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Social relationship difficulties in autism and reactive attachment disorder; improving diagnostic validity through structured assessment

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Abstract

Background: Autism Spectrum Disorder (ASD) and Reactive Attachment Disorder (RAD) may present diagnostic challenges to clinicians due to overlapping difficulties with social relationships. ASD is a relatively common neurodevelopmental disorder, whereas RAD is associated with neglect or maltreatment. Accurate differential diagnosis is critical. The current study aimed to determine whether standardised measures could reliably discriminate between children with RAD and children with ASD. **Methods:** Fifty eight children with ASD, and no history of maltreatment, were group matched on age with 67 children with RAD. The group profiles on multi-informant measures of RAD were investigated and chi-square statistics used to analyse group differences. Discriminant function analysis determined assessment features that best discriminated between the two groups. **Results:** On parent report, the ASD group demonstrated significantly fewer indiscriminate friendliness behaviours compared to the RAD group ($p<0.001$) and observation appeared to be the best discriminatory tool. **Conclusions:** Children with RAD and children with ASD may present with similar social relationship problems. However, there appears to be a difference in the social quality of the interactions between the groups. Findings have implications for differential diagnosis and management. **Keywords:** Reactive attachment disorder, autism spectrum disorder, social relationships, differential diagnosis, observation.

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Introduction

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder for which a specific genetic *etiological factor* can be identified in approximately 20% of cases and for which yet unidentified genetic factors play a major role in a majority (Delorme, Toro, Leboyer, Gillberg and Bourgeron, 2013). There is no evidence that ASD is caused by adverse environmental circumstances (Rutter, 2005). Reactive Attachment Disorder (RAD), by contrast, is caused by maltreatment (AACAP Official Action, 2005). Nevertheless ASD and RAD may present diagnostic challenges due to overlapping difficulties with social relationships.

ASD is defined by impaired social communication, fixated interests and repetitive behaviours (DSM-V, 2013). The core deficit may be one of social imagination or social instinct i.e. ability to understand one's own role and pre-empt other responses in social situations (Wing, Gould and Gillberg, 2011). Children with ASD may demonstrate limited social reciprocation, may have impaired skills in empathy, perspective taking and following social rules and limited awareness of personal boundaries.

RAD, like ASD, is characterised by difficulties with social communication and modulating social behaviour. RAD[1] is classified as having two sub-types: (a) inhibited RAD characterised by hyper-vigilance and emotional withdrawal and (b) disinhibited RAD, characterised by indiscriminate friendliness, lack of social boundaries and difficulties negotiating social relationships (Gleason et al, 2011). Other features may include lack of social reciprocity, empathy and poor awareness of social cues (Rutter et al, 1999; Pears,

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[1] *We are using DSM-IV terminology in which RAD comprises Inhibited and Disinhibited subtypes. We acknowledge the new DSM-V terminology in which the two disorders (Disinhibited Social Engagement Disorder, formerly disinihibited RAD and Reactive Attachment Disorder, formerly Inhibited RAD) are now considered to be separate disorders. We have used DSM-IV terminology because the change is very recent and may not yet be well known.

Conflict of interest: none declared

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Bruce, Fisher and Kim, 2010; Mukkades, Bilge, Alyanak and Kora (2000). Moreover, children with RAD may have pragmatic language difficulties, a feature more commonly associated with ASD. In one study, the RAD group performed even more poorly than a group with ASD and "normal IQ" in domains of social context, rapport and social relationships (Sadiq et al, 2012). However, the ASD group differed in showing more stereotyped behaviours.

The apparent overlap in symptoms between ASD and RAD is of real concern to clinicians as both psychiatric classification systems (ICD-10 and DSM-IV) state that the diagnosis of RAD should *only* be made if there is history of serious early childhood maltreatment. Thus, a diagnosis of RAD implies that maltreatment has occurred and, if the child is still living in the same family circumstances, may have important child protection implications. The English-Romanian Adoption Studies investigated the possibility of links between environmental adversity and autism. While a small group of severely deprived institution-reared children were described as suffering from "Quasi-autism," features eventually differed in important ways from classical autism and increasingly resembled Disinhibited RAD (Rutter et al, 2007; Rutter and Sonuga-Barke, 2010).

Another important reason to discriminate between ASD and RAD is management as approaches to treatment differ (O'Connor and Zeanah, 2003; Mukkades et al, 2004; Becker-Weidman, 2006). Although there is a body of research on interventions for ASD, there is very little intervention research on RAD (O'Connor and Zeanah, 2003). One preliminary study suggested that children with RAD may respond better to psycho-educational approaches compared to children with ASD (Mukkades et al, 2004), and pilot research suggests some success for family-based treatment for RAD that is unlikely to be of benefit in ASD (Becker-Weidman, 2006).

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Differential diagnosis between ASD and RAD is salient to all paediatricians and child and adolescent mental health (CAMHS) professionals because in both RAD and ASD, additional problems such as aggression or social relationships difficulties may be more likely to result in a referral to CAMHS than symptoms of the core disorder (Byrne, 2003) (Kantzer, Fernell, Gillberg and Miniscalco, 2013). Therefore diagnostic dilemmas may arise.

Although the association between attachment *patterns* and ASD has been investigated, (Rutgers, Bakermans-Kranenburg, Van Ijzendoorn and Van Berckelaer-Onnes, 2004) no other published studies were found investigating the overlap between RAD and ASD. However, CAMHS clinicians in Coventry raised concerns, in a recent editorial, regarding overlaps and differences in ASD compared to children with attachment disorders (Moran, 2010). They reported one key differential: an 'emotional feel' to the therapeutic relationship was described when working with children with an attachment disorder, which was in contrast to a 'matter of fact' feel with children with ASD. Rapport building with children with ASD was reported to be more difficult in comparison to children with attachment disorders, who seemed to have some skill in building relationships; although the latter were, on occasions, inappropriate and challenged personal boundaries. These observations are consistent with literature on indiscriminate friendliness in RAD and suggest a different social quality in the interactions of the two groups. Nevertheless, there is a need to research these profiles using standardised measures.

In a previous study we developed standardised assessment measures for diagnosing RAD in school-age children and demonstrated that these tools could reliably differentiate children with RAD from children who did not have psychiatric disorders (Minnis et al, 2009). The aim of the current study was to determine whether our measures could reliably discriminate between maltreated children with RAD and children with ASD, who have not been

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maltreated. This could a) support clinicians with accurate differential diagnoses, b) identify RAD at an earlier stage, potentially improving prognosis for affected children *or* c) identify the need to develop new methods if the measures cannot reliably discriminate between the two groups. We asked the following research questions: 1. what is the profile of children with ASD on a standardized assessment package for RAD? 2. Which measures, if any, best discriminate between the two groups?

Method

Ethical approval was granted by West of Scotland NHS ethics, Research Management committees and caldicott approval was awarded. Informed consent was given by parents and all children provided verbal assent.

Participants

We already had data regarding 67 children, aged 5-11 years, with RAD from 3 previous studies (Minnis et al, 2009; Kocovska et al 2012 and Minnis et al, 2013). The ASD group, of 58 cases, were group matched by age with the RAD group. Children in the ASD group attended mainstream primary or a language unit within a mainstream primary school.

RAD Group

The RAD group data was historical therefore we did not recruit any new participants. The group was collated as follows: (a) thirty -four children diagnosed with RAD, recruited through CAMHS teams and social workers who had been asked to refer children with symptoms of RAD behaviours, according to ICD-10 criteria (Minnis et al, 2009). (b) twenty children who were recruited through the charity Adoption UK, with a history of maltreatment and symptoms of indiscriminate friendliness and who were found to have a psychiatric

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diagnosis of RAD (according to ICD-10 criteria) (Kocovska et al, 2012) and (c) thirteen cases who were recruited through mainstream primary schools during a total population study of RAD prevalence, and who were found to have a diagnosis of RAD, according to DSM-IV criteria (Minnis et al, 2013). In all studies, diagnoses were made by multidisciplinary teams with psychiatry, psychology and/or nursing input using the standardised multi-informant assessment package for RAD (Minnis et al, 2009), as described in the measures section below. This package has good psychometric properties and good agreement with expert clinical judgement (Follan et al, 2011).

ASD Group

Sixty-four children with ASD were recruited from either, (a) the Lothian Special Needs database by the lead Consultant Paediatrician or (b) the Lanarkshire Autistic Spectrum Disorder Diagnostic Service by the lead Speech and Language Therapist. Six participants dropped out during the course of the study leaving a total sample of 58 children (52 children with ASD from Lothian and 6 children with ASD from Lanarkshire). All children with ASD had received joint assessment by a consultant paediatrician and speech and language therapist. Additional screening tools, including the Autism Diagnostic Observation Schedule (ADOS) (Lord et al, 2006) were also used. The first 20 case files were scrutinised and it was confirmed that all were diagnosed using Scottish Intercollegiate Guidelines Network (SIGN) guidelines (SIGN, 2007).

Participants in the ASD group had no known history of child protection issues. The identified clinician from each service was responsible for establishing lack of child protection prior to invite, and patient information was passed to the research team on receipt of written consent. Lack of child protection concerns were established in (a) NHS Lothian via their child protection database. This is a unique multi-agency referral and information sharing system,

operational 24 hours a day. Child protection concerns including an alleged or confirmed history of physical, sexual and emotional abuse, and neglect as well as all episodes where these agencies are made aware of childrens' exposure to domestic violence or parental drug abuse are recorded. The Child Protection database was cross-checked against the Special Needs system to exclude children where child protection concerns existed. In (b) NHS Lanarkshire information regarding lack of child protection was gathered from multiple sources including, referral report, from CAMHS teams and the electronic health records. This sample (n=6) was purposively recruited to fulfil the group matching criteria with particular emphasis on the recruitment of girls.

Our sample size calculation was based on Follan et al (2011), which required a sample of 38 children in each group to detect the same magnitude of difference (90% power, 5% significance level). We aimed to recruit a minimum of 50 (in each group) to allow for the skewed nature of total CAPA-RAD scores. As we retained 58 families, our study was well powered.

Measures

The RAD group had been assessed and diagnosed via the following multi-informant assessment package. Symptoms of RAD in the ASD group were also assessed using these measures.

The teacher Relationship Problems Questionnaire (RPQ) (Minnis et al, 2007) is a 10-item questionnaire for RAD symptoms.

The Child and Adolescent Psychiatric Assessment (*CAPA-RAD)* (Minnis et al, 2009) is a semi-structured parent-report interview about RAD symptoms. This was completed via telephone interview with parents. When conducting interviews with the ASD group, we

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made careful note of factors likely to improve discrimination from RAD. These included: talking to strangers with the purpose of engaging them in their topic of special interest or directing personal questions to their parent instead of directly asking a stranger.

Twenty percent of the CAPA-RAD interviews were audio recorded and good inter-rater reliability (> 80% agreement) was achieved with an independent rater. The CAPA-RAD diagnostic algorithm, which is based on DSM-IV core symptoms for RAD and consists of 7 key symptoms of disinhibited RAD and 4 core symptoms of Inhibited RAD, was used to assess core features of RAD in both groups. The diagnostic algorithm was validated in a previous study of RAD prevalence (Minnis et al, 2013).

The Observation Schedule for RAD (OSR) is a modification of the Waiting Room Observation (WRO); a structured 19-item observation of child behaviour with parents/carers and a stranger (McLaughlin, Espie and Minnis, 2005). In that original study, children were observed in a clinic waiting room with one parent. In this current study, however, children were brought to an unfamiliar room in a school or the Edinburgh RHSC Clinical Research Facility by a teacher (or parent in the case of the Clinical Research Facility) and the moment of meeting the stranger/researcher was captured on video, along with subsequent interactions. Due to modifications to the setting and protocol, only the first 6 items – relating to child-stranger interaction - were rated (see appendix 1) – including one (item – physical contact between stranger and researcher) that was excluded in our original study because of its poor discrimination between RAD and typically developing children but was retained here because it may have proved discriminating between RAD and ASD. All videos were independently rated and good inter-rater reliability was achieved (>80% agreement). It was impossible to blind researchers to the diagnoses of the children because the RAD data was historical but the independent rater was blind to the hypothesis of the study. Although data on all 19 original

items were available for the children with RAD, only the first 6 items were used for this study. Some OSR dataset is missing due to lack of parental permission or technical difficulties, however the samples available in each group are comparable (RAD group, n = 50, ASD group, n = 52).

Cognitive functioning: the children with RAD already had a measure of verbal IQ - the British Picture Vocabulary Scale (BPVS) (Atkinson, 1992) or the verbal subscales of the Wechsler Abbreviated Scale of Intelligence (WASI) (Psychological Corporation, 1999). The WASI is a standardised truncated screen of IQ, consisting of 4 subtests; Vocabulary, Block Design, Similarities and Matrix Reasoning. These form two subscales, Verbal IQ and Performance IQ which together provide a full scale IQ score. The BPVS is a validated measure of child verbal comprehension which is well correlated with verbal IQ (Atkinson, 1992). The children with ASD, who were all aged 6 years+ by the time of assessment, were asked to do both the BPVS and the WASI.

Comorbid Diagnoses: The children with RAD already had an assessment of comorbid diagnoses using either specific modules of the CAPA (n=37) (Angold et al, 1995) or the Development and Wellbeing Assessment (DAWBA) (n=26) (Goodman et al, 2000); both well validated semi-structured diagnostic measures for child psychopathology. Parents of the children with ASD were asked to complete the DAWBA online, where possible, which was achieved by 31 parents. A further 14 parents completed the DAWBA via telephone interview. DAWBA assessments were scored by experienced trainee Psychiatrists, who had received specific rating training.

Group characteristics and the success of the group matching process are shown in table 1. Numbers vary because members of the RAD group had different cognitive assessments (BPVS vs WASI) or because full scale IQ, in some cases, could not be computed because of

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a low verbal to high performance IQ discrepancy that was too large to retain reliability (Pearson Corporation, 1999). Group matching on age was successful as reasonable similarity between the groups in mean age and range was achieved. Recruitment of girls with ASD was more challenging, although not unexpected, as the ratio of M:F diagnosed with ASD is high (Baird et al, 2006).

For any children with ASD for whom the CAPA-RAD identified possible symptoms of RAD, all data, including the video tapes (particularly the initial meeting and the unstructured "juice break" between assessments) and, where necessary, DAWBA diagnoses, were reviewed by HM and CD, according to DSM-IV diagnostic criteria. Any children whose ASD diagnosis still seemed equivocal at this stage had their data reviewed by an independent expert (JG) and/or their casenotes and original ASD diagnostic process scrutinised.

Table 1: Group Characteristics

	Gender	Mean Age & range (yrs) (standard deviation)	Mean Full Scale IQ (standard deviation)	Mean Verbal IQ (standard deviation)	Mean Performance IQ (standard deviation)	Difference between VIQ and PIQ (standard deviation)	Mean BPVS standard score (standard deviation)
RAD Group	45M (67%) 22F (33%)	7.08, -11(1.42)	96.37 (14.07)[1]	97.69 (13.47)	95.38 (14.22)	2.31 (1.63)	98.94[2] (13.26)
ASD Group	46M (79%) 12F (21%)	7.97 5-12 (1.96)	88.78[3] (18.93)	83.73 (17.43)	97.71 (17.81)	-13.98 (3.57)	89.24[4] (13.26)

NB. 1. Data based on 16 available cases. 2. Data based on 31 available cases; 3. FIQ based on 21 of 43 available cases: FIQ could not be reliably calculated for 22 ASD cases due to large discrepancies between VIQ and PIQ; 4. Data based on 43 available cases.

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Results

Cognitive profiles

Table 1 demonstrates that the ASD group profiles on the WASI were substantially different

to the RAD group: 19 (44%) children in the ASD had a low verbal IQ and significantly

higher performance IQ while 3 children in the ASD group had a significantly higher verbal

IQ than performance IQ. No child in the RAD group demonstrated any significant VIQ-PIQ

deficit.

RAD behaviours

The profile of children with ASD on the RAD assessment package was investigated. Thirty

six (62%) children with ASD fulfilled criteria for likely RAD on the CAPA-RAD: that is 22

who had 2 or more disinhibited symptoms and 14 who had 2 or more inhibited symptoms.

For 32 of these 36, –observed behaviours were clearly indicative of ASD. Of the 4 who

required expert review, the ASD diagnosis was clear in all but 1 case. For this one girl, who

required review of both video and case notes (by AO'H), it was verified that diagnosis of

ASD (based on standardised assessments, including the ADOS), was robust and that there

was no history or suggestion of maltreatment. The most useful part of the assessment was the

videotaped observation.

Observations of RAD symptoms in both groups were analysed using the total score on the 6

OSR items (RAD group, n= 50, ASD group, n 52). A Mann Whitney test suggested

significant differences between groups (median RAD 4; median ASD 0, $p<0.0001$). As a

greater total score is indicative of more indiscriminate friendliness, the findings suggest that

these behaviours were significantly more apparent in the RAD group than the ASD group.

Teacher report of RAD symptoms was investigated using Teacher RPQ total scores. There

was no difference between teacher report of RAD symptoms in the ASD group (Mean 6.64;

SD 5.51) and the RAD group (Mean 6.09; SD 6.06); p=0.64.

Parent report of RAD symptoms was investigated using the CAPA-RAD. Chi square analysis

was used to investigate any significant differences between the RAD group and the ASD

group scores on core symptoms of likely RAD (Table 2).

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Table 2: differences between parent report symptom rates in RAD and ASD group

	RAD	ASD	Significance level
Disinhibited symptoms			
Cuddliness with strangers	29 (45%)	8 (14 %)	<0.001
Indiscriminate Adult Relationships (is a problem)	36 (55%)	5 (10%)	<0.001
Comfort seeking from strangers	13 (20%)	0	<0.001
Personal Questions	34 (52%)	9 (16%)	<0.001
Minimal Checking (is a problem)	31 (48%)	16 (28%)	<0.001
Attention Seeking	51 (76%)	15 (26)	<0.001
Inhibited Symptoms			
Unpredictable Reunion response	12 (18%)	7 (12%)	0.327
Frozen watchfulness *	8 (18%)	7 (12%)	0.388
Hypervigilance **	19 (39%)	11 (19%)	< 0.05
Avoids eye contact	38 (58%)	38 (66%)	0.421

*Based on 44 available cases,   ** Based on 49 available cases

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Table 3: Comorbid diagnosis

	RAD Group	ASD Group
Anxiety disorders*	19 (73%)	8 (18%)
PTSD	5 (19%)	1 (2%)
OCD	1 (5%)	1 (2%)
Depression	0	0
ADHD**	31 (49%)	13 (29%)
Conduct Disorder***	17 (27%)	1 (2%)
Eating Disorder	0	0
Motor Tic Disorder	2 (8%)	7 (16%)

*Anxiety disorders include: separation anxiety, specific phobia, social phobia, agoraphobia, panic disorder and generalised anxiety disorder.

**31 of 63 cases: 18 cases, (29%) diagnosed via DAWBA, 13 cases, (21%) diagnosed via CAPA. ***17 of 63 cases: 15 cases, (24%) diagnosed via DAWBA, 2 cases, (3%) diagnosed via CAPA.

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Discriminant Function Analysis: CAPA-RAD, OSR & Teacher RPQ

A discriminant function analysis was used to investigate which assessment features best

discriminated between the RAD and ASD group. The following were entered into the

analysis: CAPA-RAD core diagnostic symptoms, OSR total score, Teacher RPQ total score

and gender. The findings are shown in table 4.

Table 4: Discriminant Function Analysis

Discriminating feature (in rank order of best to least discriminating)	Discriminant function
1. OSR total score	0.775
2. Demanding or attention seeking behaviour (individual CAPA-RAD item)	0.272
3. Indiscriminate friendliness (individual CAPA-RAD item)	0.261
4. Hypervigilance (individual CAPA-RAD item)	0.223
5. Unpredictable reunion response (individual CAPA-RAD item)	0.169
6. Cuddliness with strangers (individual CAPA-RAD item)	0.159
7. Personal questions (individual CAPA-RAD item)	0.158

8. Teacher RPQ	0.114
9. Frozen Watchfulness (individual CAPA-RAD item)	0.101
10. Comfort seeking from strangers (individual CAPA-RAD item)	0.096
11. Minimal checking (individual CAPA-RAD item)	0.079
12. Avoids eye contact (individual CAPA-RAD item)	-0.049
13. Gender	0.007

When we used the discriminant function analysis to predict RAD caseness, classification was correct in all but 1 case. It is clear, however, that observation best discriminated between the groups (Figure 1). The following features were often observed in the ASD group: less likely to show interest in reciprocal interaction, conversation was, in some cases, dominated by specialist interests and the children with ASD often required extra support to maintain the interaction. When the researcher paused to allow spontaneous conversation, in some cases the interaction broke down to awkward silence. Other children continued answering the last question and their communication took on a list-like quality. Prosody is also of interest as some children with ASD presented with unusual patterns in their speech.
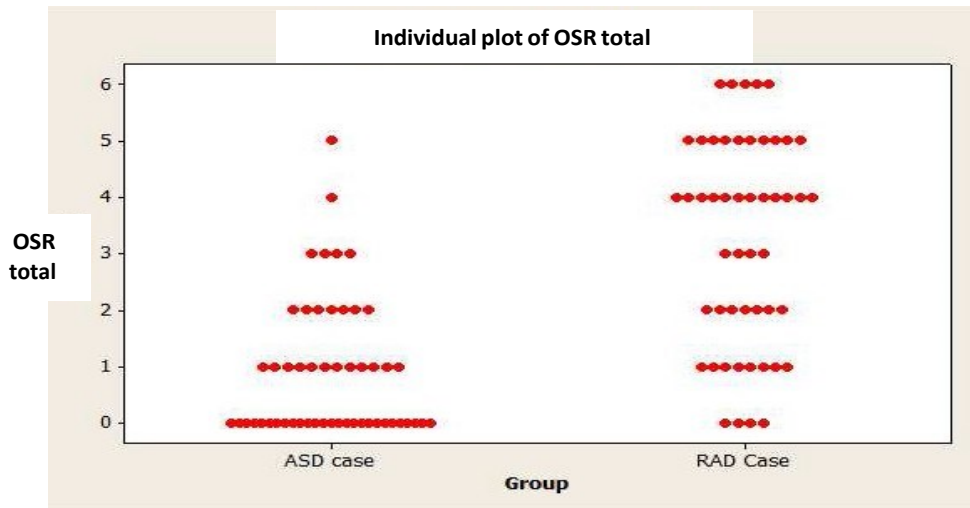
Figure 1:

N.B. each red dot represents an individual score: higher scores indicate more RAD behaviours

Discussion

In this group of children with a rigorous diagnosis of ASD and no history of child protection concerns, some children appeared, on parent report, to have symptoms of RAD. However, significant differences were found between the two groups on all core disinhibited symptoms on the parent-report CAPA-RAD.   These findings suggest that the social relationship problems may sometimes present superficially as similar, but may actually be qualitatively different. Observation of behaviour was the best discriminator. While some overlap in OSR total scores was present, it is clear that for the vast majority of children in the ASD group, few observational features of indiscriminate friendliness were present. Attention seeking and indiscriminate friendliness were the 2nd and 3rd best predictors respectively on the discriminant function analysis, which further suggests that indiscriminate friendliness is a feature less salient in the ASD group.

However, this is not entirely clear cut. For example, almost half the ASD group (46%) were observed not to show noticeable caution or shyness on meeting a stranger and teacher report of RAD symptoms did not discriminate between the two groups. 'Active but Odd' is a categorisation that has been used to describe children with ASD who make spontaneous interactions towards adults and peers, but who are not socially motivated in doing so; the purpose is often a repetitive or stereotyped interest (Wing and Gould, 1979). Such a description was typical of some children in our sample. From the independently rated OSR and observation during structured and *especially* unstructured activities, 35 out of the 36 cases who met criteria for RAD symptoms, on parent report, clearly demonstrated features more indicative of ASD. Although, we are not able to make qualitative comparisons with the RAD group as the RAD data is historical, we have previously reported our clinical observations that children with RAD show considerable interest in the stranger, may take an interrogative role to try to 'get to know' the person and do not struggle to maintain a conversation, even if it is not modulated in an appropriate manner (Bennet, Espie, Duncan and Minnis, 2009). This is similar to observations made in the European Adoption Studies (Rutter et al, 2007; Rutter and Sonuga-Barke, 2010). The present findings also support work by Moran (2010) who reported differences in the "feel" of the therapeutic rapport when working with these two groups of children.

Multiple sources of information, which include standardised observation schedules, have been found to result in more consistent and rigorous application of diagnostic criteria (Risi et al, 2006). Our results support this to a certain extent: the OSR was the most discriminating aspect of our assessment, but our findings are limited by the fact that the OSR was performed in a different context (school) than the original Waiting Room Observation, a teacher rather than a parent accompanied the child and the OSR raters, though blind to the hypothesis of the study, could not be blind to these differing contexts. We would therefore recommend future

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research to further elucidate the observations required to make a confident discrimination between ASD and RAD.

The poorer discrimination between the ASD and RAD groups on symptoms of Inhibited RAD may, in part, be because Inhibited RAD is rare, therefore lack of discrimination could have been due to measurement error (because of low frequency behaviours), *or* it could have been due to the ASD group being genuinely prone to emotional withdrawal or hypervigilant behaviours. This requires investigation in future studies.

Cognitive profiles may also be useful in differential diagnosis. Children with RAD may have poor social communication skills and below average performance on cognitive assessments (Kocovska, 2012), but the groups markedly differed as regards VIQ<PIQ deficit, with a large deficit in the ASD group and none in the RAD group. While cognitive assessment may make an important contribution in assisting differential diagnosis, we would caution that larger samples are required to clarify whether this is reliably the case.

This present study confirms the complex clinical presentations for both groups of children which need to be taken into account in differential clinical diagnosis. There are some important overlaps between the two disorders, but also divergent patterns. Additional diagnoses, including social anxiety disorders and ADHD, were present for some children with ASD (Siminoff et al, 2008), but ADHD and other disruptive behavioural disorders co-occurred more often in the RAD group, with 27% of the sample diagnosed with conduct disorder. These multiple diagnoses apparent in the RAD group support the notion that RAD

is a complex disorder presenting a wide range of challenges (Kocovska et al, 2012; Gillberg, 2010; Pritchett, Pritchett, Marshall, Davidson and Minnis, 2013).

We acknowledge that there are some limitations present within this study which partly arise from the historical nature of our RAD group. However within the ASD group we have the strength of having been able to vigorously exclude known emotional abuse and neglect, along with welfare concerns such as exposure to family violence and substance abuse.

A further potential limitation is the not unexpected slight gender imbalance between the RAD and the ASD group. However, when gender was entered into the discriminant function analysis it was not a useful discriminating feature, suggesting that despite this imbalance our results do not appear to have been biased.

The study also contended with some missing data within two of the inhibited items on the CAPA-RAD and on the OSR in both groups. As there was a large difference in scores on the OSR between the RAD and ASD groups with no systematic bias in collection of data (missing data was simply because we developed the OSR and modified the CAPA-RAD during the course of one of our studies or because schools could not accommodate our assessments within the time frame) we suggest that this this does not limit our findings.

In addition, although the previous studies from which the RAD data was collated used *either* the DAWBA *or* the CAPA to assess co-morbidity and *either* the WASI *or* the BPVS which decreased the sample available, the Verbal IQ scores and BPVS standard scores are similar in each group. Despite these limitations, enough data was collected in order that all the key analyses were fully powered. We would argue, therefore, that we are presenting important findings regarding clinical tools that can assist in this complex clinical field, so that children

affected by the innate disorder of ASD can be distinguished from those manifesting RAD secondary to maltreatment, despite potentially confusing similarities in their symptoms.

- Children with autism spectrum disorder may appear to present with similar social relationship difficulties to children with reactive attachment disorder.

- Differential diagnosis is of the essence as ASD is a highly heritable neurodevelopmental disorder where as RAD is primarily caused by maltreatment.

- This study found that, on parent report, children with ASD had significantly fewer indiscriminate friendliness symptoms than the RAD group.

- The best discriminating tool was structured observation.

- Although observation was clearly important there was still some misclassification of cases. We would therefore recommend further research and development of more detailed observation tools.

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Appendix 1: Observational schedule for Reactive Attachment Disorder

Child stranger interaction	YES	NO

1. Does the child look at stranger(s) as if to invite conversation (the child does not have to smile but, the eye contact must be of a quality that would invite the stranger to communicate in a "normal" social setting)?   ☐ ☐

2. Does the child interrupt conversation between the stranger(s) and his/her carer?   ☐ ☐

3. Does the child initiate conversation with the stranger(s) as if previously familiar?   ☐ ☐

4. Does the child move towards and approach the stranger(s)?   ☐ ☐

5. Does the child make physical contact with the stranger(s)?   ☐ ☐

6. Does the child display noticeable caution or shyness with the stranger(s)?   ☐ ☐