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Easing the transition to secondary education for children with autism spectrum disorder: An evaluation of the Systemic Transition in Education Programme for Autism Spectrum Disorder (STEP-ASD)

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Abstract

In mainstream education, the transition from primary to secondary school ('school transition') is difficult for children with autism spectrum disorder, being marked by high levels of emotional and behavioural difficulties. The Systemic Transition in Education Programme for Autism Spectrum Disorder (STEP-ASD) is a new, manualised school transition intervention. We investigated its feasibility and efficacy for children diagnosed with autism spectrum disorder (N = 37; mean age = 11.47 years; mean IQ = 85.24) using an unblinded, non-randomised, controlled design. Teachers found the intervention feasible and acceptable. Children receiving STEP-ASD (n = 17) showed a large (Cohen's d = 0.88) reduction in school-reported emotional and behavioural difficulties, whereas controls (n = 20) showed a slight increase (d = −0.1) (p = 0.010). These encouraging findings suggest the value of STEP-ASD as a low-intensity intervention for reducing problem behaviours and distress in children with autism spectrum disorder as they transition to mainstream secondary school.

Keywords

autism spectrum disorder, clinical trial, education, intervention, school transition

Autism spectrum disorder (ASD) is a lifelong neurodevelopmental condition that occurs in approximately 1% of the population (Baird et al., 2006). It is diagnosed in response to impairments in social reciprocity, communication, flexibility and sensory processing and is usually associated with a range of additional features including difficulties with executive function, eating, sleeping, motor development and emotion regulation (American Psychiatric Association, 2013). Increasingly, people with ASD are being defined by their strengths as well as their difficulties (Mandy et al., 2015a). For example, it is now known that most people on the autistic spectrum have fluent language and an IQ above the intellectual disability range (Developmental Disabilities Monitoring Network Surveillance Year 2010 Principal Investigators and Centers for Disease Control and Prevention (CDC), 2014), and many show specific cognitive strengths that are directly related to their ASD (Howlin et al., 2009; Meilleur et al., 2014). Reflecting this is a trend towards more people with ASD being included in mainstream education. In the United Kingdom, 70% of children with ASD are taught in mainstream settings (Department for Education, 2012). In the United States, between 1991 and 2009 the proportion of children with ASD taught in mainstream schools increased from 12% to 59% (Snyder and Dillow, 2012).

The policy of including people with ASD in mainstream education is designed to promote equality. Nevertheless,

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there are several indicators that, currently, children with ASD often struggle in mainstream school. For example, compared to typically developing peers, they are at greater risk of being bullied (Sterzing et al., 2012), of academic underachievement (Jones et al., 2009), of teacher-reported emotional and behavioural problems (Kaat et al., 2013), and of being excluded on the grounds of disruptive behaviour (Donno et al., 2010). Such findings suggest an urgent need to identify ways in which mainstream education can be made more accommodating for children with ASD, to maximise their strengths and minimise their difficulties.

This study focuses on helping students with ASD negotiate one specific challenge of mainstream education: the transition from primary to secondary school. In most industrialised countries, this takes place as students approach adolescence, when they are 11 or 12 years of age. Compared to primary schools, secondary schools tend to be larger and to make greater demands on their pupils' independence, with a stronger focus on self-directed learning and academic assessment (Coffey, 2013). A child in primary education receives most of their teaching from a single class teacher, in one room surrounded by a familiar group of peers. By contrast, at secondary school, students have to follow a timetable to navigate around the school campus throughout the day, receiving instruction from multiple teachers. As such, the move from primary to secondary school places substantial social, intellectual, organisational and emotional demands upon pupils and is considered to be one of the greatest challenges in a young person's educational career (Zeedyk et al., 2003).

Students must draw upon considerable personal resources in order to make a successful school transition. For example, social competence, flexibility, self-regulation, and strong academic attainment all predict a successful move to secondary school (Chung et al., 1998; Evangelou et al., 2003; Rudolph et al., 2001). Individuals who lack such personal resources, and who have previously experienced bullying and high levels of anxiety are at risk of struggling as they attempt the step up to secondary education (Chung et al., 1998; Evangelou et al., 2003). Given that difficulties with social skills, flexibility, emotion regulation, academic attainment, anxiety and bullying are all common among young people with ASD, this implies that the transition from primary to secondary school may be particularly difficult for pupils on the autistic spectrum. Clinical observation and the reports of parents support this view (Tobin et al., 2012).

To systematically and empirically test the idea that the primary–secondary transition is difficult for pupils with ASD, we recently conducted a study of students with ASD as they made the move from primary to secondary school in the United Kingdom (Mandy et al., 2015b). This research showed that as students with ASD approached the primary–secondary transition, they had very high levels of emotional and behavioural difficulties, as measured by parent- and teacher-report on the Strengths and Difficulties Questionnaire (SDQ) (Goodman, 2001). Crucially, these difficulties persisted across the transition: when followed up in the second semester of secondary school, participants continued to show elevated levels of emotional and behavioural difficulties on the SDQ, by both teacher- and parent-report.

The finding that, among young people with ASD, maladaptation is widespread and persistent during the school transition suggests the need for an intervention to support them as they move from primary to secondary school. This accords with the views of parents in a study by Tobin et al. (2012), who stressed the need for an intervention that promoted communication between different agencies and which prepared the secondary school to meet the child's individual needs. Our search of the scientific literature revealed no manualised, evaluated interventions for supporting the mainstream primary-to-secondary school transition in children with ASD. As a result, we devised the Systemic Transition in Education Programme for Autism Spectrum Disorder (STEP-ASD).

STEP-ASD was developed on the basis of clinical experience, focus-group work with parents (including that published in Tobin et al., 2012) and consultation with educators and charity workers. It is designed to reduce the risk of emotional and behavioural problems in young people with ASD making the transition to secondary school. STEP-ASD is based on a core principle of developmental psychopathology: that maladaptation is not an inherent property of the individual, but arises from an interaction between the individual and their environment (Bronfenbrenner, 1979; Cicchetti, 1984). As such, STEP-ASD seeks to reduce emotional and behavioural maladaptation by modifying the school environment before, during and after transition to improve the fit between the individual with ASD and their educational environment. STEP-ASD is a standardised, manualised intervention and is described in greater detail in the 'Methods' section of this article.

In this study, we piloted STEP-ASD, with the following aims.

1. To gain information about the feasibility and acceptability of STEP-ASD.
2. To seek preliminary information about whether STEP-ASD is effective for reducing behavioural and emotional problems at school.
3. To investigate whether any teacher-reported effects generalised beyond school.

To these ends, we implemented STEP-ASD in a cohort of young people with a clinical diagnosis of ASD, making the transition from primary to secondary school in the UK mainstream educational system in 2011. We interviewed teachers about the acceptability and feasibility of STEP-ASD (aim 1) and compared school transition data for those

children receiving STEP-ASD with information we had collected previously on equivalent children making the transition in 2009 and 2010, who did not receive STEP-ASD (Mandy et al., 2015b). Because we sought to investigate whether STEP-ASD can reduce emotional and behavioural problems at school (aim 2), we chose the school-reported SDQ total problems score as our primary outcome measure. We were also interested in changes in the parent-reported SDQ total problems score, to see whether any teacher-reported effects generalised beyond school (aim 3).

Methods

Design

This investigation of STEP-ASD is a non-randomised (quasi-experimental) controlled trial, with outcomes being measured before and after transition to secondary school for an intervention group, who received STEP-ASD, and a 'management as usual' control group.

Participants

For a child to be included in this study, they had to meet all of the following criteria: (1) clinical diagnosis of an ASD, given by a UK National Health Service (NHS) team with expertise in ASD assessment; (2) transitioning from mainstream primary to mainstream secondary school in 2009, 2010 or 2011; (3) receiving education in mainstream classrooms, not in a specialist unit within a mainstream school; (4) in state education, not the private sector; (5) does not have a diagnosed intellectual disability; (6) lives in Greater London, or the South-East of England.

A total of 37 children meeting inclusion criteria comprised the total sample for this study. No two participants were attending the same school. The control group (n = 20) was made up of participants making the school transition in 2009 and 2010 (Mandy et al., 2015b). These children did not receive any additional support or interventions as a result of being in this study. The intervention group contained 17 participants making the 2011 transition, all of whom started STEP-ASD.

Table 1 shows the characteristics of the whole sample, and of the STEP-ASD and control groups. These groups did not differ significantly in terms of their age, IQ, autistic diagnosis, autistic symptom severity, co-occurring conditions, likelihood of identifying as White British, or level of special educational needs support at school. Also there was no difference in their neighbourhoods on the 2010 Index of Multiple Deprivation (IMD), a statistic calculated by the UK Government's Department for Communities and Local Government to measure local deprivation (Department for Communities and Local Government, 2011). In London, the median IMD is 23.81 (Interquartile Range = 20.85), suggesting that the sample of this study was drawn from regionally representative neighbourhoods, in terms of relative deprivation (Department for Communities and Local Government, 2011). UK schools are regularly inspected by the Office for Standards in Education (OFSTED), which rates schools on a number of dimensions as 'outstanding', 'good', 'requires improvement' or 'inadequate'. Schools receiving the latter two ratings are expected to reform and become the subject of additional OFSTED scrutiny. As shown in Table 1, the schools attended by participants in the STEP-ASD and control groups received a similar proportion of 'outstanding' or 'good' ratings for their pastoral performance ('care and guidance').

STEP-ASD

STEP-ASD is a manualised intervention to facilitate successful school transition for people with ASD via intervention on the child's educational environment. It works by helping parents and teachers develop their shared understanding of the child's needs and abilities and then promoting individualised modifications at secondary school. It was developed by clinicians experienced in working with children with ASD, in consultation with children with ASD, parents of children with ASD, teachers, educational psychologists and expert charity workers. STEP-ASD was designed as a low-intensity intervention as it seeks to modify and improve existing practices in schools, rather than impose extensive additional tasks on school staff.

The step STEP-ASD manual, known as the 'transitions pack', contains comprehensive information and resources for school staff to help children with ASD make the transition to secondary education. This includes information on general strategies likely to benefit most children with ASD, such as gradually familiarising the child with the new school and other ways to increase the predictability of the educational environment. The transition pack also has chapters on specific core (e.g. social interaction difficulties) and associated (e.g. executive function difficulties) features of ASD. These help teachers conceptualise particular areas of difficulty and provide practical, school-based support strategies, with associated resources provided in appendices. For example, the chapter on 'Planning and Organisational Problems' (i.e. executive functioning difficulties) includes information on how to identify different types of executive difficulties in the classroom (e.g. 'goal setting', 'monitoring', 'initiating') and sets out support strategies targeted at each of these. Because the transitions pack has been designed as a comprehensive tool that should inform *individualised* support for each pupil, teachers need only refer to relevant sections of the pack, dependent on the child's pattern of strengths and difficulties identified at the bridge meeting (see below).

Table 1. Characteristics of the sample.

	Whole sample	STEP-ASD group	Control group	Significance of group difference
	N = 37	n = 17	n = 20	
Number of males (%)	30 (81.1%)	13 (76.5%)	17 (85.0%)	p = 0.680
Number identifying as 'White British' (%)	25 (67.6%)	10 (58.8%)	15 (75.0%)	p = 0.295
Mean age in years at transition (SD)	11.47 (0.44)	11.45 (0.27)	11.48 (0.55)	p = 0.876
Mean WISC-IV Full-scale IQ (SD)[a]	85.24 (18.51)	84.43 (20.22)	85.20 (16.12)	p = 0.835
Autism spectrum diagnosis				
Autism	11 (27.0%)	5 (23.5%)	6 (30.0%)	p = 0.328
Asperger's syndrome	15 (40.5%)	5 (29.4%)	10 (50.0%)	
ASD/atypical autism	11 (29.7%)	7 (41.2%)	4 (20.0%)	
Mean Social Communication Disorders Checklist	13.80 (5.68)	13.31 (5.51)	14.21 (5.93)	p = 0.648
Autistic symptom severity (SD)[b]				
Number with emotional and behavioural difficulties identified by clinical services (%)				
ADHD	7 (18.9%)	3 (17.6%)	4 (20.0%)	p = 1.000
Anxiety	6 (16.2%)	3 (17.6%)	3 (15.0%)	p = 1.000
Depression	2 (5.4%)	1 (5.9%)	1 (5.0%)	p = 1.000
OCD	1 (2.7%)	1 (5.9%)	0 (0%)	p = 0.459
Tic disorder	3 (8.0%)	0 (0%)	3 (15%)	p = 0.234
Behavioural problems	6 (16.2%)	2 (11.8%)	4 (20.0%)	p = 0.667
Level of special educational needs provision at mainstream school				
No additional support	1 (2.7%)	0 (0%)	1 (5.0%)	p = 0.501
Low intensity ('School Action')	4 (10.8%)	2 (11.8%)	2 (10%)	
Medium intensity ('School Action Plus')	12 (32.4%)	4 (23.5%)	8 (40%)	
Higher intensity ('Statement of special educational needs')	20 (54.1%)	11 (64.7%)	9 (45%)	
Office for Standards in Education (OFSTED) rating of school				
Primary school rated 'outstanding' or 'good' for care and guidance of pupils	33 (89.2%)	15 (88.2%)	18 (90%)	p = 1.000
Secondary school rated 'outstanding' or 'good' for care and guidance of pupils[c]	32 (88.9%)	16 (100%)[a]	16 (80%)	p = 0.114
Mean index of multiple deprivation for child's neighbourhood (SD)	22.92 (12.79)	24.37 (14.17)	21.69 (11.72)	p = 0.534

STEP-ASD: Systemic Transition in Education Programme for Autism Spectrum Disorder; ASD: autism spectrum disorder; SD: standard deviation; WISC-IV: Wechsler Intelligence Scale for Children, Fourth UK Edition; ADHD: attention deficit hyperactivity disorder; OCD: obsessive compulsive disorder.

[a]N = 34 (STEP-ASD n = 14).

[b]N = 35 (STEP-ASD n = 16).

[c]N = 36 (STEP-ASD n = 16) due to one child leaving mainstream education.

The STEP-ASD intervention is depicted in Figure 1 and involves the following stages.

1. Bridge meeting held in the summer prior to transition. This is attended by the child with ASD, their parents, an allocated professional from both their primary and secondary schools and a STEP-ASD worker. During this meeting, the child's needs are collectively identified and, drawing on materials from the transitions pack, strategies are generated to support transition.
2. After the bridge meeting, an individualised 'transitions management plan' and 'pupil profile' are developed by the STEP-ASD worker. The transitions management plan is a summary of the child's needs, and the support strategies designed to meet these. It reflects the discussions of the bridge meeting and, crucially, contains explicit statements about who will take responsibility for each support and management strategy identified. The transitions management plan is distributed to the key players in the child's school transition, namely, their parents, and an allocated member of staff at both primary and secondary schools. By contrast, the pupil profile is distributed to all secondary school staff who have contact with the child. It is a one-page summary of key information from the transitions management plan, designed to convey essential information in a way that is concise and accessible to busy school staff.

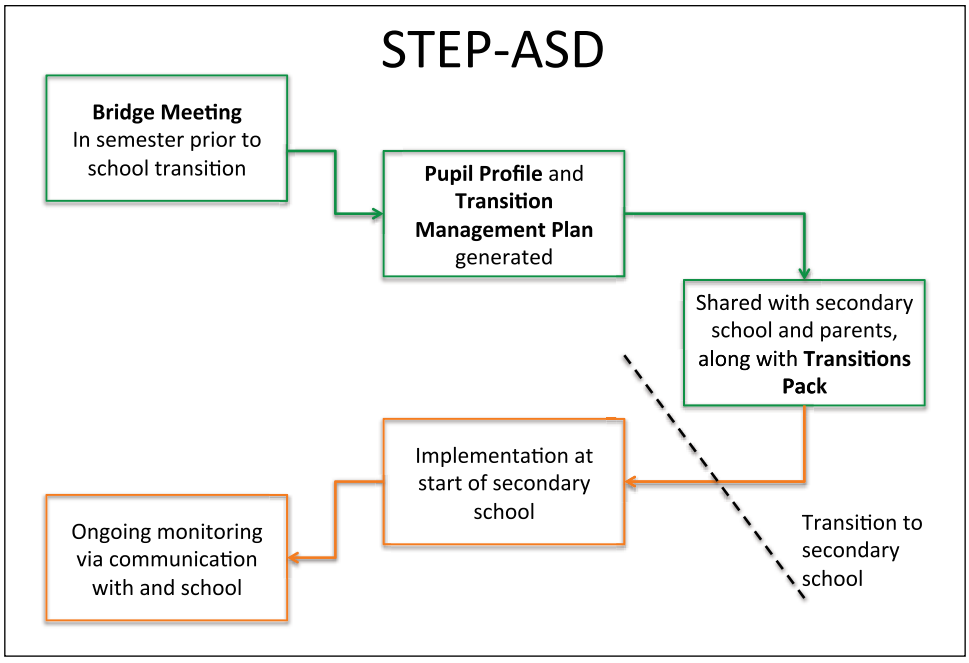

Figure 1. The process of the STEP-ASD intervention.
STEP-ASD: Systemic Transition in Education Programme for Autism Spectrum Disorder.

3. The transitions management plan and pupil profile are shared with the secondary school prior to transition. The needs and strategies identified in the transitions management plan and pupil profile are linked to specific chapters of the transitions pack, to provide school staff with guidance about supporting the child.
4. Implementation of STEP-ASD strategies occurs at the start of secondary school.
5. STEP-ASD workers seek to promote compliance with the transitions management plan by making scripted monitoring phone calls to school staff over the first two semesters of secondary school.

Measures

The SDQ was used to measure emotional and behavioural problems. The SDQ is a 25-item measure of internalising and externalising difficulties, which has strong reliability and validity, both as a screen for mental disorders in childhood (Goodman, 2001) and a dimensional measure of psychopathology (Goodman and Goodman, 2009). It yields a total problems score, as well as subscale scores for hyperactivity (i.e. attention deficit/hyperactivity symptoms), emotional problems (i.e. internalising), peer problems, conduct problems and prosocial behaviour. Both parent- and teacher-report versions were administered in this study. Since we sought to investigate whether STEP-ASD reduces emotional and behavioural problems at school (aim 2), our primary outcome measure was the school-reported SDQ total problem score.

The Social Communication Disorders Checklist (SCDC) was administered to both groups to test whether they were matched in terms of their autistic social communication difficulties. The SCDC is a 12-item measure that has excellent test–retest reliability and internal consistency (Skuse et al., 2005). The SCDC's criterion validity is demonstrated by its correlations with a well-validated parent-reported ASD interview; the developmental, diagnostic and dimensional interview (3Di) (Skuse et al., 2004); and its strong sensitivity (0.8) and specificity (0.8) with respect to ASD diagnosis (Skuse et al., 2009). Construct validity is shown by associations with male gender and measures of pragmatic language impairment (Mandy et al., 2013; Oliver et al., 2011).

The Wechsler Intelligence Scale for Children, Fourth UK Edition (WISC-IV) was administered, with its 10 core subtests being employed to measure general intelligence. The WISC-IV has proven reliability and validity and has been used extensively with people with ASD (Wechsler, 2003).

The Post-Transition Monitoring Interview was designed especially for this study to assess STEP-ASD's acceptability and perceived feasibility to school staff (aim 1). This was a highly structured interview that was administered to the secondary school teacher who also provided SDQ outcome data for the child. Its eight questions covered perceptions of the bridge meeting, the pupil profile, the transition management plan and the transitions pack. Answers were recorded using 4-point Likert scales. A copy of the interview is available from the corresponding author on request.

Procedure

The study was approved after review by an NHS ethics committee. Participants were sought using adverts in NHS child and adolescent mental health services; publications and websites aimed at parents of children with ASD; and through support groups run by autism charities. The same recruitment strategies were used throughout the study to recruit both control and STEP-ASD participants. Both parental consent and child assent were required for participation.

Baseline assessments took place in the last year of primary school, and follow up assessment was conducted in the second semester of secondary school. The average interval between these two assessments was 9.90 months (standard deviation (SD) = 3.12), and there was no difference in the length of this interval for the control and intervention groups ($p = 0.324$).

When seeking data from school, we asked that the member of staff who knew the child best provide information. As such, data were not provided by people blind to whether or not the child was receiving STEP-ASD. At baseline, school informants were class teachers (n = 19, 51.4% of total sample), learning support workers (n = 8, 21.6%), Special Educational Needs Coordinators (SENCOs) (n = 9, 24.3%) and a head teacher (n = 1, 2.7%). At follow up, school information was provided by SENCOs (n = 21, 56.7%), learning support workers (n = 9, 24.3%) and class teachers (n = 5, 13.5%). There were no significant differences in school informant type between the control and intervention groups at baseline assessment ($p = 0.109$) or follow up ($p = 0.441$). In this study, STEP-ASD workers, who oversaw the implementation of the intervention, were graduate-level psychologists, supervised by an experienced clinical psychologist.

Analysis

To examine the feasibility and acceptability of STEP-ASD (aim 1), we ran frequencies for items from the Post-Transition Monitoring Interview. The following analytic steps were used to examine the efficacy of STEP-ASD on behavioural and emotional problems, both at school (aim 2) and beyond (aim 3). Initially, to check for confounds, cross-sectional group differences for continuous variables were investigated with independent sample t-tests. Between-group comparisons of categorical variables were made using two-tailed Fisher's exact tests. Group differences in SDQ scores over the transition were tested with 2×2 mixed analyses of variance (ANOVAs), with group (STEP-ASD vs control) as the between subjects factor and time (primary school vs secondary school) as the within subjects factor. The significance of the interaction between group and time was the indicator of STEP-ASD's effect, as this shows whether change in scores over the transition was different between the treatment and control groups. The threshold for significance was set at $p < 0.05$. Within-group change in SDQ scores was expressed as Cohen's d, adjusted for correlations between scores over time (Dunlop et al., 1996). Cohen (1992) suggests that $d = 0.8$ is a large effect size, $d = 0.5$ is medium and $d = 0.2$ is small.

Two individuals in the STEP-ASD group did not have school-reported SDQ data for time two (secondary school). For one participant, this was because, after joining the study, their parents decided that their child would move to a specialist secondary school, which was not classified as mainstream education. In the second case, data were missing because despite the secondary school implementing STEP-ASD, repeated requests to collect time two data were unfulfilled by staff. Rather than exclude these individuals from our analyses, we took a conservative 'intent to treat' approach, using the last observation carried forward method to estimate time two data points.

In order to investigate the effect of STEP-ASD at the level of individuals, we used the methods of Jacobson and Truax (1991) to identify who had shown reliable symptom improvement across the transition, who showed no change, and who got worse. This method is designed to distinguish changes in scores that are probably real from those which are likely to have arisen from fluctuations due to measurement error and regression to the mean. A reliable change index (RCI) was calculated for each participant's parent- and school-reported SDQ total problems scale, by subtracting time one from time two scores and dividing by the standard error of the difference (Jacobson and Truax, 1991). The standard error of the difference represents the spread of change scores that would be expected if no real change had occurred and is based on the reliability of the measure being used, in this instance the SDQ total problems scale (Goodman, 2001). As such, the RCI is a standardised change score, with values above 1.96 and below −1.96 unlikely to occur by chance ($p < 0.05$). Individuals with RCIs of 1.96 and above were classified as showing improvement, and those with an RCI of −1.96 and below were deemed to have shown worsening of SDQ-measured symptoms. The remainder of the sample ($1.96 > RCI > -1.96$) were identified as showing no reliable change.

Results

Acceptability and feasibility

Due to 1 child leaving STEP-ASD because they accessed specialist (non-mainstream) secondary education, and 1 school not providing post-transition data, the Post-Transition Monitoring Interview was completed for 15 of the 17 children in the STEP-ASD group. Most respondents (n = 11, 73.3%) reported that they found the bridge meeting to be 'very helpful'. In 12 schools (80.0%), the staff member reported that the transition management plan agreed that the bridge meeting had been 'somewhat' (n = 4) or 'fully' (n = 8) implemented. Also, in 12 schools (80%), the

Table 2. Comparison of STEP-ASD and control groups on the Strengths and Difficulties Questionnaire (SDQ) by school- and parent-report (positive effect sizes denote the reduction of difficulties over time).

	STEP-ASD			Control group			Significance of group by time interaction
	n = 17			n = 20			
	Primary school	Secondary school	Change during school transition as Cohen's d	Primary school	Secondary school	Change during school transition as Cohen's d	
	Mean (SD)	Mean (SD)		Mean (SD)	Mean (SD)		
School-reported SDQ							
Total problems score	14.59 (5.53)	10.00 (4.86)	0.88	14.45 (6.79)	15.20 (7.48)	−0.10	p = 0.010
Hyperactivity	5.71 (2.31)	3.29 (2.69)	0.96	4.05 (2.80)	3.95 (2.56)	0.04	p = 0.029
Emotional problems	3.18 (2.21)	2.41 (2.40)	0.33	3.85 (2.37)	4.75 (3.08)	−0.32	p = 0.075
Peer problems	3.41 (2.48)	2.59 (2.03)	0.36	4.45 (2.70)	4.36 (2.34)	0.03	p = 0.402
Conduct problems	2.35 (2.23)	1.71 (1.83)	0.32	2.10 (1.86)	2.30 (2.56)	−0.09	p = 0.354
Prosocial behaviour	4.53 (2.50)	5.00 (2.81)	0.23	4.90 (2.65)	4.15 (1.98)	−0.32	p = 0.202
Parent-reported SDQ[a]							
Total problems score	19.94 (7.03)	18.25 (6.67)	0.25	18.10 (6.98)	18.90 (7.71)	−0.11	p = 0.153
Hyperactivity	7.25 (1.98)	6.37 (2.55)	0.37	4.90 (2.83)	5.35 (2.60)	−0.17	p = 0.050
Emotional problems	4.44 (2.69)	4.25 (2.72)	0.07	5.05 (2.96)	5.25 (3.24)	−0.06	p = 0.631
Peer problems	4.94 (1.91)	4.25 (2.29)	0.32	5.45 (2.65)	5.80 (2.38)	−0.14	p = 0.123
Conduct problems	2.81 (2.01)	3.44 (2.06)	−0.31	2.85 (1.98)	2.50 (1.88)	0.18	p = 0.063
Prosocial behaviour	4.81 (2.07)	5.25 (2.29)	0.20	5.15 (1.39)	5.90 (2.63)	0.30	p = 0.693

STEP-ASD: Systemic Transition in Education Programme for Autism Spectrum Disorder; SD: standard deviation.
[a]N = 36 (STEP-ASD n = 16; control n = 20).

respondent reported that it had been possible to disseminate the pupil profile and transition pack to all staff having contact with the transitioning child with ASD. A total of 13 of the 15 staff (86.6%) reported using the transition pack, with all saying that it had changed the way in which the school managed the pupil with ASD's transition. Staff tended to report that they found the transition pack helpful (n = 14, 93.3%) and user friendly (n = 14, 93.5%) and that it had improved their knowledge of ASD (n = 12, 80%). A total of 14 (93.5%) reported that they would recommend the STEP-ASD programme to colleagues.

Efficacy – group-level analyses

As shown in Table 1, despite not being created by randomisation, our intervention and control groups are comparable on all clinical, educational and demographic variables measured in this study. Table 2 shows scores on the study outcome measures before and after transition. For the primary outcome measure (the school-reported SDQ total problems scale), those receiving STEP-ASD showed a large reduction in their difficulties, whereas there was no such improvement in the control group, and this group difference was significant (p = 0.010). Similarly, there was a significant group-by-time interaction on the school-reported SDQ hyperactivity subscale, whereby the STEP-ASD group, but not the control group, showed a large reduction in symptoms across the transition. There was a trend towards the same being observed for internalising difficulties at school (SDQ emotional problems subscale), but the group-by-time interaction narrowly failed to reach significance (p = 0.075).

In common with reports from school, the parent-reported data also showed a decline in SDQ total problems score for the STEP-ASD group, but not the control group. However, as is shown in Table 2, the difference between group trajectories on the parent-reported SDQ total problems scale was not significant. By parent-report, in STEP-ASD, hyperactivity symptoms declined over the transition and this effect was moderate in size. In contrast, for controls, hyperactivity increased slightly. This group-by-time effect approached, but narrowly failed to reach, significance (p = 0.050).

As described in the 'Analysis' section above, information from secondary school was not available for two participants, so their time two SDQ data were estimated using last observation carried forward. To check that this had not skewed our findings in some way, we repeated the analyses shown in Table 2 after excluding these two cases. For school data, the pattern of significant and non-significant findings shown in Table 2 was identical. For parent data, there was one difference, with the marginally significant hyperactivity finding becoming significant (p = 0.036).

Efficacy – individual-level analyses

To gain a better initial sense of the efficacy of STEP-ASD, we sought to understand its effects on individuals, not just on group central tendencies. To this end, we used the methodology of Jacobson and Truax (1991) to classify each

participant as showing either 'reliable improvement', 'reliable worsening' or 'no reliable change' during transition on the SDQ total problems scale. The results of these analyses are shown in Table 3. By school-report, a greater proportion of STEP-ASD children (n=8, 47%) showed reliable improvement across the transition compared to controls (n=2, 10%; p=0.033).

Table 3. Reliable change in parent- and school-reported Strengths and Difficulties Questionnaire (SDQ) total problems scores across the transition.

	STEP-ASD	Control
	n (%)	n (%)
School-reported SDQ total problems		
Reliable worsening	1 (5.9)	3 (15.0)
No reliable change	8 (47.1)	15 (75.0)
Reliable improvement	8 (47.1)	2 (10.0)
Total	17	20
Parent-reported SDQ total problems		
Reliable worsening	1 (6.3)	3 (15.0)
No reliable change	12 (75.0)	15 (75.0)
Reliable improvement	3 (18.8)	2 (10)
Total	16	20

STEP-ASD: Systemic Transition in Education Programme for Autism Spectrum Disorder.

Discussion

The transition from primary to secondary school is a challenge for most children and can be especially demanding for those with an ASD (Mandy et al., 2015b; Tobin et al., 2012). Currently, there are no standardised, evidence-based interventions to facilitate primary-to-secondary school transition for people with ASD, so we designed STEP-ASD, a programme that seeks to reduce maladaptation during and after the school transition, by guiding modifications to school, to promote a better fit between the child with ASD and their educational environment. In this study, we sought to pilot STEP-ASD, to assess its feasibility and acceptability to teachers; and to use a non-randomised, controlled design to get an initial estimate of the intervention's efficacy.

Teachers endure heavy workloads, as they must manage and respond to multiple demands (Philipp and Kunter, 2013). Any intervention that relies on input from teachers, but which is experienced by them as burdensome, confusing or unacceptable in other ways is liable to fail. Therefore, one of our aims when designing STEP-ASD was to ensure that it is acceptable to educational workers, not just clinicians, and to minimise the additional burden placed on school staff. We sought to understand how STEP-ASD was perceived by the educators who were involved in its implementation. Most reported that they found STEP-ASD to be a useful programme that had an impact on how they supported the child with ASD during school transition. The great majority found the transitions pack to be user friendly and informative; and reported that they were able to effectively share STEP-ASD strategies with all relevant colleagues in their school. Over 90% said that they would recommend STEP-ASD to other educational professionals.

In line with high levels of reported acceptability is the fact that the programme was implemented for 16 of 17 participants enrolled. Nevertheless, 'full' implementation of STEP-ASD was only reported by just over half (53.3%) of school respondents; and in 20% of secondary schools, it was not possible to disseminate information from the pupil profile to all staff having contact with the child. In future evaluations of STEP-ASD, it will be important to operationalise and measure adherence in some detail. This would allow for precise measurement of how completely the intervention is implemented and could identify any specific components that are more challenging to put in place. Furthermore, a psychometrically sound measure of STEP-ASD implementation would allow for analyses to test whether adherence moderates outcomes, and could inform developments to promote full implementation.

Our analyses provide initial evidence that STEP-ASD is efficacious as well as feasible. The group who received this low-intensity intervention showed a large reduction in school-reported emotional and behavioural problems across the transition, whereas the control group showed no such amelioration of symptoms. Nearly half (n=8, 47%) of children who received STEP-ASD showed reliable improvement in their emotional and behavioural problems during the move to secondary education, compared to only 10% (n=2) of the controls. One interpretation of this is that STEP-ASD caused a reduction of emotional and behavioural maladaptation at school. Such a conclusion must be considered tentative at this stage, as it is based on findings from a non-randomised, quasi-experimental controlled trial (Cook and Campbell, 1979). The intervention and control groups are equivalent on a wide range of individual and contextual variables, but it is nevertheless possible that analyses are confounded by factors that were not measured in this study. Future tests of STEP-ASD should employ a randomised controlled design, which will result in even greater internal validity than was achieved in this study.

Another reason to be cautious about initial evidence for STEP-ASD's efficacy is that our outcome measures were not blind, as teachers and parents knew whether a child had received STEP-ASD. Thus, it is possible that knowing a participant had received STEP-ASD might cause raters to under-report symptoms at time two, perhaps because of their expectations that STEP-ASD had been useful, or an unconscious desire to help the researchers. Such a phenomenon would most likely result in a blanket pattern of greater improvement across all SDQ subscales, as there is

no reason to believe that bias would apply more to some types of difficulties than others. By contrast, we observed that STEP-ASD was associated with positive change in some, but not all, SDQ subscales. Nevertheless, a lack of blinding may have inflated estimates in this study, and it will be essential for future investigations to implement single blinding, which could be achieved using an observational measure of school adaptation, administered by an observer unaware of whether or not a child received the intervention. Another approach would be to use more objective outcome measures, by investigating whether STEP-ASD was associated with reduced rates of school exclusion and educational placement breakdown.

STEP-ASD is an intervention situated in school that constitutes the design and implementation of adaptations to the child's educational environment. Nevertheless, we measured parent-reported outcomes, to see if improvements in adaptation at school would carry over outside of school. We did not find much evidence for such a ripple effect: parent-reported scores on the SDQ did not show significant symptom reduction for STEP-ASD children compared to controls. This may be because STEP-ASD's effects are limited to the immediate school context. However, it is notable that there were trends in the direction of STEP-ASD participants showing improvement and control children showing worsening of symptoms for the SDQ total problems scales, and for four of the five SDQ subscales. Of particular interest is the observed reduction of parent-reported hyperactivity symptoms for children receiving STEP-ASD, which was moderate in size ($d=0.37$) and very nearly reached significance ($p=0.05$). The current analyses were powered to detect large effects, so it is possible that they missed a more subtle impact outside of school. In future, broader effects of STEP-ASD should be studied using larger sample sizes. Furthermore, the time two assessment was halfway through the first year of secondary school. It will be important to consider longer-term effects of STEP-ASD, as it is possible that any generalisation to different contexts of the school-based effects we observed may not fully manifest until later.

Our findings should be considered in the light of the following limitations, in addition to those already discussed above. First, while we have established an association between receiving STEP-ASD and a reduction in emotional and behavioural problems at school, we did not investigate which processes underpin this. Future inductive, qualitative work with children, parents and teachers will be needed to generate hypotheses about this, which can then be tested qualitatively. Second, we focused the study on psychopathology outcomes. While this serves to avoid multiple analyses, and so controls the rate of type one errors, it would be interesting to know about any effects of STEP-ASD on other outcomes, such as academic performance and quality of life. Third, we did not independently confirm the clinical ASD diagnoses of our participants. Arguably, the stipulation that participants have an NHS diagnosis contributed to the ecological validity of our study, as additional support for autistic difficulties in the UK state school system is dependent on an 'official', NHS ASD diagnosis. Nevertheless, had we used gold-standard measures to confirm diagnosis, and this would have bolstered the generalisability of the findings to the general population of children meeting criteria for ASD.

In conclusion, this pilot study offers evidence that STEP-ASD is feasible and acceptable to the teachers who implemented the intervention. Furthermore, using a non-randomised, but equivalent control group, we found initial evidence that STEP-ASD may be effective for reducing emotional and behavioural problems at school for children with ASD making the transition from mainstream primary to secondary education. On this basis, further work is warranted, using a well-powered randomised controlled design, with blinded measurement of outcomes. This would be a more rigorous test of STEP-ASD's efficacy, and would elucidate whether effects carry beyond the school setting and longer-term outcomes of the intervention. STEP-ASD is a low-intensity intervention that is carried out by teachers supported by graduate-level psychologists. It will be interesting in future research to estimate its cost-effectiveness.

Clinical work to help people with ASD seeks to reduce their maladaptation, by improving the fit between the individual and their environment (Bronfenbrenner, 1979). In practice, this often involves 'environmentally focused interventions', which we define as attempts to modify their environment to make it more suitable for them, for example by making changes at school or to the way the child is cared for at home. By contrast, most of the burgeoning evidence base concerns 'child-focused interventions', which seek to reduce maladaptation by modifying the child with ASD, for example by building their social skills, communication or joint attention (Wong et al., 2015). We argue that environmentally focused intervention strategies should be subjected to the same level of rigorous testing as child-focused ones. This study illustrates that it is possible to formulate manualised environmentally focused interventions and to evaluate these using controlled trials.

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Declaration of conflicting interests

Drs Mandy, Murin, Baykaner, Staunton, Cobb, Hellriegel, Anderson and Skuse report no relevant financial interests or potential conflicts of interest.

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