

Repetitive Behaviour and Play in Typically Developing Children and Children with Autism Spectrum Disorders

Emma Honey · Sue Leekam · Michelle Turner ·
Helen McConachie

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Abstract The view of a triad of impairments [(Wing and Gould (1979). *Journal of Autism and Developmental Disorders*, 9, 11–30)] in which impaired imagination is linked with repetitive behaviour is widely accepted. However this categorisation differs from the international classification systems, which link imagination to communication impairments rather than to repetitive behaviours. To investigate this relationship, the Activities and Play Questionnaire-Revised was completed by 196 parents of 2–8-year-old children with autism spectrum disorders (ASD) and typical development. Results showed that repetitive behaviours were associated with play in ASD but not in typical development, supporting Wing and Gould's triad. However there was also an association between play, repetitive behaviour and language, confirming the international classification systems description of imagination as a component of language and communication difficulties.

Keywords Autism · Repetitive behaviours · Play · Parental report · Questionnaire

Introduction

Repetitive behaviour is a broad term used to describe a large variety of behaviours characterised by sameness,

rigidity and repetitiveness. These behaviours are universally seen in children with autism spectrum disorder (ASD) but vary in type and degree between different individuals and change over time within an individual (Kanner, 1943; Bishop, 1989). Although repetitive behaviours are one of the defining characteristics of ASD, they are not exclusive to ASD; and are also seen in young children with typical development (Evans et al., 1997; Bodfish, Symons, Parker, & Lewis, 2000) and in children with other developmental, neurological and psychiatric disorders (M. Turner, 1996, Unpublished data).

The presence of repetitive behaviours in children with ASD is widely reported to be associated with impairment in imaginative activities. Indeed, within Wing and Gould's (1979) 'triad' of features of autism, one part is an impairment made up of two inversely related activities—impairments in imagination co-occurring with restricted, repetitive behaviours. This definition is also used in the algorithm for ASD within the Diagnostic Interview for Social and Communication Disorders (DISCO) (Leekam, Libby, Wing, Gould, & Taylor, 2002). This view of the triad of impairments, in which impaired imagination is linked with repetitive behaviour, is widely accepted in the literature and has provided the descriptive basis for theoretical accounts of autism for many years (see Frith, 1989; Happe, 1994). However, surprisingly, this definition does not provide the basis for the diagnostic criteria provided by the international classifications of autism. These systems (DSM-IV, WHO, 1993; ICD-10, APA, 1994) provide a separate category for repetitive behaviours whilst categorising impairments of imagination, notably as seen in symbolic play, as part of the communication deficits of ASD. It is, therefore in theory possible using ICD-10 for

E. Honey (✉) · S. Leekam · M. Turner
Psychology Department, University of Durham, Science
Site, South Road, DurhamDH1 3LE, UK
e-mail: e.j.honey@durham.ac.uk

H. McConachie
Child and Adolescent Mental Health, University of
Newcastle, Newcastle upon TyneNE1 7RU, UK

a child to be diagnosed with ASD with significant repetitive behaviours and impaired communication alongside good symbolic play skills.

To date we know very little about the relationship between repetitive activities and imagination either in autism or in typical development although research has documented the presence of these activities independently. Research on repetitive behaviours in typical development shows that repetitive behaviours are present in infancy until around 4 years of age when they begin to decline with the maturation of emotions and social communication (Evans et al., 1997). Research on repetitive behaviours reports that significantly more and longer bouts of repetitive phenomena occur in ASD in comparison to the typically developing population (Hermelin & O'Connor, 1963; Prior & Macmillan, 1973; Bodfish et al., 2000). Furthermore repetitive behaviours in autism are a pervasive feature maintained with age (Berkson & Tupa, 2000); moreover M. Turner (1996, Unpublished data) reports that repetitive behaviours in young autistic children are not age related but persistent and stable over time.

Imaginative behaviours include activities ranging from simple pretend play with miniature objects to creative engagement with fictional stories. All these activities are impaired and delayed in children with autism (Wing, 1996). Traditionally, research on imagination in autism has focused on the development of play and specifically on the development of pretend play. In typical development, the onset of pretend play at around 18 months is considered to reflect the emergence of the stage of symbolic representational thought (Piaget, 1962). This capacity enables the development of both symbolic play and language (Piaget, 1962; McCune-Nicolich, 1981; Bates, O'Connell, & Store, 1987; McCune, 1995). Symbolic play has been identified as problematic or impaired in the ASD population (Charman et al., 2000). Some debate surrounds the issue of whether children with ASD can engage in this form of play; some studies report no evidence of symbolic play in ASD whilst other report symbolic play impairments that specifically relate to generativity (Lewis & Boucher, 1988; Russell, Mauthner, Sharpe, & Tidswell, 1991; Williams, Costell, & Reddy, 2001), social integration and flexibility (for review see Jarrold, 2003).

Even non-symbolic play is generally delayed in children with autism. It has been reported that children with autism engage less in functional play than do typically developing children and children with learning difficulties (Jarrold, Boucher, & Smith, 1996). Functional play in children with autism has also been reported to be less elaborate, varied and integrated

than that of typical infants and those with learning difficulties (Jarrold et al., 1996; Williams et al., 2001). In comparison, however, there are those who have found no differences in the functional play of children with ASD in comparison to typically developing children (Baron-Cohen, 1987; Libby, Powell, Messer, & Jordan, 1998). At present we know little about the association between repetitive behaviours and any play behaviours either imaginative or not. Given that levels of exploratory and functional play provide a prerequisite stage for symbolic play, it is important to examine all levels of play behaviour and the relationship between play and repetitive behaviour, before focusing specifically on symbolic play. The aim of the present study is to consider the relationship between repetitive behaviour and play overall in order to begin to examine whether the proposed relationship is general or specific to types of play. If such a relationship exists then it may be possible to facilitate improvements in one or both of these behaviours through interventions, which aim to reduce repetitive behaviours or improve imaginative play.

The delay in play development in children with ASD reflects their developmental delays in other domains. It is important then in studies of imagination and repetitive behaviour to investigate the level of play skills being used rather than the quality of play. Level of play and repetitive behaviour should also be examined against the background of the child's language skills. In the present study, a measure of language was included in addition to measures of repetitive behaviour and play. In studying the relationship between repetitive behaviour and play in children with ASD and children with typical development, the predictions were that: repetitive behaviours will be more numerous in children with ASD than in typical development, and that play will be more imaginative in typical development than in ASD. It was also predicted that for children with ASD, repetitive behaviour will be negatively correlated with overall play while no specific hypothesis about this relationship in typical development can be made.

Method

Design

A parent report measure was first developed to examine repetitive behaviours and play in typically developing and ASD populations. Principal components analysis was used to devise factors and factor scores calculated for each child for use in descriptive analyses.

Participants

Information on repetitive behaviours and play was collected for 117 typically developing children and 79 children with ASD aged 2–4 and 6–8 years. Information was gathered using parent/carer report questionnaires. All participants were asked to provide information about any psychological diagnoses, which their child may have.

Parents of typically developing children were recruited from four schools and nurseries within the North of England. Data were gathered for an equal number of typically developing children in each of the age groups. If any respondent recruited for inclusion in the typically developing groups indicated any psychological diagnosis for instance dyslexia, epilepsy, ASD or learning difficulties they were not included in the analysis.

Parents of children with ASD were recruited from schools and nurseries with specialist autism provision in the North of England, where the child was required to have a Special Educational Needs statement for Autism or ASD, specialist support groups across England and via an advertisement placed in Communication, the national newsletter of the National Autistic Society for parents of children with ASD. For inclusion in the ASD group respondents were required to specify that their child had a diagnosis of Autism or ASD. Of those included in the group a large percentage also included a date of diagnosis. Due to diagnostic procedure and ASD symptom presentation it was not possible to gather equal amounts of data for each of the ASD age groups. Recruitment via national advertisement and support groups across England attempted to reach the wider ASD population and maximise numbers for the 2–4 year age group.

The research project and the Activities and Play Questionnaire-Revised (APQ-R) were approved by University of Durham and NAS ethical committees. Items which were originally included to gather information about social economic status, ethnicity, family make up and detailed information about diagnosis were not permitted as the questionnaire was to be anonymous.

Measures

Repetitive Behaviour and Play Measure

The APQ-R is a 31-item parental report questionnaire designed to assess repetitive behaviours and play abilities of typical children and children with ASD. The final version of this questionnaire was developed after

an earlier 28-item version [Activities and Play Questionnaire (APQ)] had been completed by 91 parents of typically developing children and 40 parents of children with ASD aged 2–8 years. Principal component analysis with varimax rotation was conducted for the APQ to examine the factor structure of the questionnaire and validity and reliability of the individual items.

The APQ-R draws from two main sources (See Table 1):

- (1) The Repetitive Behaviour Questionnaire (RBQ) (M. Turner, 1996, Unpublished data) is a form of the Repetitive Behaviour Interview (M. Turner, 1996, Unpublished data). The questionnaire assesses the severity, nature and frequency of repetitive behaviours demonstrated by an individual. The RBQ is made up of 33 items designed to tap specific types of repetitive behaviour. For the APQ-R, 11 repetitive behaviour items were selected from the RBQ. Items selected tapped a range of repetitive behaviours including sensory interests, motor mannerisms, routines and rituals. Respondents rate behaviours for severity or frequency, dependent upon the type of behaviour in question.
- (2) The DISCO is an interview schedule for the diagnosis of autistic spectrum and related disorders. Inter-rater reliability of DISCO items is high with κ coefficients of 0.75 or higher in over 80% of the items (Wing, Leekam, Libby, Gould, & Locombe, 2002). For the APQ-R, seven sensory items and seven play items were selected from the DISCO and adapted for use in a questionnaire form. Play items ranged across all levels of play from simple exploratory/functional to symbolic play.

Following analysis and parental feedback in the piloting stage a number of revisions were made to the questionnaire. Items tapping the quality of play were removed; these items were summary items and therefore unlikely to be as objectively scored as more specific items. Additional play items were added to tap play at a more fine grained level and to examine the spontaneity of symbolic play. Finally, response options were revised to create four options for each item to overcome floor effects reported for some behaviours in typical development.

Items were scored from 0 to 3 with a score of 3 if the behaviour was present to a considerable degree and 0 if a behaviour was never shown. A total repetitive behaviour (TRB) score was obtained by

Table 1 Activities and play questionnaire—items, sources and factor scores

Item	Response (Score)	Source	Factor 1	Factor 2
Arrange toys/items in rows or patterns		RBQ	0.44	0.32
Fiddle with toys/items	Never (0)	RBQ	0.73	−0.078
Spin self	Rarely (1)	RBQ	0.59	0.06
Rock self	One or more episode daily (2)	RBQ	0.65	−0.1
Pace self	15 or more episodes daily (or at least once an hour) (3)	RBQ	0.77	−0.13
Hand and Finger mannerisms		RBQ	0.75	−0.2
Touch parts of body		RBQ	0.71	−0.13
Unusual interest in smell		DISCO	0.66	−0.16
Unusual interest in feel	No (0)	DISCO	0.7	−0.23
Unusual interest in sounds	Occasional feature of behaviour (1)	DISCO	0.68	−0.17
Special interest in bright/shiny things	Regular feature of behaviour (2)	DISCO	0.66	−0.12
Sounds upset child	Marked feature of behaviour (3)	DISCO	0.65	−0.24
Flick near eyes		DISCO	0.66	−0.23
Look at objects from certain angles		DISCO	0.78	−0.25
Sameness in home	No (0)	RBQ	0.39	−0.07
Sameness in daily routine	Mild problems which does not effect others (1)	RBQ	0.73	−0.15
Sameness in other people	Regular feature of behaviour but tolerates alternatives when necessary (2)	Original Item	0.69	−0.15
Sameness in clothing	Serious problem which effects others on a regular basis (3)	RBQ	0.59	−0.04
Sameness in music/games/books/videos		RBQ	0.79	−0.1
Roll toys		Original Item	0.04	0.55
Play real/household objects for real purpose		DISCO	−0.04	0.71
Hold dolls/toys as if real		DISCO	−0.09	0.68
Play simple sequences with toys as if real	Never (0)	DISCO	−0.16	0.83
How often does child start simple sequences	Rarely (1)	DISCO	−0.25	0.81
Play act longer sequences with toys as if real	Once a week or more (2)	Original Item	−0.11	0.89
How often does child start longer sequences	Once per day or more (3)	DISCO	−0.16	0.86
Use object as something else		Original Item	−0.18	0.79
Make-believe games with invisible object		Original Item	−0.19	0.8
How often does child start games with invisible objects		DISCO	−0.25	0.81
Invent stories when pretend to be someone else		Original Item	−0.2	0.66
How often does child start games when pretend to be someone else		DISCO	−0.18	0.62

summing the item scores for all 19 repetitive behaviour items. This TRB score represents the total frequency of a range of repetitive behaviours seen in the child. A total play score (TP) was obtained by summing the item score for all 12-play items. The TP score represents the total frequency of a range of play types seen in the child.

Language Measure

Two language items were included with the questionnaire to provide an estimate of expressive and receptive language level. Items were taken from the DISCO and can be seen in Table 2.

Results

Analysis

Principal components analysis was used to capture the cluster structure of the APQ-R. Varimax rotation was used to maximise the dispersion of loadings within the factors. Comparisons between ASD and typically developing groups were made using *t*-tests, after checking for normal distribution. Examination of the relationships between repetitive behaviour and play were tested using Spearman's correlation. The role of language was examined as a mediator of any associations between repetitive behaviour and play using regression.

Table 2 Language measures adapted from the DISCO

Behaviour	Responses (Score)
Expressive language	No speech or sounds (0) Babbles, gurgles, coos or laughs without meaning (1) Babbles or makes noises with meaning (2) Gives names of people or things when asked (3) Spontaneously says names of several familiar objects for some purpose (4) Says phrases of two words (5) Says some longer phrases, missing out small linking words (when time go holiday?) (6) Talk in spontaneous sentences using small linking words (7) Uses past, present and future tenses and complex sentences (8)
Receptive language	Responds to name only (0) Understands simple phrases in context (go to bed, give mummy a kiss) (1) Understands and responds appropriately to a phrase not said regularly (2) Can be sent out of the room to fetch 2 or more objects (e.g. go upstairs and get your hat and shoes) (3) Understands a sequence of instructions (e.g. first put your paints away and then wash your hands) (4) Understands instructions, which involve decisions (e.g. see if your hat is in the cupboard if it isn't then have a look upstairs) (5)

Reliability and Validity of the APQ-R

Principal components analysis of the APQ-R resulted in a two factor solution, in which repetitive behaviour and play items loaded onto separate factors (see Table 1). The two factor solution was true for the entire sample, and for ASD and typically developing children independently.

Internal consistency scores for each factor were calculated for the entire sample, typically developing and ASD groups independently. All Cronbach's alpha scores were between 0.84 and 0.93 suggesting the factors extracted were reliable and valid.

Relationship Between Repetitive Behaviours and Play

A TP and TRB score was created for each participant. The scores were converted to z-scores to allow statistical comparison. Table 3 reports the mean TP and TRB scores, alongside expressive and receptive language scores for typically developing children and children with ASD aged 2–4 and 6–8 years.

As hypothesised at all ages typically developing children demonstrated lower TRB than children with

ASD. Typically developing children also engaged in more play than children with ASD (see Table 3).

Expressive and receptive language ratings for the older typically developing group reached ceiling level, and would therefore not allow for the effects of language upon the relationship between repetitive behaviours and play to be examined further. In the ASD groups there was little variation between the language abilities of the two age groups; it is therefore proposed that these groups be collapsed for further analysis of associations between repetitive behaviour and play. The following calculations therefore compared typically developing children aged 2–4 years ($n = 61$) and ASD children aged 2–8 years ($n = 79$).

Significant differences were found between TRB scores of typically developing 2–4 year olds and ASD children aged 2–8 years ($t = -8.98$, $P < 0.001$). Significant differences between the TP scores were also found between these groups of children ($t = 10.44$, $P < 0.001$) (see Fig. 1).

Correlations between TRB and TP were examined for typically developing children and children with ASD. A significant correlation was found for children with ASD ($r = -0.35$, $P = 0.003$). However the correlation of

Table 3 Descriptive statistics for ASD and TD children

Group (N)	Males	Females	Age range in months (Mean/SD)	Expressive language rating (Mean/SD)	Receptive language rating (Mean/SD)	Standardised mean TRB (SD)	Standardised mean TP (SD)
TD 2–4 years (61)	35	26	29–58 (46.36/6.60)	5–8 (7.56/0.719)	2–5 (4.66/0.77)	–0.50 (0.56)	0.89 (0.56)
TD 6–8 years (56)	26	30	72–104 (84.20/7.94)	7–8 (7.98/0.135)	5 (5/0)	–0.66 (0.56)	0 (0.83)
ASD 2–4 years (19)	16	3	35–59 (50.95/7.65)	1–8 (5.00/2.45)	0–5 (2.28/1.56)	0.91 (0.91)	–0.46 (1.06)
ASD 6–8 years (60)	41	19	72–106 (84.65/11.23)	1–8 (5.42/2.26)	0–5 (2.64/1.580)	0.73 (0.98)	–0.54 (0.88)

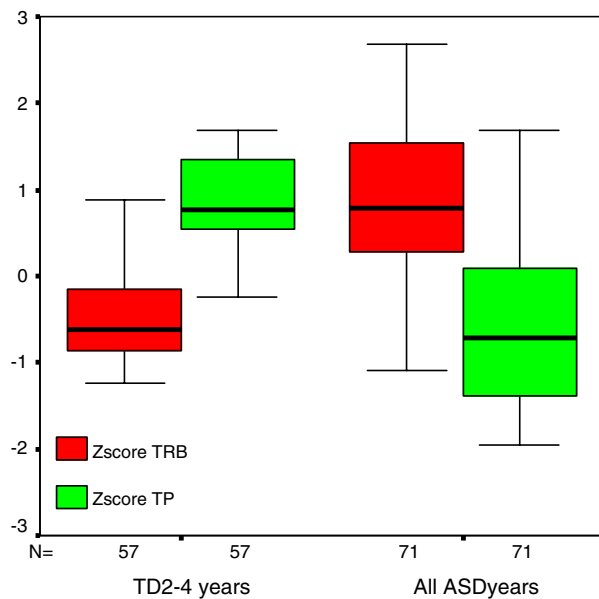


Fig. 1 Mean total repetitive behaviour and play scores

TRB and TP for typically developing children was non-significant ($r = 0.063$, $P = 0.64$).

Hierarchical regression analysis was used to examine expressive language, receptive language and TRB as

predictors of play. For the entire group (TD 2–4 years, ASD 2–8 years combined) expressive language, receptive language and repetitive behaviours were revealed as significant predictors of play ($R^2 = 0.33$). For ASD children repetitive behaviours and expressive language were revealed as significant predictors of play ($R^2 = 0.33$). For typically developing children aged 2–4 years, expressive language was revealed as the only significant predictor of play ($R^2 = 0.27$) (Table 4).

Discussion

It has been proposed that repetitive behaviours take the place of imaginative activities in individuals with ASD (Wing & Gould, 1979). A parental report questionnaire was used in the present study to examine a wide range of repetitive behaviours and play activities. TRB scores were compared with TP scores, including functional and symbolic play. Repetitive behaviour and play were found to be associated only in children with ASD aged 2–8 years. Such a finding suggests that ASD children with few repetitive behaviours are likely to engage in more play activities than ASD children who frequently engage in repetitive behaviours.

Table 4 Summary of hierarchical regression analysis for variables predicting total play

Group	Model	R^2	B	SEB	B	t	p -value
All	Step 1	0.33					
	Receptive language		0.30	0.06	0.46	5.13	<0.001
	Expressive language		0.18	0.05	0.34	3.80	<0.001
	Step 2	0.34					
	Receptive language		0.13	0.06	0.23	2.13	0.035
	Expressive language		0.17	0.05	0.37	3.44	0.001
TD	TRB		-0.10	0.07	-0.10	-1.4	0.163
	Step 1	0.27					
	Expressive language		0.44	0.13	0.46	3.30	0.002
	Receptive language		0.09	0.12	0.10	0.75	0.457
	Step 2	0.29					
	Expressive language		0.46	0.13	0.48	3.44	0.001
ASD	Receptive language		0.07	0.13	0.08	0.55	0.582
	TRB		0.16	0.14	0.13	1.10	0.275
	Step 3	0.29					
	Expressive language		0.50	0.11	0.53	4.56	<0.001
	TRB		0.17	0.14	0.14	1.22	0.227
	Step 4	0.27					
	Expressive language		0.41	0.09	0.52	4.47	<0.001
	Step 1	0.32					
	Expressive language		0.16	0.05	0.35	2.68	<0.001
	Receptive language		0.19	0.09	0.28	2.182	0.033
ASD	Step 2	0.36					
	Expressive language		0.15	0.06	0.34	2.66	0.010
	Receptive language		0.15	0.09	0.22	1.66	0.101
	TRB		-0.22	0.11	-0.22	-2.05	0.044
	Step 3	0.33					
	Expressive language		0.19	0.19	0.46	4.44	<0.001
ASD	TRB		-0.27	-0.27	-0.27	-2.5	0.015

On the basis of these findings regression analysis was carried out to examine predictors of play abilities. Play in typically developing children aged 2–4 years was found to be predicted only by expressive language. For children with ASD aged 2–8 years play was also predicted by repetitive behaviours.

Play and language are known to develop alongside one another in the typical population with the first signs of play emerging around the time when a child speaks their first words (Piaget, 1962; Bates, 1979; Morans, 1997). Furthermore a child's ability to use mental representation aids in the development of both symbolic play and language skills. Without symbolic communication, it is unlikely then that a child would be able to engage in symbolic play activities.

On the basis of these findings the present study provides support for the triad of impairments put forward by Wing and Gould (1979) in which impairments of imagination reflect excessive repetitive behaviours. The present study also indicates that play in ASD and TD is highly related to the developmental area of language and communication and may therefore also provide supporting evidence for the ICD-10 categorisation of imaginative impairments as a component of communication difficulties. Although it is possible in principle, according to ICD-10, to obtain a diagnosis of ASD on the basis of impaired communication and repetitive behaviour without having impaired imagination, in practice this is unlikely. Our results suggest that repetitive behaviour associates with impaired imaginative play in autism as Wing and Gould (1979), observed but that a three-way association between repetitive behaviour, imagination and communication might provide the best way of representing these associated impairments. Whether the association between imagination and communication reflected in the ICD-10 categorisation relates only to symbolic communication or also to non-verbal forms of communication remains to be investigated in future research.

Associations between repetitive behaviour and imagination have not been studied previously. This may be partly due to methodological issues, which surround these behaviours. Some repetitive behaviours such as motor mannerisms and stereotyped behaviours can be observed directly, but others, such as rituals and routines, are more difficult to observe as they may reflect a relationship between a behaviour and a corresponding mental state are (Turner, 1999). Routines and rituals are often seen in the private context such as bedtime and mealtimes; whilst observations may be possible, a large proportion of these behaviours remain inaccessible to the observing researcher. An additional issue surrounding the study of repetitive

behaviours is salience. As they are one of the identifying features of ASD, parents of children diagnosed with the disorder are likely to be aware of the behaviours and activities, which their child engages in repetitively. Parents of typically developing children, on the other hand, may not necessarily notice repetitive behaviours, which their child may show. The advantage of the APQ-R is that it allows information about these behaviours to be gathered easily from parents using a self-report questionnaire, without the need for extensive clinical interview. Whilst such methods may present a risk in terms of reliability, other recent research using parent questionnaires to collect behaviours on language (McArthur Communication Development Inventory, Fenson et al., 1993), communication (Children's Communication Checklist, Bishop, 1998) and autism behaviour (Social Communication Questionnaire, Berument, Rutter, Lord, Pickles, & Bailey, 1999) have proved to be both effective in collecting information from large numbers of parents and also reliable. Further, the APQ-R has proven able to distinguish between typical and ASD populations on the basis of repetitive behaviours manifested without the production of floor or ceiling effects.

Nevertheless, this study has limitations that would be overcome by the use of observational methods. This is particularly important for the study of play. Being able to distinguish different levels of play, particularly distinctions between pretend, functional and exploratory play require a trained eye. Unlike repetitive behaviours, play lends itself to standardised observational methods. The play items created for the APQ-R have been based on theory and existing detailed interview schedules. To validate the APQ-R play items further observational methods should be employed. A further limitation to this research is the global assessment of language level. Whilst parent report on children's levels of ability can be shown to have good validity (Bailey, Simeonsson, Byusse, & Smith, 1993; Fenson et al., 1993), a more accurate measure of language will also be preferable to examine the relationship between repetitive behaviour and imagination. In addition, the present study does not provide information about the severity of ASD nor about the validity of the procedures used in establishing the clinical diagnosis, and this would also need to be taken into consideration in future research. Further analysis should also be conducted with regards to the types of repetitive behaviours which children demonstrate, as it is possible that associations between repetitive behaviour and play will be more apparent for certain repetitive behaviours. Finally, during the present

study difficulties were found in recruiting and indeed identifying parents of children with ASD under the age of 5 years. To investigate associations between repetitive behaviour and imagination further, a larger sample would be highly advantageous.

Conclusion

Development of the APQ-R has enabled a study of repetitive behaviour and play in a broad range of children through parent report. The present study found that repetitive behaviour and play were associated in children with ASD aged 2–8 years but not in typically developing children aged 2–4 years. Moreover findings that repetitive behaviours in ASD were predicted by TP and language suggest support for both the ICD-10 and the Wing and Gould (1979) categorisation of imaginative impairments. This finding has theoretical implications for the understanding of the developmental relationship between imagination and repetitiveness in ASD and practical implications for current diagnostic classifications and interventions in which attempts to reduce certain behaviours may lead to an improvement in play abilities. Longitudinal research in both ASD and typical children will offer insights into the whether the relationship between repetitive behaviours and imagination remains stable or changes from early to later childhood. The possibility that we may need to consider an association not only between repetitive behaviour and imagination but a three-way association that incorporates both imagination and communication may also help us to rethink the way that ASD is currently categorised, as well as helping to gain further insights into symbolic development and autism.

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