Instruments for Measuring Repetitive Behaviours.

One of the key issues when evaluating the effectiveness of an intervention in research projects and in practice is to use well established measurements that have been validated in previous research. We have provided summary on the measures of anxiety and repetitive behaviours that might be helpful in your everyday work and we will regularly update this section with a list of established measures for assessment of other aspects of autism and related co-morbid problems. Please refer to the NICE guidelines for a comprehensive overview of diagnostic instruments.

Author: Mirko Uljarevic (Uljarevicm@Cardiff.ac.uk)

<table>
<thead>
<tr>
<th>Measure</th>
<th>RRBs Specific Instrument</th>
<th>Suitable Across Ages</th>
<th>Suitable not only for Autism but also other diagnoses</th>
<th>Easily administered/not time consuming</th>
<th>Used in research/validated</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCQ</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>DISCO</td>
<td>X</td>
<td>✓</td>
<td>X</td>
<td>X</td>
<td>✓</td>
</tr>
<tr>
<td>ADI-R</td>
<td>X</td>
<td>✓</td>
<td>X</td>
<td>X</td>
<td>✓</td>
</tr>
<tr>
<td>Y-BOCS/CY-BOCS</td>
<td>✓</td>
<td>✓</td>
<td>X</td>
<td>X</td>
<td>✓</td>
</tr>
<tr>
<td>RBS/RBS-R</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>X</td>
<td>✓</td>
</tr>
<tr>
<td>Scale</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>-----------</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>RBI/RBQ</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>RBQ-2</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CRI</td>
<td>✓</td>
<td>✓</td>
<td>X</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

**Descriptions of Individual Scales/Instruments**

**The Autism Diagnostic Interview Revised (ADI-R; Rutter et al., 2003)**

**General Overview of the instrument:** The ADI-R is a semi-structured interview designed to differentiate individuals with autism from those with language impairments and mental retardation. The interview can be completed in about 90 to 180 minutes; questions are scored on the basis of the interviewer's judgment. It contains sections on:

- early development,
communication,

social development and play,

repetitive and restricted behaviours and

behaviour problems.

The content of the interview closely mirrors the descriptions of autism found in *DSM-IV ICD-10* criteria for Autism. The ADI-R has been shown to have good psychometric properties (Rutter et al., 2003).

**Overview of the instrument as a measure for repetitive behaviours:** Within the ADI-R there are fourteen items which target repetitive behaviours; two of these items (circumscribed interests and repetitive language) are not applicable to children under four years of age with low levels of verbal ability. Eight of the fourteen ADI-R repetitive behaviour items are included in the algorithm score and are categorised into four subsections which represent ICD-10 and DSM-IV repetitive behaviour criteria. Items not included in the algorithm are unusual fears, self-injury, difficulties with minor changes, resistance to change, abnormal idiosyncratic responses and unusual attachment to objects.

**Limitations (for research):** Despite the sound psychometric properties of the total ADI-R scores and Social and Communication subscales, the psychometric properties of the Repetitive Behaviour domain have been shown to be weak (Lecavalier et al. 2006). It has also been suggested that ADI-R undersamples repetitive behaviours (Esbensen et al., 2009).

*The Social Communication Questionnaire*

*(SCQ; Berument et al., 1999; Rutter et al., 2003)*

**General Overview of the instrument:** The SCQ is a 40 item parent/caregiver completed questionnaire. Items were selected based on the ADI-R algorithm and correspond to the diagnosis criteria from the DSM-IV. All items are presented in yes/no format and the SCQ is applicable to individuals of chronological age above 4.
If an individual is younger than 4 then mental age should be at least 2 years or higher.

The SCQ assesses three core feature of autism:

reciprocal social interaction (15 items),
communication (13 items) and
repetitive behaviours (8 items).

The SCQ has been used extensively in the ASD literature and has been reported to have good psychometric properties (Berument et al., 1999, Rutter et al., 2003).

**Overview of the instrument as a measure for repetitive behaviours:** The SCQ assesses the following types of repetitive behaviours:

verbal rituals,
compulsions and rituals,
unusual preoccupations,
repetitive use of objects,
circumscribed interests,
unusual sensory interests,
hand and finger mannerisms and
complex body mannerisms.

The SCQ also includes a question about the presence self-injurious behaviours.

Rutter et al. (2003) reported that the repetitive behaviours subscale of the SCQ strongly correlated with total ADI-R scores and also all three ADI-R subscales.

**Limitations (for research):** Since the SCQ items were modelled around ADI-R, the same limitations of the ADI-R repetitive behaviours subscale are applicable here. Furthermore, the yes/no response format only indicates whether certain behaviour is
present or not; however, it is not possible to determine the frequency and the impact of the behaviour in question. Also, as the factor analysis of the SCQ repetitive subscale has not been conducted so far, only the total repetitive behaviour score can be extracted which, bearing in mind the heterogeneity of repetitive behaviours, limits the interpretation of the collected data. Finally, the SCR has never been used specifically to assess repetitive behaviours.

**Diagnostic Interview for Social and Communication Disorders - 10**

*(Wing, Leekam, Libby, Gould & Larcombe, 2002)*

**General Overview of the instrument:** The DISCO is a parent interview measure that provides an in-depth assessment of a wide range of developmental skills and behaviours. The main purpose of the DISCO is to provide an assessment of the individual's profile of behaviours and abilities rather than to provide a categorical diagnosis. Nevertheless, the DISCO has been designed to include algorithms for a number of different diagnostic systems including ICD-10. The structure of the DISCO enables clinicians to rate behaviours according to whether they are present, their current level and development and the occurrence of atypicality. The DISCO has been found to have good psychometric properties (Leekam et al., 2002; Billsted, Gillberg, & Gillberg, 2007; Wing et al., 2002; Nygren et al., 2009).

**Overview of the instrument as a measure for repetitive behaviours:** Repetitive behaviour items in the DISCO, unlike the ADI-R and ADOS-G repetitive behaviour items, focus on the specific behaviours rather than categories of behaviours. The DISCO includes more than 50 items covering repetitive behaviours and sensory interests. Twenty eight of these repetitive behaviour items are included in the DISCO ICD-10 algorithm. Algorithm items are categorised into the following types of behaviours: limited interests, routines and rituals, motor stereotypies and interests in particular objects. There are also a further 30 non-algorithm items that include additional detail within the categories above in addition to information on special skills and responses to sensory stimuli.

**Limitations (for research):** Although the psychometric properties of the DISCO have been previously published (Leekam, Libby, Wing, Gould, & Taylor, 2002; Wing,
Leekam, Libby, Gould, & Larcombe, 2002), no psychometric properties or factor analysis of the repetitive behaviours subscale have been published thus far. The other significant limitation of the DISCO for assessing the repetitive behaviours domain is the fact that it is a very time-consuming instrument and it might not be easy to administer it in all the situations.

The Yale-Brown Obsessive Compulsive Scale (Y-BOCS; Goodman et al., 1989) and the Child Yale-Brown Obsessive Compulsive Scale (CY-BOCS; Scahill et al., 1997)

Overview of the instrument: The Y-BOCS and CY-BOCS were originally developed for the use with the Obsessive Compulsive Population (OCD) and were not intended for the use with the populations with developmental disabilities. Both the Y-BOCS and CY-BOCS are interviews administered by the clinician with the aim of identifying the presence and severity of key compulsions and obsessions.

Both interviews provide a checklist of obsessions divided in several categories (i.e., Contamination Obsessions, Aggressive Obsessions, Hoarding/Saving Obsessions, Health-Related Obsessions, Religious/Moral Obsessions, Magical Obsessions, Sexual Obsessions, and Miscellaneous Obsessions) and compulsions (i.e., Washing/Cleaning Compulsions, Checking Compulsions, Repeating Compulsions, Counting Compulsions, Arranging/Symmetry, Hoarding/Saving Compulsions, Excessive Games/Superstitious Behaviours, Rituals Involving Other Persons, and Miscellaneous Compulsions).

Once the most prominent obsessions and compulsions are identified from the checklist, the severity of these behaviours is assessed using the following five items: Time Occupied, Interference, Distress Associated with Compulsions, Resistance Against Compulsions and Degree of Control.

Use in the ASD population: both instruments have been used in ASD population, mainly in the psychopharmacological studies (DelGiudice-Asch, Simon, Schmeidler, Cunningham-Rundles, & Hollander, 1999; Hollander, Soorya, et al., 2006; Hollander,
Wasserman, et al., 2006; King et al., 2009; McDougle et al., 2005; Wasserman et al., 2006).

For example, De Ramus (2004) found that children with high functioning autism (HFA) had higher severity of compulsions than obsessions and that, when compared with children with OCD, they had lower scores of aggressive obsessions, washing/cleaning compulsions, and checking/counting compulsions.

McDougle et al. (1995) used Y-BOCS to compare repetitive behaviours of adults with ASD and OCD.

Using discriminant analysis, they identified that the cluster of the following 3 behaviours: hoarding, touching, tapping, or rubbing and self-mutilating behaviour was 96% accurate in predicting that individual belonged to the ASD group while the cluster of aggressive obsessions, symmetry obsessions and checking and counting compulsions was 94% accurate in predicting that individual belonged to the OCD group.

One factor analysis of Y-BOCS in the autistic population has been conducted thus far. Anagnostou et al. (2011) identified the following four factors: obsessions, higher-order repetitive behaviours, lower-order repetitive behaviours and hoarding.

**Limitations (for research):** although both the CY-BOCS and Y-BOCS gather information about the presence of specific obsessions and compulsions, the severity ratings represent all behaviours shown by the individual and not individual behaviours. As a result distinctly different repetitive behaviours such as body rocking and intense interests are grouped together which significantly reduces the amount of information provided by these scales. In most of the cases, because of the communication deficits that are usually present in the ASD population, only the compulsive subscale can be used. Also, to the best of my knowledge, the psychometric properties of the Y-BOCS and CY-BOCS in the ASD population have not yet been evaluated.
The Repetitive Behaviour Scale (RBS; Bodfish, Symons & Lewis, 1999) and the Repetitive Behaviour Scale-Revised, RBS-R; Bodfish, Symons & Lewis, 2000)

Overview of the instrument: The RBS was specifically designed to assess a variety of repetitive behaviours in individuals with ASD and it consisted of 3 subscales: stereotypic behaviour, self-injurious behaviour, and compulsions subscales.

The RBS was found to have good psychometric properties with total score inter-rater reliability of 0.88 and test-retest reliability of 0.71 (Bodfish et al., 1999). However, since the original RBS did not assess more complex repetitive behaviours such as ritualized behaviours, an insistence on sameness, and restricted interests, Bodfish et al. (2000) designed the revised version of the scale. The revised version (RBS-R) is a 43-item questionnaire where items are rated on a four-point Likert scale ranging from ‘behaviour does not occur’ to ‘behaviour occurs and is a severe problem’. The items of the RBS-R are grouped into 6 subscales:

- stereotyped behaviour (defined as apparently purposeless movements or actions that are repeated in a similar manner),
- self-injurious behaviour (defined as movements or actions that cause or have the potential to cause redness, bruising, or other injury to the body, and that are repeated in a similar manner),
- compulsive behaviour (defined as behaviour that is repeated and performed according to a rule or involves things being done just so),
- ritualistic behaviour (defined as performing activities of daily living in a similar manner),
- sameness behaviour (defined as the resistance to change, insisting that things stay the same)
- restricted behaviour (defined as limited range of focus, interest, or activity).

A factor analytic study by Lam et al. (2007) identified 5 factors that accounted for 47.5% of total variance in a group of 307 individuals with ASD aged 3-48 years.
Identified factors mostly replicated original conceptualisation of the scale with an exception of collapsing? ritualistic and sameness behaviours into one factor. Lam et al. (2007) reported that the psychometric properties of the revised scale were acceptable.

**Use in the ASD population:** it has been used in a number of studies (Boyd et al., 2009; 2010; 2011; Cuccarro et al., 2007; Dichter et al., 2009; Esbensen et al., 2009; Gabriels et al., 2005; 2008; King et al., 2009; Mirenda et al., 2010) that supported the proposed factor structure of the instrument and found the psychometric properties to be acceptable.

**Limitations (for research):** The RBS and RBS-R is a time-consuming instrument. Furthermore, a large proportion of the items are appropriate only for younger children or children with lower developmental level, thus limiting its use with higher functioning ASD individuals and also its use in studying the whole range of RRBs in a typically developing population.

*The Repetitive Behaviour Interview (RBI; Turner, 1996)*

**Overview of the instrument:** The RBI is a semi-structured, parent-report, interview that was designed to examine a frequency of 50 repetitive behaviours. The RBI produces summary scores for each of the following four subscales:

- motor movements,

- object use,

- repetitive use of language,

- insistence on rigid routines.
There are two sets of questions for each item in the motor movements and the object use subscales and these questions assess the frequency and the duration of the behaviour. Frequency is measured on a 8-point ranging from ‘never’ to ‘almost constantly’ and the duration of the behaviour is on a 5-point scale ranging from 'less than 60 seconds' to 'more than 30 minutes'. The behaviours in the rigid routines subscale are rated depending on the impairment caused by the behaviour, using a 4-point scale that ranges from ‘the behaviour does not exist for the child, or usually does not affect the routines and well-being of others’ to ‘the behaviour is pervasive, inflexible, and often has a severe impact on the family and others around the child’. All items refer to both current functioning, as well as ‘worst ever’ during the individual’s lifetime.

Use in the ASD population: The RBI has been used in several studies of repetitive behaviour in ASD (Turner, 1995; South et al., 2005), however, its psychometric properties have not been evaluated.

Limitations (for research): the presence of the ‘repetitive use of language’ subscale limits the population of the individuals with ASD to which RBI is applicable as it is not suitable for young children and individuals with limited language. Although the presence of over 50 items allows detailed assessment of wide variety of behaviours, this can also make the use of RBI less suitable for certain populations.

*The Repetitive Behaviour Questionnaire*

Overview of the instrument: The RBQ was developed from the RBI. It is a 33 item, parent-completed questionnaire that collects information about the severity, frequency and the nature of repetitive behaviours. Items are grouped into 4 subscales:

- repetitive movements,
- repetitive use of language,
sameness behaviours
circumscribed interests.

For the first 29 items, parents are asked to rate the frequency or severity of repetitive behaviours on a 3 or 4 point likert scale. Four additional items include a summary item which examines a child's overall variety of interests, and three qualitative items about the age repetitive behaviours emerged and the most problematic and noticeable repetitive behaviours.

**Use in the ASD population:** the RBQ was used in a number of studies of repetitive behaviour in ASD (Barrett et al., 2004; Ozonoff et al., 2000; Shearer, 2001; Zandt et al., 2007; Zandt et al., 2009; Honey et al., 2012). In a recent factor analytic study, Honey et al. (2012) identified a reliable two factor solution. Two factors, sensory/motor behaviours and sameness/circumscribed interests accounted for 42% of total variance. Honey et al. (2012) also reported that RBQ showed good psychometric properties.

**Limitations (for research):** the RBQ has similar limitations to the RBI from which it was developed.

---

**The Repetitive Behaviours Questionnaire-2 (RBQ-2, Leekam et al., 2007)**

**Overview of the instrument:** The RBQ-2 is a 20 item parental questionnaire that was designed to record repetitive behaviours which occur in children with autism, but also in typical development. It was developed from the RBQ and DISCO. Items were selected if they were represented in both instruments, were suitable for very young children, and/or were suitable for inclusion in a brief postal questionnaire for a large non-clinical sample.

Thirteen selected items came from both the RBQ and DISCO, while two came from the RBQ only, and five from the DISCO only. Questionnaire scores can be added to give a total repetitive behaviours score and can be also summarised into two factors
(the motor-sensory and the rigidity, routines, and preoccupations) and four factors (the motor, the rigidity, the preoccupation and the sensory).

Psychometric properties of RBQ-2 have been reported for typically developing children (Leekam et al., 2007; Arnott et al., 2010). It has been found that RBQ-2 has good psychometric properties with high internal consistency of responses on all the items.

With respect to the two factors solution, it has been shown that both factors have good reliability (Cronbach’s alpha= 0.81 for the Factor 1 and 0.71 for the Factor 2; Arnott et al., 2010).

For the four factor solution Arnott et al. (2010) found that internal consistency ranged from good (Cronbach’s alpha = 0.82 for the Factor 1 and 0.74 for the Factor 2) to acceptable (Cronbach’s alpha 0.64 for the Factor 3 and 0.51 for the Factor 4).

Use in the ASD population: the RBQ-2 has not thus far been used in a published research.

Limitations (for research): although the instruments from which the RBQ-2 was developed have been used extensively in ASD populations and have been shown to have good psychometric properties, the psychometric properties and factor structure of this instrument have not been evaluated in ASD population.

The Childhood Routines Inventory (CRI; 1997)

Overview of the instrument: the CRI is a 19 item, parent completed, questionnaire that was originally developed to assess the compulsive-like behaviours in typically developed children.

Parents provide answers about the frequency/intensity, the onset of each of the behaviours and also whether the child currently engages in the behaviour in question. CRI has been used in numerous studies that examined compulsive
behaviours in typically developing children (Evans et al., 1997; Evans & Gray, 2000; Evans et al., 2001) and children with various disabilities such as Down syndrome for example (Evans & Gray, 2000) and it has been shown to have good psychometric properties.

Evans et al. (1997) examined the factor structure of CRI in a population of 1492 children aged 8 to 72 months and found the evidence for two factors, both relating to insistence on sameness. One was a ‘Just Right’ factor (e.g., preference for particular ways of doing things), while the other factor combined insistence on sameness with repetitive actions (e.g., performing the same task repeatedly).

**Use in the ASD population:** The CRI has been used by Chen et al. (2009) and Greaves et al. (2006).

**Limitations (for research):** The CRI collects data on a wide range of behaviours; however, there is a clear lack of items that reflect sensory motor repetitive behaviours.