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Research Article

Rock Drumming in School: Enhancing Motor and Psychosocial Skills of Children with Emotional and Behavioural Difficulties

Ruth Lowry

Department of Sport & Exercise Sciences, University of Chichester, Chichester, West Sussex, United Kingdom

*Corresponding author: Ruth Lowry, Department of Sport & Exercise Sciences, University of Chichester, Chichester, West Sussex, United Kingdom, Tel: +4401243816309, E-mail: r.lowry@chi.ac.uk

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Abstract

Drumming may have therapeutic and learning benefits however little causal evidence regarding the benefits for children with Emotional and Behavioural Difficulties (EBD) such as Autistic Spectrum Disorder exists. Six EBD pupils (EBDEx) and 6 peers (MatEx) were given 2, 30-minute rock drumming lessons over 5 weeks, six matched peers received no drumming instruction (3=EBDCon; 3=MatCon). A mixed-methods analysis was used to explore quantitative changes in skills and qualitative perspectives of the teaching staff. All pupils were tested three times (baseline, post-intervention, two-week retention), on drumming skills; motor skills (Movement Assessment Battery for Children, version 2); and teacher's rating of social behaviour (Strengths and Difficulties Questionnaire; SDQ). Significant differences in total SDQ difficulties between the four groups ($\chi^2(3)= 8.210$, $p = 0.042$) and the hyperactivity subscale ($\chi^2(3)= 10.641$, $p = 0.014$) were observed. The EBDEx group had greater reductions in total difficulties to MatEx peers ($p = 0.009$) and greater reductions in hyperactivity to MatEx ($p = 0.046$) and EBDCon ($p = 0.006$) peers. In follow-up interviews, staff spoke positively about changes in pupil's attitudes towards learning and social confidence. The positive changes in social and behavioural skills are similar to those found for other music modalities.

Keywords: Behavioral Difficulties; Drumming; Educational Enrichment; Hyperactivity; Psychomotor Coordination; Psychosocial

Music Intervention for Children with Emotional and Behavioral Difficulties

A range of anecdotal evidence exists which extols the therapeutic virtues of drumming and drumming groups in particular [1]. By contrast, the empirical evidence base is small but accumulating [2].Psychosocial therapeutic benefits such as enhanced communication, concentration, psychomotor coordination, emotional processing and tension reduction, group cohesion and connectedness have been listed [3-5]. The published studies which have used drumming with children and young people have mainly been with adolescents and in particular, those 'at risk' [6]. Despite this, there is still little causal evidence regarding the benefits of drumming instruction at enhancing the quality of life for children with specific educational needs and in particular within the context of mainstream education. Since the 1981 Educational Act, arrange of children with different Emotional and Behavioral Difficulties (EBDs) are educated within mainstream schools in the UK [7].Despite this integration, children with EBDs still underachieve academically compared to those with other disabilities [8]. The range of learning, emotional and interpersonal difficulties these children present can often be complex, placing demands on teaching staff and class-peers. Some of these children will undergo formal assessment of their educational needs in addition to, or separate from, any formal diagnosis of an intellectual or behavioral disorder such as Autism Spectrum Disorders [ASD], Attention Deficient Hyperactivity Disorder [ADHD] or Pervasive Developmental Disorder not Otherwise Specified [PDD-NOS].

Difficulty in forming and maintaining peer relationships are a particular feature of children with ASD as they struggle to understand the perspective of others, in addition to their poor communication skills; this is commonly referred to as Theory of Mind or mind blindness [9]. Recently, researchers have suggested that

individuals with ASD lack motivation in social interaction and therefore seek fewer opportunities to develop social skills [10]. Some researchers have argued that girls display less disruptive behaviors and therefore are less likely to come to immediate attention and consequently are less likely to be referred for additional support [11]. Molnar-Szakacs and Heaton (2012) argue that individuals with ASD demonstrate preference for music and are able to interpret musical emotion in child and adulthood.

Music has been integrated into the care offered to children and adolescents who have a range of mental, emotional, behavioral and physical needs including, eating disorders, post-traumatic stress disorder, cancer, terminal illnesses [12] and also in the assessment of communication deficits of ASD children, adolescents and young adults [13,14]. Hillier, et al. (2011) reported significant improvements in self-esteem, positive attitudes toward peers and reductions in anxiety after an eight-week programmed of 90-minute music sessions with adolescent and young adults with ASD. Music is intuitively appealing given the social interactions such encounters create through singing and musical instruments [15]. This appears to be particularly true when music instruction takes place as a group intervention [5,16]. Sustained, long term behavioral and psychological improvements have also been reported as a result of music therapy [17] particularly for those who have poor prosocial skills [18].

Drumming could be regarded as particularly beneficial because of its; universal appeal regardless of age, gender, culture, language competency and ethnicity; ability to foster group identity through collective music making; accessibility to people of multiple skill levels [19,20]. In addition, rock drumming as an activity is more physically demanding than playing of other musical instruments thereby offering a viable alternative to other high intensity physical activities [21]. Despite the wide spread adoption of music as therapy, the evidence which informs the literature in the area is largely based on case-studies rather than empirical examination. In addition, rock drumming, requires the gross motor coordination of four limbs to create independent actions on separate elements of the drum kit. To create a proficient performance, this coordinated movement also requires temporal accuracy and therefore spatial awareness and attentional control.

The present study sought to investigate whether rock drumming might children with a range of Emotional and Behavioral Difficulties (EBD) within a school setting. The study aimed to systematically examine the influence of rock drumming in terms of recognized measures of psychosocial and psychomotor skills alongside ratings of drumming proficiency. Using a control group of matched (age and gender) typically developing peers enabled examination of differences in the rate of progression made across the five-week intervention. The inclusion of a matched EBD control group enabled examination of changes specific to the drumming intervention rather than on-going educational attainment and maturation. Using a follow-up post-intervention measurement permitted examination of potential short-term retention or decrements in recently acquired drumming skills.

Method

Participants

Eighteen pupils (4 girls and 14 boys; aged 7 and 8) were recruited to take part in the study from a single primary school in West Sussex. Nine children were identified as having Emotional and Behavioral Difficulties (EBD). Inclusion criteria for this group was based on the judgements of the Special Educational Needs Co-coordinator (SENCO), school head and class teacher. Criteria used was existing, recorded, educational profiles of their strengths and weaknesses (social, emotional and/or motor difficulties) and suitability to take part in the research project. An additional nine children were recruited who had no additional educational needs; they were matched for school attendance, age and gender to the other group (Mat). Each child was matched and randomly assigned to one of two groups (drumming group and control group) based on their EBD status (EBDEx n=6, MatEx n=6; EBDCon n=3, MatCon n=3). The drum tutor was blinded to the education needs of each participant.

Six staff agreed to be involved in a short follow-up interview to be conducted at the conclusion of the intervention. Three classroom teachers from whom the participants were recruited, a further three staff, namely, the head teacher (S1), the SENCO (S2) and a classroom assistant (S3) also participated in a follow-up interview.

Procedure

Ethical approval was sought and granted by the University Ethical Review Committee prior to recruitment. Each selected pupil's parents/carers were contacted by letter to attend an 'open meeting' to discuss the aims of the research project and the nature of their child's involvement. After this meeting written consent from the child and parent was collected. Teachers were then contacted and asked to complete an initial SDQ for each of the pupils involved. The study consisted of three phases.

Prior to starting the drumming intervention baseline information was obtained for each child. They completed the MABC-2 test battery for the evaluation of fine and gross motor control and a drumming based skills test where each participant played a set drumming pattern to evaluate degree of drumming motor control and rhythm. The intervention phase consisted of 2, 30-minute drumming sessions held on 2 separate days, separated by 48 hours, over 5 weeks. All sessions were held in the same, open access area of the school during the afternoon study period. The week after the last drumming lesson and two weeks after this, the pupils were retested on the drumming skills test. At the retention testing, partici-

pants also completed the MABC-2 again and teachers were asked to complete a second SDQ for each pupil.

Individual interviews were conducted with the staff, lasting between 30 and 40 minutes. A semi-structured interview format was employed to enable exploration of similar topics regarding their opinions of the drumming intervention feasibility, their experiences and observations regarding specific pupils involved.

Measures

Each participant was given 16 drumming tasks to perform, ranging from simple rhythmic patterns involving 2 limbs (left and right hand) to more complex movements involving 4 limbs (left/right hand and left / right foot). Drumming proficiency was measured using four skills (consistency, sticking, time and co-ordination) all of which were rated by the drumming tutor using video recording to aid recall using a percentage rating. Consistency was calculated from drumstick stroke height and velocity. Sticking was measured by the ability to follow a specified order in which the hands were required to play, such as right/left/right/left-known as 'hand to hand'. Keeping Time was established from the ability to not speed up or slowdown in relation to playing the required drumming pattern at a set tempo. Co-ordination was determined from the ability to integrate hands and feet movements. An overall percentage score out of 100 was awarded for each of the 4 attributes of drumming performance at baseline, post intervention and following the retention period.

A Roland HD-1 drum kit and PM-01 amplifier (Roland UK Ltd, Swansea, Wales), using Vic Firth (Vic Firth, Boston, USA) 5A drumsticks was used for the testing and drumming sessions. Each 30-minute drumming lesson comprised 6 participants and the same drum instructor. Gross and fine motor skills were measured using the MABC-2 [22]. The MBAC-2 is a standardized performance test of age appropriate, motor skills. The assessment battery 2 for 7-10 years was used. This measure three areas of motor performance; manual dexterity (peg board, threading lace, drawing trail), aiming and catching (two handed ball catch, throwing to target) and balance (one foot on board, walking heel-to-toe, and hopping).

Social behavior was rated by the classroom teachers of the relevant pupils using the Strengths and Difficulties Questionnaire [23]. The SDQ consists of 25 items which measure 5 subscales (5 items per scale), conduct problems, hyperactivity, emotional symptoms, peer problems, and prosocial behavior. Teachers are asked to rate the pupil on certain behaviors using a three-point Likert scale (not true, somewhat true or certainly true) in terms of the last 6 months or the school year. An example item stem would be "Restless, overactive, cannot stay still for long". At the follow up testing, teachers were asked to rate the pupil in terms of their behavior in the last two weeks (post drumming intervention). Total scores for each sub-scale can be classified as normal, borderline or abnormal.

Drumming Intervention

Each drumming lesson comprised of 3 EBDEx and 3 MatEx participants, again the drum tutor was not informed about the composition of each group of 6 children he was required to teach. Each 30-minute drumming lesson was divided into three inter-relating sections. Section 1 was a 5-minute 'warm up' period comprising simple 'clapping' and seated 'marching' rhythms. It also served as a refresher in terms of gripping the drumsticks and orientation around the drum kit. Section 2 lasted 15 minutes where the drum tutor introduced new drumming patterns for the participants to undertake. The rate of progression, in terms of complexity, during section 2 was tailored to the drumming ability of each group. Section 3 lasted 10 minutes where the 'learned' drum patterns from section 2 were performed alongside songs recorded by popular artists of a similar tempo and rhythm

Data Analysis

A mixed method, exploratory sequential [24] approach to intervention evaluation was employed to examine the qualitative changes in social, motor-control and drumming skill whilst an inductive, qualitative approach was used to explore the perceptions of intervention efficacy from staff involved. Scores for the drumming scores, MABC-2 and SDQ subscales were created and descriptive measures for each reported. Non-parametric significance tests (Kruskall-Wallis and Mann-Whitney U tests) were completed to see if there were significant differences in scores for the measures. Interviews with the staff members were recorded and transcribed verbatim and subjected to inductive content analysis following the procedures outlined by [25].

Results

Changes in Drumming Skills Performance

Changes in drumming skills were assessed across the three time points and examined for differences between the two conditions. From (Table 1) it can be seen that on average, all groups improved across the four drumming skills from baseline to post intervention. For the group of interests, the EBDEx group, the dispersion of scores increased for all skills at the retention testing, scores for consistency and coordination were also more dispersed than at baseline. The four elements of drumming were combined to generate an average drumming score at the three time points. Non-parametric significance tests (Kruskall-Wallis tests) were completed to see if there were significant differences in scores at the three time points between the groups. Group differences in average drumming score were observed after five weeks drumming ($\chi2(3) = 8.730$, $p = 0.033$) and at the seven-week retention stage ($\chi2(3) = 9.451$, $p = 0.024$). The MatEx group consistently performed better than the EDBEx and two control groups at the end and retention testing. The EBDEx group had higher scores than the EBDCon group post intervention and at retention testing.

Skill	Time	MatCon		EBDCon		MatEx		EBDEx	
		M	SD	M	SD	M	SD	M	SD
Consistency	Baseline	38.33	12.58	25.00	21.79	45.83	11.58	33.33	11.69
	Post	77.50	17.68	60.00	8.66	89.17	8.01	70.83	16.56
	Retention	78.33	24.66	60.00	8.66	90.00	7.07	61.67	26.39
Sticking	Baseline	52.67	21.13	37.67	20.50	61.83	20.19	44.50	20.58
	Post	71.00	24.04	55.33	4.62	90.83	9.66	65.17	19.15
	Retention	69.33	31.79	52.67	4.62	93.83	9.77	66.00	21.38
Timing	Baseline	30.00	13.75	25.33	20.55	38.83	18.06	23.50	11.40
	Post	58.50	19.09	54.67	13.50	84.00	13.73	57.50	10.99
	Retention	60.67	23.18	48.00	22.65	83.83	15.48	53.00	19.61
Coordination	Baseline	33.33	19.60	27.00	13.45	41.83	16.94	30.17	13.91
	Post	71.50	19.09	56.67	6.11	86.33	11.41	64.67	15.10
	Retention	64.33	35.80	55.33	11.55	87.67	12.86	64.67	23.13
Average Drumming Score	Baseline	38.58	16.68	28.75	18.52	47.08	16.31	32.88	13.50
	Post	69.63	19.98	56.67	7.80	87.58	10.56	64.54	14.95
	Retention	68.17	28.42	54.00	11.08	88.83	10.80	61.33	22.30

Table 1: Mean and Standard Deviation values for the four groups (N=18) on four Drumming Skills measured at baseline, post intervention and retention. Changes in motor skills performance

Changes in Motor Skills Performance

Motor control was measured at two time points (baseline and two-week retention) using the MABC-2. The post intervention score was subtracted from the baseline results to generate a "change" score (positive scores indicating improvement and negative indicating a decrement in performance). The children in the EBDEx and EBDCon on average showed greater improvements in aim and catch and balance skills as well as total MABC-2 than the two matched groups. These results can be seen in (Figure 1) below. The differences observed were not statistically significant for the three aspects of movement.

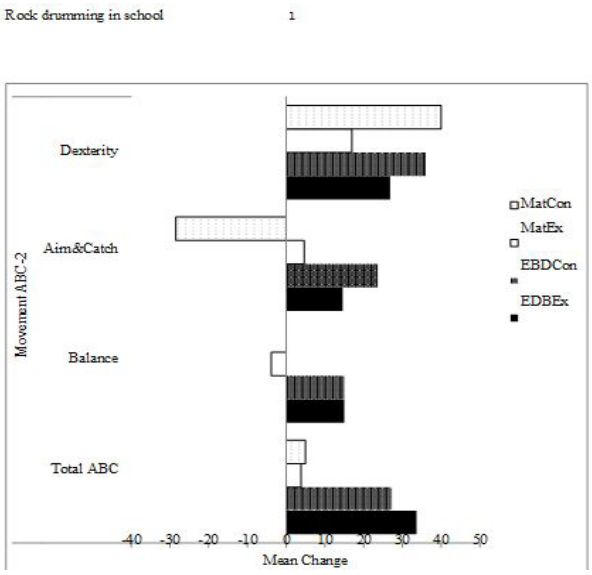

Figure 1: Mean change in Movement ABC-2 subscale scores from baseline to post intervention for participants in the drumming intervention and control conditions

Changes in Social Behavior

The teachers completed the Strengths and Difficulties Questionnaire (SDQ) for the children just prior to the first lesson and as the drumming lessons finished and change scores have been calculated, these values have been averaged for each group and are depicted in (Figure 2). The SDQ showed that Total Difficulties (the aggregation of subscales) reduced for all children except one MatEx child (accounting for the positive value). For many of the EBDEx group the reduction between the first and second recording brought their difficulties within a similar range of values to those of the MatEx and MatCon groups, even though their baseline scores had been higher. As depicted in Figure 2, the largest reduction in SDQ subscales for the EBDEx group was in hyperactivity and peer problems, with modest gains in prosocial behavior. The EBDCon group followed a similar pattern but not to the same extent. Significant difference in total difficulties between the four groups ($\chi^2(3) = 8.210$, $p = 0.042$) and for hyperactivity ($\chi^2(3) = 10.641$, $p = 0.014$) were observed. The EBDEx group had significantly greater reductions in their total difficulties score to the MatEx group ($U = 8.833$, $p = 0.009$). In terms of hyperactivity change scores, the EBDEx group had significantly greater reductions than the MatEx ($U =$

6.833, p = 0.046) and EBDCon (U = 8.147, p = 0.006) groups.

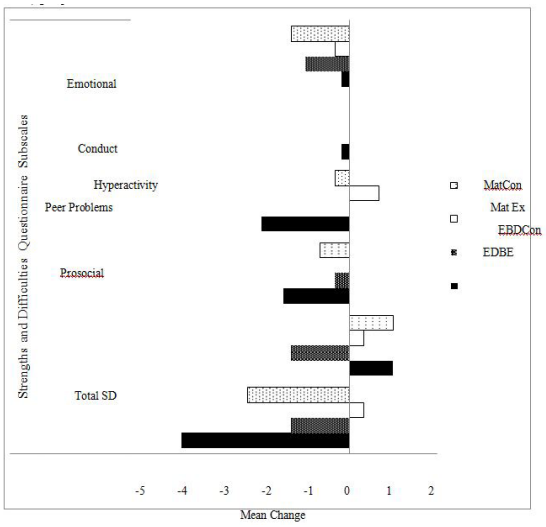

Figure 2: Mean change in teacher ratings of Strengths and Difficulties Questionnaire (SDQ) test scores from baseline to post intervention for participants in the drumming intervention and control conditions.

Teaching Staff's Perspective: Follow-up Interviews

The six members of staff interviewed all expressed enthusiasm towards the project and willingness for the school to be involved. Three themes to emerge from the interviews with staff concerned the benefits to the school, these have been coded as

- reflecting the values of the school
- intervention novelty
- intervention feasibility.
- In addition, staff also reflected on the benefits of the intervention to the EBD involved, two themes emerged and have been coded as
- improved confidence and communication skills
- improvements of attentional focus and delay of gratification.

Reflecting the Values of the School

The staff interviewed were very positive about being involved in the project. All expressed interest in finding out the results from the study as well as being involved in follow-up work. "Because we are a school that takes on new initiatives and we never stand still…. That's got to be positive for the school and positive for the children involved [pause] so happy to take part." (Classroom Teacher 2)

Novelty

There appeared to be a general curiosity factor because of the novelty of rock drumming and so staff members were interested in getting involved. In particular, the concept of working with children with educational and social needs was appealing to the teachers. "We've just enjoyed being part of something for the future really and hopefully it will lead to great things." (Classroom Teacher 2)

Feasibility of Intervention

The classroom teachers whose pupils were involved in the drumming project shared their observations on how the project had influenced class dynamics. All three teachers expressed the view that the withdrawal of children from class had no detrimental effect to either the specific children involved, class peers or to the management of the class. It was felt that the sequencing of the drumming classes in the afternoon seemed to complement the structure of the school timetable. A further observation from one teacher was that the children had the opportunity to be in a group with children who they would ordinarily have limited contact with. Children are normally grouped by ability for small group work and so it was felt that the opportunity to work in a small group of mixed abilities was good for class cohesion.

When asked about any perceived changes, progress or regression made by the children involved in the project; the consensus from staff was that the children had enjoyed and benefitted from the experience.

Perceived Benefits for EBD Children

When asked about the changes in the behavior of those involved in the drumming project, class teachers explained that the differences observed were very specific dependent upon the particular difficulties of each child. In general the themes of increased confidence and communication skills and enhanced attentional focus and delayed gratification were commonly cited. "Going in and out and watching it progress over the weeks you could see the utter enjoyment that the children were experiencing… you could see the benefits they were getting from that"(Head Teacher).

Improved Confidence and Communication Skills

Teachers described observing increased confidence displayed by EBD pupils in relation to their interactions with school staff. [EBDEx Lewis] has blown everybody really…. his functioning is way below reception children with very poor speech and language and very poor understanding of safety…. I don't know whether it's a combination of things, or whether it's one particular thing, one of which could be the drumming or whether it's just coincidence. His confidence is now just great.… but the confidence that he displays now means that he can say to someone now "can you read that to me because I can't read it yet" or even that he'll speak. I mean we've got our class assembly on Friday in front of the whole school and all the parents, and he's speaking. And he's never stood up and spoken before in front of a huge audience" (Classroom Teacher 1). "[EBDEx Daisy] has been getting gradually more confident throughout the year and that's a progressive

thing, I'm sure the drumming has been another opportunity to help her grow in confidence. She is quite … a musical person anyway, so I think it [the drumming] has helped her to develop her rhythm a bit more" (Classroom Teacher 3).

An informal observation from another teacher suggested that this child [EBDEx Daisy] had grown in social competence. The teacher remarked that Daisy had never been able to speak to adults in the school but on the last week of the project had stopped [the teacher] in the corridor and showed her photos of a pet, talking at length. The teacher remarked at her surprise at this. This theme of increased social competence in the EBDEx children consistently emerged from the interviews. They seem better equipped to interact with adults in particular and articulate their needs.

Improvements of Attentional Focus and Delay of Gratification

One teacher did observe a difference in the behaviors of certain children in the EBDEx group attributed to idiosyncrasies of their particular needs. "it was like any other day of the week because [pause] they [MatEx] managed their emotions in a far better way, the excitement and enthusiasm was tempered 'oh it's drumming today'. The children who are on the spectrum [EBDEx] it would be from the moment they would come in [in the morning] 'when is it, when is it, when is it' because the concept of time is so difficult for them. Somebody like [EBDEx Bobby] knows time like there is no tomorrow, so if I asked him now, 'what time is it?' He would tell me 'it's 49 minutes to two' but would have no concept of when that is in the day so he knew it was today but it would be all day, all day. Someone like [EBDEx Lewis] who is a very low level boy, it would be 'have I got to wait before it goes dark again before I go, is it another sleep before I go?' So those children, who have some obsessive behavior, were enhanced because they knew it was that day and it was for them and they were going to do it. When they came back from [the drumming] - very, very heightened, very animated but with enthusiasm, not in a difficult or unmanageable way at all" (Classroom Teacher 1).

In terms of the comparison group, the teachers were unable to pinpoint any noticeable changes in ability or temperament over the 5 weeks but remarked that all involved had enjoyed the sessions. Teacher 3 described how these children had enjoyed being selected for the activity. This would suggest that there was a certain degree of feeling pride at selection for involvement perhaps due to the novelty of drumming. "[MatEx Evan] was his usual, excitable self really [pause] generally seemed to have enjoyed it and responded to it, like he does everything, put 100% in but not particularly dramatic change in him in class, just generally upbeat and enjoying the fact that he got to be picked" (Classroom Teacher 3).

Discussion

The objective of this study was to assess the psychosocial and psychomotor benefits of a drumming intervention for children with a range of emotional and behavioral difficulties within the school environment. The inclusion criteria were developed with the school staff to reflect the manner in which they would identify children to benefit from timetabled, enrichment activities during the school year. The study did not seek to work with a group who had a particular disorder, but rather to work with those who had particular social, emotional and coordination deficits. Whilst the benefits quantified are not as large as they initially seem, they should be considered in comparison to the changes in those who did not receive drumming lessons. The graphs do demonstrate that the children who had drumming lessons were the ones to show the most improvement. It cannot be determined whether these changes are specifically due to drumming or whether learning a different novel skill would have similar effects. It should also be emphasized that there was within group variability within both EBD groups that masked the degree of difference between groups.

In terms of drumming skill, it is evident that all groups improved from baseline to post intervention suggesting a learning effect but with greater variability at two weeks' retention. Of particular interest is the improvement in the EBDEx group who were able to improve their performance to a proficiency level similar to theMATEx group at baseline. This may not appear statistically significant given the small sample size but reflects a meaningful improvement in performance that in real terms would not distinguish them from their peers. The inability to detect change between groups (experimental versus control) may suggest that the method of scoring drumming performance in this study requires further refinement. It is feasible that an impartial, blinded (to the study design and participant allocation) tutor would increase inter-rater reliability [26]. Adopting objective metrics of drumming such as those employed in the Amad, et al. (2016) rock drumming study would provide a more sophisticated measure and remove the issue of rater bias.

The MABC-2 was used as an objective measure of movement competence to see if there was a transfer of the motor skills learned in drumming to wider motor skills (in particular manual dexterity). Whilst there were no significant differences in the change in MABC-2 scores, there were observable improvements with both EBD groups making greater gains in the short time frame than the matched peers. Possible reasons for this may relate to the low initial starting point of the EBD pupils and their ability to respond to activities leading to an increase in motor skills. This could be attributable to drumming or exposure to activities being undertaken across the school curriculum. Positively, theEBD children narrowed the gap in terms of motor skills to their peers. Again, the choice of the MABC-2 may be examined further to see if it allows for the potential benefits of drumming to general motor skills. The researchers involved in data collection did note that at the second testing, the children from both EBD groups appeared to be less timid and careful in their approach to the activities. These

children were not as concerned about making mistakes and displayed a greater 'gusto' when the tests began. This difference in attitude demonstrates the complexity of competence testing as it inadvertently measures the process as well as the product. During the parental debriefing, one parent remarked that they had noticed that their child (EBDEx) had shown improvement in dexterity and strength in holding a pen in order to complete homework as the intervention progressed. Therefore, measures of grip strength may be a useful measure to be included in any future studies.

Perhaps the most consistent findings were the SDQ results and the supporting qualitative comments made by the teachers and support staff. Significant, positive changes in hyperactivity and total difficulties were observed for the EBDEx group in comparison to the other groups. Teachers described positive changes in the attentional control and delayed gratification of those EBD children who had participated in the drumming. Children learn to control their immediate needs through effort control but this is often reported as deficient in children with ASD [28]. There were also descriptive positive changes in peer problems and prosocial scores. These findings are corroborated by the views of the classroom teachers who discussed the confidence, enthusiasm and social engagement of the pupils involved. The teachers viewed the drumming intervention as enabling those children with EBD to become more vocal and seek to communicate with teachers and support staff in a positive way that had not previously been undertaken. An examination of the film footage of the drumming sessions clearly demonstrated the social nature of group drumming previously described in the literature [16]. The children responded positively to the music selection, the tutor's instruction and feedback and to the presence and encouragement of the other group members. The positive changes in social and behavioral skills observed by teachers is similar to that found by other researchers for different music modalities [15-18].

The study employed a small sample size and therefore inferences drawn from the results of the study should be done with caution. There is a need for a larger, replication of the study with consideration given to the selection of measures used to assess intervention effectiveness. The measure MABC-2 was used to assess the transfer of drumming to standardized tests of gross and fine motor skills. The challenge of using standardized measures to assess change is that they may fail to capture the diversity and meaningful change that occur with EBDs participants. Spooner and Browder (2015) discussed the need for more studies with specialist groups but acknowledge the difficulty researchers face in demonstrating learning or communication breakthroughs. The use of the SDQ and the teacher interviews provided greater scope to capture such small and idiosyncratic changes.

The constellation of disorders and symptoms clustered under the term EBDs appear to be more common in boys than in girls [30]. The demands presented by EBD boys may be distinct to their female peers. They to be more prone to hyperactivity in the classroom, and find gross and fine motor movements challenging which can consequently lead them to engage in seeming anti-social displays of frustration, more so than their female peers [25,31]. In future studies, researchers need to consider gender in terms of the design and sample composition but perhaps also in terms of the outcome variables measured.

A secondary aim of this study was to assess the feasibility of such interventions within the school working life. School staff interviewed were very positive regarding the intervention and indicated that it was feasible in terms of future delivery within the school curriculum. In terms of the tutor, timing of the sessions, location and the number of sessions, the staff felt that the right balance had been struck. During study planning, the research team and the teachers were concerned about potential disruption that might be caused to EBD children who used the open access space for specialized teaching and therapy. Despite initial reservations regarding potential disruption, the mere presence of the drumming sessions led to an observable change in one child's behavior: "Jasmine is for me the one that stands out of the whole thing…. She's so nervous and doesn't like change, typical autistic child, and it's taken ages for her to get used to noise in the hall you know…. She wanted to have a go and wasn't frightened of it, and yeah was very interested. That's the real thing that stood out to me" (SENCO teacher).

Conclusions

To assess the impact of the drumming intervention upon pupil's psychosocial and psycho-motor skills, this study used a number of established measures from the developmental psychology literature. In terms of observable differences, the most notable changes were in regard to psychosocial skills. Reductions in hyperactivity and peer problems, with modest gains in prosocial behavior, were evident following the five-week drumming intervention. These findings were supported by the teacher's observations. A secondary aim of the study was to assess the feasibility of conducting such an intervention within the normal working practices of a school. The overwhelming opinion of the staff interviewed was that the 5-week drumming programmed, comprising two 30-minute lessons, was deliverable and complemented rather than detracted from the ongoing enrichment activities of the school. As part of the research team's reflections, further consideration and refinement of the measures selected to evaluate impact is needed. Further consideration regarding the optimal assessment of drumming performance is needed; possibly using competency ratings accrued over the intervention period, rather than demonstration of ability at one-single time point. Inclusion of other measures, such as grip strength in light of comments passed by a parent and the inclusion of parental ratings of their child's behavior may yield further insights. Research conducted in the school environment is a working collaboration between researchers, staff and parents and

without this buy-in valuable insights will be missed and progress impeded.

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