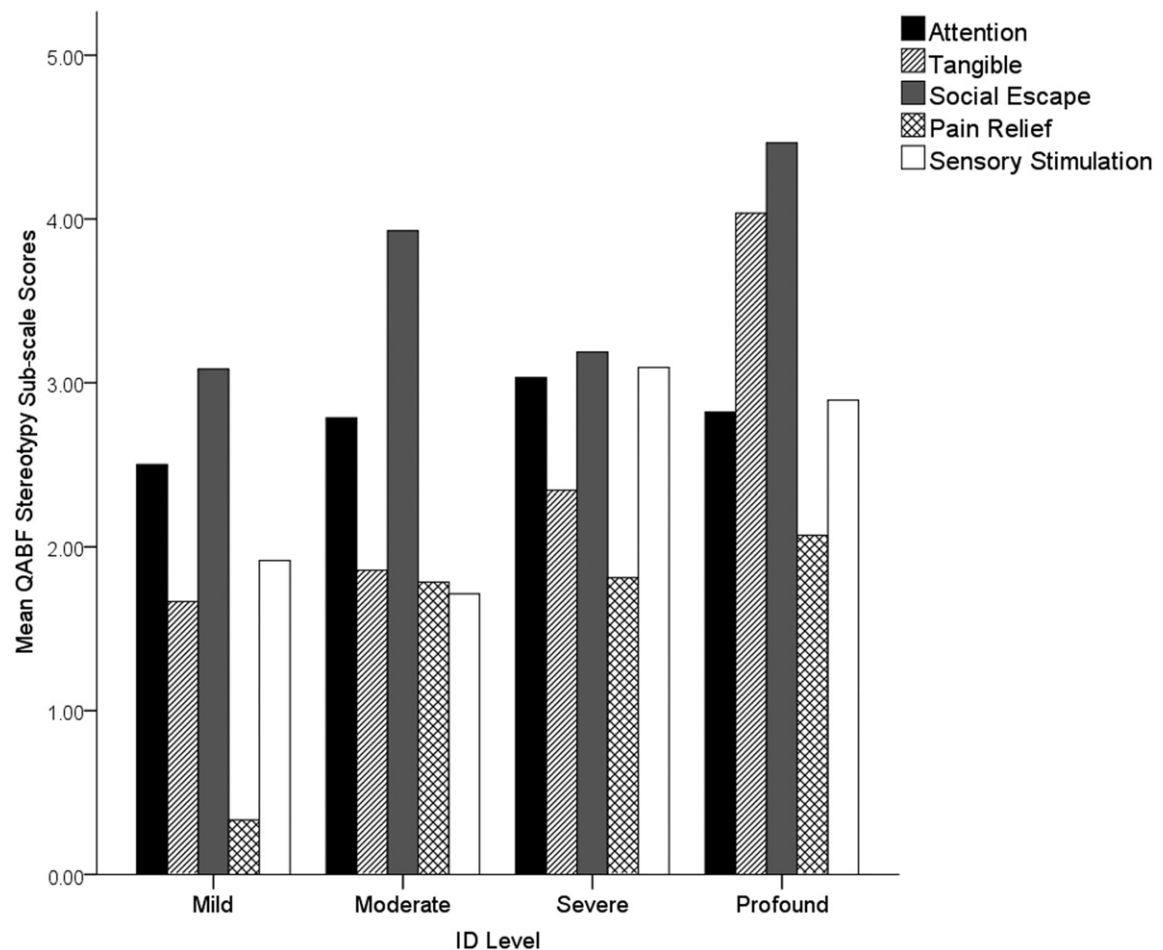


Figure 2 Mean Questions about Behavioural Function (QABF) sub-scale scores by level of intellectual disability (ID) for stereotyped behaviour.

than the entire group ($\beta = 0.60$, $P < 0.01$). Regardless of ID level, individuals displayed SIB equally for attention [$F(3, 26) = 1.82$, $P > 0.05$], sensory stimulation [$F(3, 26) = 1.15$, $P > 0.05$] and pain reduction [$F(3, 26) = 1.41$, $P > 0.05$] (Fig. 3).

Discussion

In this study, we examined whether the level of ID impacts the function of behaviour problems. Our results showed that in general, across behaviour problems, a variety of functions are commonly endorsed by all levels of functioning. This could serve as a measure of precaution for families and professionals working with individuals with severe

and profound ID, to be wary of concluding an internal or automatic reinforcement function. Concluding that a behaviour problem such as aggression, stereotypy or SIB is occurring for internally reinforcing reasons may not be justified without properly eliminating the possibility of external motivating operations such as attention, tangible items and social demands.

In regards to SIB, two specific significant differences were found, such that individuals with mild ID tended to use SIB less often for tangible items or to escape social demands, and individuals with severe ID tended to use SIB for these same purposes significantly more often. In other words, with the decline of intellectual functioning, SIB functions

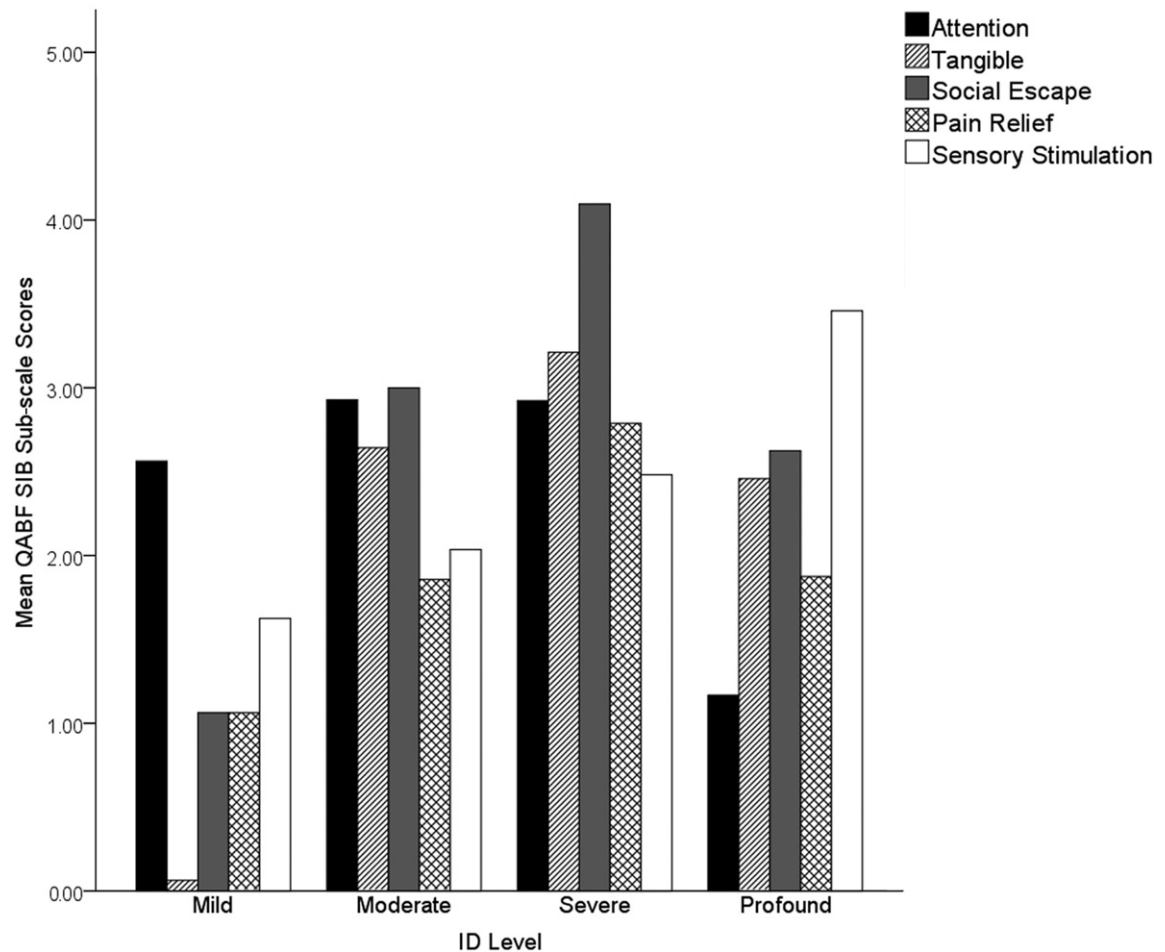


Figure 3 Mean Questions about Behavioural Function (QABF) sub-scale scores by level of intellectual disability (ID) for self-injurious behaviour (SIB).

more often to gain tangible items and escape social demands. This could be implemented in interventions as noting the need for support for the use of manipulatives, preferred items, or other physically stimulating objects for individuals with severe ID who exhibit SIB. Language and communication training may also alleviate SIB for the more severely impacted population, as it would provide an avenue for expressing a desire for stimulation or a desire to take a break from the social demands at hand.

This research showed that aggressive and stereotypic behaviour problems can function for various reasons across all levels of functioning. In other words, regardless of the severity of ID, individuals appear to exhibit these behaviour problems for the

purposes of attention, sensory stimulation, pain reduction, social escape and tangible reinforcement. This has implications for future interventions for all levels of ID that target the elimination of behaviour problems.

One limitation to this research is the measurement error in the assessment instrument, the QABF. This study may not reflect the relationship between ID and functions of behaviour problems, but more accurately reflects the relationship between the label of ID that they receive and how their behaviour is interpreted by an observer. By using two observers and two time points, the effect of measurement error is lessened, thus we are more confident in the appropriateness of the conclusions

drawn from our assessment, albeit a questionnaire rather than a formal functional analysis. The potential interaction of rater perspective, environment and behaviour problem function is still left to be explored.

A second limitation is the measurement error in the BPI-01. Although the QABF was filled out with one target behaviour in mind, previously determined by the highest frequency on the BPI-01, several participants exhibited comorbid behaviour problems. At least one exhibition of aggressive behaviour had been noted in 90.8% of participants, 80.8% of participants had at least one episode of stereotypic behaviour, and 68.5% of participants had at least one display of SIB. Therefore, whether the comorbid behaviours were simultaneously exhibited, or whether multiple behaviours serve for the same, similar or a variety of functions is unclear. A hierarchical usage depending on the effectiveness in different contexts is also plausible. Future studies should consider longitudinal investigations of the progression of behaviour problems in quantity and quality to better describe this repertoire of functions and determine appropriate interventions.

This research was a preliminary exploration of the relationship of ID level and motivating operations of aggressive, stereotypic and self-injurious behaviour problems. These results show the potential for future research to provide an average frequency rate for population comparisons within each level of ID.

References

- Allen D. (2000) Recent research on physical aggression in persons with intellectual disability: an overview. *Journal of Intellectual and Developmental Disability* **25**, 41–57.
- American Psychiatric Association (2000) *Diagnostic and Statistical Manual of Mental Disorders-Text Revision*, 4th edn. Author, Washington, DC.
- Barrera F. J. & Graver E. E. (2009) A comparison of behaviour functions in community and facility settings. *Journal on Developmental Disabilities* **15**, 30–4.
- Bodfish J. W., Powell S. B., Golden R. N. & Lewis M. H. (1995) Blink rates as an index of dopamine function in adults with mental retardation and repetitive behavior disorders. *American Journal on Mental Retardation* **99**, 334–5.
- Bodfish J. W., Symons F. J. & Lewis M. H. (1999) *Repetitive behavior scales*. Western Carolina Center Research Reports.
- Borkowski J. G., Carothers S. S., Howard K., Schatz J. & Farris J. R. (2007) Intellectual assessment and intellectual disability. In: *Handbook of Intellectual and Developmental Disabilities* (eds J. W. Jacobson, J. A. Mulick & J. Rojahn), pp. 261–78. Springer-Verlag New York, LLC, New York, NY. doi:10.1007/0-387-32931-5_14
- Brassard M. R. & Boehm A. E. (2007) *Preschool Assessment: Principles and Practices*. The Guilford Press, New York.
- Cooper J. C., Heron T. E. & Heward W. L. H. (2007) *Applied Behavior Analysis*, 2nd edn. Pearson, Upper Saddle River, NJ.
- Cooper S. A., Smiley E., Jackson A., Finlayson J., Allan L., Mantry D. *et al.* (2009) Adults with intellectual disabilities: prevalence, incidence and remission of aggressive behaviour and related factors. *Journal of Intellectual Disability Research* **53**, 217–32. doi:10.1111/j.1365-2788.2008.01127.x
- Cunningham A. B. & Schreibman L. (2008) Stereotypy in autism: the importance of function. *Research in Autism Spectrum Disorders* **2**, 469–79. doi:10.1016/j.rasd.2007.09.006
- Dawson J., Matson J. & Cherry E. (1998) An analysis of maladaptive behaviors in persons with autism, PPD-NOS, and mental retardation. *Research in Developmental Disabilities* **19**, 439–48. doi:10.1016/S0891-4222(98)00016-X
- Durand V. M. & Crimmins D. B. (1992) *The Motivation Assessment Scale (MAS) Administration Guide*. Monaco and Associates, Topeka, KS.
- Emberson J. & Walker E. (1990) Self-injurious behavior in people with a mental handicap. *Nursing Times* **86**, 43–6.
- Emerson E. (2005) *Challenging Behaviour: Analysis and Intervention with People with Learning Difficulties*. Cambridge University Press, Cambridge.
- Emerson E., Kiernan C., Alborz A., Reeves D., Mason H., Swarbrick R. *et al.* (2001) The prevalence of challenging behaviors: a total population study. *Research in Developmental Disabilities* **22**, 77–93. doi:10.1016/S0891-4222(00)00061-5
- Farmer C. A. & Aman M. G. (2011) Aggressive behavior in a sample of children with autism spectrum disorders. *Research in Autism Spectrum Disorders* **5**, 317–23. doi:10.1016/j.rasd.2012.04.014
- Favazza A. R. (1989) Why patients mutilate themselves. *Hospital and Community Psychiatry* **40**, 137–45.
- Gonzalez M. L., Dixon D. R., Esbensen A., Rojahn J., Matson J. L., Terlonge C. *et al.* (2009) The behavior problems inventory: reliability and factor validity in institutionalized adults with intellectual disabilities. *Journal of Applied Research in Intellectual Disabilities* **22**, 223–35. doi:10.1111/j.1468-3148.2008.00429.x
- Holden B. & Gitlesen J. P. (2006) A total population study of challenging behaviour in the county of Hedmark,

- Norway: prevalence, and risk markers. *Research in Developmental Disabilities* **27**, 456–65. doi:10.1016/j.ridd.2005.06.001
- Iwata B. A., Pace G. M., Dorsey M. F., Zarcone J. F., Vollmer T. R., Smith R. G. *et al.* (1994) The functions of self-injurious behavior: an experimental epidemiological analysis. *Journal of Applied Behavior Analysis* **27**, 215–40. doi:10.1901/jaba.1994.27-215
- Jacobson J. W. (1982) Problem behavior and psychiatric impairment within a developmentally disabled population I: behavior frequency. *Applied Research in Mental Retardation* **3**, 121–39.
- Jones R. S. P., Wint D. & Ellis N. C. (1990) The social effects of stereotyped behavior. *Journal of Mental Deficiency Research* **34**, 261–8.
- Koskentausta T., Iivanainen M. & Almqvist F. (2007) Risk factors for psychiatric disturbance in children with intellectual disability. *Journal of Intellectual Disability Research* **51**, 43–53. doi:10.1111/j.1365-2788.2006.00871.x
- Lerman D. C., Iwata B. A., Smith R. G., Zarcone J. R. & Vollmer T. (1994) Transfer of behavioral function as a contributing factor in treatment relapse. *Journal of Applied Behavior Analysis* **27**, 357–70. doi:10.1901/jaba.1994.27-357
- Lloyd E., Kelly M. L. & Hope T. March (1998). *Self-mutilation in a community sample of adolescents: descriptive characteristics and provisional prevalence rates*. Poster session presented at the meeting of the Society for Behavioral Medicine, New Orleans, LA.
- McClintock K., Hall S. & Oliver C. (2003) Risk markers associated with challenging behaviours in people with intellectual disabilities: a meta-analytic study. *Journal of Intellectual Disability Research* **47**, 405–16.
- McTiernan A., Leader G., Healy O. & Mannion A. (2011) Analysis of risk factors and early predictors of challenging behavior for children with autism spectrum disorder. *Research in Autism Spectrum Disorders* **5**, 1215–22. doi:10.1016/j.rasd.2011.01.009
- Matson J. L. & Boisjoli J. A. (2007) Multiple versus single maintaining factors of challenging behaviours as assessed by the QABF for adults with intellectual disabilities. *Journal of Intellectual and Developmental Disability* **32**, 39–44. doi:10.1080/13668250601184689
- Matson J. L. & Vollmer T. R. (1995) *The Questions About Behavioral Function (QABF) User's Guide*. Scientific Publishers, Baton Rouge, LA.
- Matson J. L., Bamburg J. W., Cherry K. E. & Paclawskyj T. R. (1999) A validity study on the Questions About Behavioral Function (QABF) Scale: predicting treatment success for self-injury, aggression, and stereotypies. *Research in Developmental Disabilities* **20**, 163–76.
- Matson J. L., Mayville E. A. & Lott J. D. (2002) The relationship between behavior motivation and social functioning in persons with intellectual impairment. *The British Psychological Society* **41**, 175–84. doi:10.1348/014466502163958
- Matson J. L., Wilkins J. & Macken J. (2009) The relationship of challenging behaviors to severity of symptoms of autism spectrum disorders. *Journal of Mental Health Research in Intellectual Disabilities* **2**, 29–44. doi:10.1080/19315860802611415
- Mudford O. C., Arnold-Saritepe A. M., Phillips K. J., Locke J. M., Ho I. C. S. & Taylor S. A. (2008) Challenging behaviors. In: *Clinical Assessment and Intervention for Autism Spectrum Disorders* (ed. J. L. Matson), pp. 267–97. Elsevier, Inc., London, UK. doi:10.1016/B978-012373606-2.50011-5
- Murphy O., Healy O. & Leader G. (2009) Risk factors for challenging behaviors among 157 children with autism spectrum disorder in Ireland. *Research in Autism Spectrum Disorders* **3**, 474–82. doi:10.1016/j.rasd.2008.09.008
- Nicholson J., Konstantinidi E. & Furniss F. (2006) On some psychometric properties of the questions about behavioral function (QABF) scale. *Research in Developmental Disabilities* **27**, 337–52.
- Nind M. & Kellett M. (2002) Responding to individuals with severe learning difficulties and stereotyped behaviour: challenges for an inclusive era. *European Journal of Special Needs Education* **17**, 265–82. doi:10.1080/08856250210162167
- Nock M. K. & Prinstein M. J. (2005) Contextual features and behavioral functions of self-mutilation among adolescents. *Journal of Abnormal Psychology* **114**, 140–6. doi:10.1037/0021-843X.114.1.140
- O'Neill R., Horner R., Albin R., Sprague J., Storey K. & Newton J. (1997) *Functional Assessment and Programme Development for Problem Behaviour: A Practical Handbook*. Brooks/Cole Publishing Company, Pacific Grove, CA.
- Paclawskyj T. R., Matson J. R., Rush K. S., Smalls Y. & Vollmer T. R. (2000) Questions About Behavioral Function (QABF): a behavioral checklist for functional assessment of aberrant behavior. *Research in Developmental Disabilities* **21**, 223–9. doi:10.1016/S0891-4222(00)00036-6
- Poppes P., van der Putten A. J. J. & Vlaskamp C. (2010) Frequency and severity of challenging behaviour in people with profound intellectual and multiple disabilities. *Research in Developmental Disabilities* **31**, 1269–75. doi:10.1016/j.ridd.2010.07.017
- Rapp J. T. & Lanovaz M. J. (2011) Stereotypy. In: *Teaching and Behavior Support for Children and Adults with Autism Spectrum Disorder: A Practitioner's Guide* (ed. J. K. Luiselli), pp. 127–35. Oxford University Press, New York, NY.
- Rapp J. T. & Vollmer T. R. (2005) Stereotypy I: a review of behavioral assessment and treatment. *Research in Developmental Disabilities* **26**, 527–47. doi:10.1016/j.ridd.2004.11.005

- Reid D. H., Parsons M. B. & Lattimore L. P. (2010) Designing and evaluating assessment-based interventions to reduce stereotypy among adults with autism in a community job. *Behavior Analysis in Practice* **3**, 27–36.
- Roeleveld N., Zielhuis G. A. & Gabreels F. (1997) The prevalence of mental retardation: a critical review of recent literature. *Developmental Medicine and Child Neurology* **39**, 125–32. doi:10.1111/j.1469-8749.1997.tb07395.x
- Rojahn J. (1986) Self-injurious and stereotypic behavior of non-institutionalized mentally retarded people: prevalence and classification. *American Journal on Mental Deficiency* **91**, 268–76.
- Rojahn J., Matson J. L., Lott D., Esbensen A. J. & Smalls Y. (2001) The Behaviour Problems Inventory: an instrument for the assessment of self-injury, stereotyped behavior and aggression/destruction in individuals with developmental disabilities. *Journal of Autism and Developmental Disorders* **31**, 577–88.
- Rojahn J., Aman M. G., Matson J. L. & Mayville E. (2003) The Aberrant Behavior Checklist and the Behavior Problems Inventory: convergent and divergent validity. *Research in Developmental Disabilities* **24**, 391–404. doi:10.1016/S0891-4222(03)00055-6
- Rojahn J., Schroeder S. & Hoch T. (2008) *Self-Injurious Behavior in Intellectual Disabilities*. Elsevier, Oxford, UK.
- Rojahn J., Wilkins J., Matson J. L. & Boisjoli J. (2010) A comparison of adults with intellectual disabilities with and without ASD on parallel measures of challenging behaviour: the Behavior Problems Inventory-01 (BPI-01) and Autism Spectrum Disorders-Behavior Problems for Intellectually Disabled Adults (ASD-BPA). *Journal of Applied Research in Intellectual Disabilities* **23**, 179–85. doi:10.1111/j.1468-3148.2009.00519.x
- Rojahn J., Zaja R., Turygin N., Moore L. & van Ingen D. (2012) Functions of maladaptive behavior in intellectual and developmental disabilities: behavior categories and topographies. *Research in Developmental Disabilities* **33**, 2020–7.
- Roscoe E. M. (2002) Assessment and treatment of hand mouthing: a large-scale analysis. *Dissertation Abstracts International: Section B: The Sciences and Engineering* **62** (10-B), 4769.
- Singh N., Lancioni G., Winton A., Singh J., Curtis W., Wahler R. *et al.* (2007) Mindful parenting decreases aggression and increases social behavior in children with developmental disabilities. *Behavior Modification* **32**, 749–71. doi:10.1177/0145445507300924
- Sturmev P., Fink C. & Sevin J. (1993) The Behavior Problems Inventory: a replication and extension of its psychometric properties. *Journal of Developmental and Physical Disabilities* **5**, 327–36. doi:10.1007/BF01046389
- Sturmev P., Sevin J. & Williams D. E. (1995) The Behavior Problems Inventory: a further replication of its factor structure. *Journal of Intellectual Disability Research* **39**, 353–6. doi:10.1111/j.1365-2788.1995.tb00527.x
- Vollmer T. R. & Iwata B. A. (1991) Differential reinforcement as treatment for behavior disorders: procedural and functional variations. *Research in Developmental Disabilities* **13**, 393–417. doi:10.1016/0891-4222(92)90013-V
- Witwer A. N. & Lecavalier L. (2008) Psychopathology in children with intellectual disability: Risk markers and correlates. *Journal of Mental Health Research in Intellectual Disabilities* **1**, 75–96. doi:10.1080/19315860801988327
- Zaja R. H., Moore L., van Ingen D. J. & Rojahn J. (2011) Psychometric comparison of the functional assessment instruments QABF, FACT and FAST for self-injurious, stereotypic and aggressive/destructive behaviour. *Journal of Applied Research in Intellectual Disabilities* **24**, 18–28.
- Zimbelman K. (2005) Instruments for assessing behavioral problems. In: *Assessing Adults with Intellectual Disabilities* (eds J. Hogg & A. Langa), pp. 179–91. Blackwell Publishing, Malden, MA. doi:10.1002/9780470773697.ch13

Accepted 2 January 2013