

## **Beyond Drumming; Therapeutic music and talking as an instrument for improving mental health and behaviour of disadvantaged adolescent boys**

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### **ABSTRACT**

#### **Background**

This research examined the impact of a program integrating therapeutic music and group discussions (Holyoake's DRUMBEAT program), on mental wellbeing, psychological distress, post-traumatic stress symptoms and antisocial behaviour of disadvantaged adolescents.

#### **Method**

Students displaying antisocial behaviours in grades eight to ten at three socio-economically disadvantaged secondary schools in Perth, Western Australia were invited to participate in a DRUMBEAT program. A series of eight DRUMBEAT programs (each incorporating ten sessions of drumming with djembes, therapeutic discussions and a final performance) were held in 2014. Each session was facilitated by an accredited DRUMBEAT facilitator and a school psychologist. Pre and post intervention questionnaires measured mental wellbeing (Warwick-Edinburgh Mental Wellbeing Scale), psychological distress (Kessler-5), post-traumatic stress symptoms (Abbreviated Post-Traumatic Stress Disorder Checklist- Civilian version) and antisocial behaviours (Adapted Self-Reported Delinquency Scale).

#### **Results**

Of the 62 students completing the program, 41 completed pre and post questionnaires. Following participation in the DRUMBEAT program, on average boys' recorded 7.6% higher WEMWBS scores

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(mental wellbeing) ( $p=0.05$ ), 19.3% lower A PCL-C scores (post-traumatic stress symptoms) ( $p=0.05$ ) and 23.9% lower ARSDC (antisocial behaviours) ( $p=0.02$ ). These changes were not evident for girls. No significant differences were detected for psychological distress changes between pre and post DRUMBEAT program for either gender. There were no changes in these outcomes for girls.

### **Conclusion**

This research highlights the potential of the DRUMBEAT program as effective, targeted strategy to reduce post-traumatic stress symptoms and antisocial behaviour and increase mental wellbeing in socioeconomically disadvantaged adolescent boys.

### BACKGROUND

The mental health of children and adolescents is an escalating international concern. World-wide up to 20% of children and adolescents experience a mental illness and in many countries suicide is the leading cause of death for young people (World Health Organization, 2001). The large impact of youth mental illness is costly to individuals and society. This is exemplified in Australia where mental illness is the largest contributor to burden of disease (disability-adjusted life years lost) for those aged 15-24, accounting for approximately half the burden (Australian Institute of Health and Welfare, 2011).

Increasingly, evidence is starting to 'unpick' the complex entwining between disordered mental health and behavioural functioning in adolescents. For instance, research indicates that aggression may be facilitated by post-traumatic stress disorder and psychological distress (Rasche et al., 2016). There are vast immediate and long term social and economic impacts of problematic behaviour (Siegel & Welsh, 2011) and risky health behaviours (DiClemente, Hansen, & Ponton, 1996) stemming from childhood. Longitudinal data indicates that persistent antisocial behaviour is associated with mental health problems, substance dependence, financial problems and criminal behaviour at 26 years of age (Moffitt, Caspi, Harrington, & Milne, 2002).

There is also burgeoning understanding about the relationships between physiological constructs and mechanisms, mental health and behaviour (Cacioppo, 2000; Klimecki, Leiberg, Lamm, & Singer, 2013; Walters & Kiehl, 2015). For instance, in Ohio an examination of just over 2600 college students identified that chronically lonely individuals recorded elevated mean salivary cortisol levels across the day (Cacioppo, 2000). Magnetic resonance imaging was used in a study of 191 incarcerated youth in the United States to explore grey matter volumes of the amygdala and hippocampus (Walters & Kiehl, 2015). Their results noted that the antisocial personality characteristic of 'fearlessness' correlated negatively with amygdala grey matter volume (associated with fear conditioning) and 'disinhibition' correlated

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negatively with hippocampal grey matter volume (associated with behavioural control and memory problems). Importantly, there is the building evidence around brain plasticity with new information that activities can actually change functioning areas of the brain. Klimecki and team (2013) investigated the impact of compassion training on functional neuronal responses using functional magnetic resonance imaging (fMRI). They noted that, compared to their control group, compassion training elicited increased neuronal activity in a brain region associated with positive affect and affiliation (Klimecki et al., 2013). Music interventions are likewise postulated to impact brain regions associated with emotions and behaviour. One study, using electrophysiological and autonomic measures, noted that activation of the brain acoustic sensory streams, as used in music therapy, generated changes in mental health and dysfunctional behaviours in youth diagnosed with generalized anxiety disorder or adjustment disorder (Kazymov, Mamedov, Alieva, & Chobanova, 2014). A meta-analysis noted that music therapy was related to improvement in behavioural and developmental outcomes in children and adolescents with psychopathology (Gold, Voracek, & Wigram, 2004). Despite some difficulties with evaluating music interventions in the school setting (Crooke, 2014), there is evidence that group music programs delivered at school may have a positive impact on adolescent socio-emotional outcomes (Jackways, 2014; Uhlig S, Jansen J, & Scherder J). For instance, evaluation results of the Rap & Sing Music Therapy program held in a school in the Netherlands identified that psychological well-being, self-description, self-esteem and emotion regulation of 190 grade eight students improved significantly post program when compared to a control group (Uhlig S et al.)

DRUMBEAT is a multicomponent program incorporating therapeutic use of music (i.e. drumming on a djembe), group therapeutic discussions and relationship building to assist people experiencing, or at risk of problematic health and social outcomes. DRUMBEAT was designed initially for Australian Aboriginal youth in the Western Australian Wheatbelt region by an Aboriginal elder and Holyoake staff. The aim of the DRUMBEAT program is to promote social understanding, compassion and connection through a team

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drumming experience. Facilitators gain accreditation after attending a three-day training course. The DRUMBEAT program is facilitated by at least one accredited facilitator who leads group discussions and rhythms and harmonies with djembes. The program incorporates teaching drumming and sound making skills to participants (who sit in a circle) via analogies, role play, games, and group activities. The program includes goal setting with a focus on generating competence and confidence and culminates in a group performance to an audience. After an initial session, incorporating learning base rhythms and developing group guidelines, six learning modules are covered including; 1) rhythm of life, 2) relationships, 3) harmony, 4) individuality and self-expression, 5) emotions and feelings, and 6) teamwork. Sessions eight and nine focus on developing and practicing harmonies to deliver at the performance scheduled for session ten.

The DRUMBEAT program has been implemented in schools widely in Australia and more recently in North America, the United Kingdom, New Zealand, Canada and Anguilla. Previously DRUMBEAT has been shown to increase in self-esteem and reduce reported behaviour incidents in primary and secondary school students (Wood, Ivery, Donovan, & Lambin, 2013). The value of implementing programs such as DRUMBEAT in educational settings includes the setting's high reach and extended contact which assists with program uptake, accessibility and completion (Clarke, Morreale, Field, Hussein, & Barry, 2015). A plethora of mental and behavioural programs suitable for school implementation exist (for a comprehensive list of Australian programs see <https://www.mindmatters.edu.au/tools-resources/programs-guide>), however schools can struggle to identify which intervention is likely to be the most suitable and successful for their students. This is particularly problematic as many programs have not been evaluated by external researchers and thus there are few rigorous program evaluations published. In addition to being effective, a program needs to fit into school setting limitations such as budgets and timetabling, term length and teacher expectations. Additional issues with running programs in disadvantaged schools, such as low attendance and difficulties gaining parental consent, also need to be considered. With its combination of therapeutic components and structured program, a study

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exploring the potential impact of DRUMBEAT on mental and behavioural outcomes in disadvantaged schools was warranted.

### **Aim and hypothesis**

The aim of this study was identify if mental wellbeing, psychological distress, post-traumatic stress symptoms and delinquent behaviour changed for adolescents following their attendance at a ten-week DRUMBEAT program. We hypothesised that the DRUMBEAT program, delivered in the school setting, would be associated with increased mental wellbeing, and reduced psychological distress, post-traumatic stress symptoms and antisocial behaviour in boys and girls.

## **METHODS**

### **Design**

A single group pre-test/post-test research design was implemented. Initially, a control group (using a wait-list) was proposed, however due to low student consent responses and a limited data collection time-frame, this was not possible.

### **Sample selection**

This study sought to recruit schools within areas of low socio-economic status (SES) due to the association between socio-economic disadvantage and higher rates of mental health disorders (Sawyer et al., 2000) and antisocial and delinquent behaviours (Losel, Carson, & Bull, 2003). Thus three schools were purposely selected from three of the lowest socio-economic areas within the Perth metropolitan region, with one school each located in the northern, eastern and southern corridors.

Initial contact regarding the research was made with each school's psychologist. Once formal written approval was provided by the principal, potential student participants were identified and agreed upon by school psychologists, student services coordinators and/or grade coordinators. Selection criteria

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included; students within a specified grade group/s (as decided by each school) who displayed antisocial behaviour/s. The uptake of the program and research was approximately 50% of those invited – this was mainly due to the failure of students to return a signed consent form from their parent/guardian.

### **Ethical Considerations**

Approval for the study was gained from the institutional ethics committee and the state education department. Students were told that their participation in the DRUMBEAT program and the research was completely voluntary and that they could withdraw from either the program and/or the research at any time. They were also informed that they could still participate in the DRUMBEAT program if they declined or withdrew their involvement in the research. Informed written consent to participate in the research was gained from both the student and their parent/guardian. This project involved minimal risk to participants. As the research involved measurement of mental health constructs, the students and parents were informed (via the information and consent forms) that the school psychologist would be notified about students who exceeded normal thresholds for psychological distress and post-traumatic stress scores. Students who exceeded these thresholds could continue with the DRUMBEAT program and the research. Participation in the DRUMBEAT program did mean that students would miss one class per week for ten weeks. This however, was considered by the school staff to be appropriate considering the social, learning and behavioural difficulties being faced by the students and the potential benefit of their participating in the DRUMBEAT program.

### **Instruments and measurement**

The pre and post program questionnaires included four instruments; 1) Warwick Edinburgh Mental Wellbeing Scale (WEMWBS) (Tennant et al., 2007), 2) Kessler 5 (K5) (Australian Institute of Health and Welfare, 2009), 3) Abbreviated post-traumatic stress disorder (PTSD) Checklist – Civilian version (A PCL-C) (Lang et al., 2012), and 4) Adapted Self-Reported Delinquency Scale (ASRDS) (Carroll, Durkin, Houghton,

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& Hattie, 1996; Mak, 1993). These instruments were chosen due to their brevity, readability and constructs (as below).

1) Mental Wellbeing was assessed using the 14 item Warwick Edinburgh Mental Wellbeing Scale (WEMWBS) (Tennant et al., 2007). This is a validated measure of positive mental wellbeing (content validity 0.89, internal reliability 0.87, test-retest 0.83). This instrument asks respondents to signify which response best describes their experience over the last 2 weeks; *1 = none of the time, 2 = rarely, 3 = some of the time, 4 = often, 5 = all of the time*, for feelings and thoughts such as 'I've been feeling cheerful'. All feelings and thoughts are positive thus a higher score indicates higher mental wellbeing (resultant score between 14 and 120). This instrument was recently tested in an Australian sample and performed well in adolescents aged 13-16 (Hunter, Houghton, & Wood, 2015).

2) Psychological distress was measured using the Kessler 5 (K5). The K5 is an adapted version of the Kessler 6 (K6) (Australian Institute of Health and Welfare, 2009). Recent testing of the K6 in adolescents demonstrated the scale to have 0.79 sensitivity and 0.83 specificity (Furukawa, Kessler, Slade, & Andrews, 2003). The K5 was adapted for use with Australian Aboriginal populations. This adaptation involved the removal of the statement 'I feel worthless' as it is considered potentially offensive to Aboriginal and Torres Strait Islanders (Australian Institute of Health and Welfare, 2009). This K5 instrument asks respondents - *During the past 30 days, about how often did you feel a) nervous, b) hopeless, c) restless or fidgety, d) so depressed that nothing could cheer you up, e) that everything was an effort*. Response options include; *1= none of the time, 2= a little of the time, 3= some of the time, 4= most of the time, and 5= all of the time*. Responses were summed to generate a total K5 score (resultant score between 5 and 25).



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3) Post - traumatic stress symptoms were measured using the Abbreviated PTSD Checklist – Civilian version (A PCL-C) (sensitivity .92, specificity .72. efficiency .75) (Lang et al., 2012). This instrument includes six questions asking respondents to *indicate, how much, in the last month (1= not at all; 2= a little bit; 3= moderately; 4= quite a bit; 5= extremely), they had been bothered by; a) repeated, disturbing memories, thoughts, or images of a stressful experience; b) feeling very upset when something reminded you of a stressful experience; c) avoiding activities or situations because they reminded you of a stressful experience; d) feeling distant or cut off from other people; e) feeling irritable or having angry outbursts; and f) having difficulty concentrating.* Responses were summed to generate a total A PCL-C score (resultant score between 6 and 30).

4) Antisocial behaviours were measured using the Adapted Self-Reported Delinquency Scale (ASRDC) (goodness of fit >0.85, internal consistency .67 to .91) (Carroll et al., 1996). The ASRDC is a Western Australian adaptation of the Australian Self-reported Delinquency Scale (Mak, 1993). The ASRDC asks respondents to indicate how often they have behaved in a particular way in the past month, and if so, how often they have done them. This questionnaire incorporates 11 questions asking respondents *In the past 1 month how often (Never, 1-3 times, 4-6 times, once a month, more than once a month, more than once a week they have; a) deliberately damaged your own property or that of others, b) disrupted other people's games or activities (e.g., classwork) c) sworn at others or called them names, d) not done your classwork or homework, e) hit, pushed, punched or slapped someone else, f) been unable to concentrate in the classroom, h) disrupted the class by calling out or by being out of your seat, i) teased or made fun of someone else, j) been sent out of the classroom, k) been suspended from school, l) skipped class or wagged school?* Responses were summed to generate a total delinquency score (resultant score between 11 and 66).

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### **Procedure**

A series of eight DRUMBEAT programs were delivered within the three schools over a seven month period (between May 2014 and November 2014). Six programs were single sex (three male, three female) and two programs incorporated mixed genders. Each DRUMBEAT program was facilitated by an accredited DRUMBEAT facilitator assigned to deliver the programs within the schools. Each facilitator also had either a certificate or degree in youth work and had facilitated DRUMBEAT to disadvantaged youth previously. A school liaison staff member or school psychologist at each school assisted the DRUMBEAT facilitators with organising the DRUMBEAT programs, co-facilitated the program, and assisted the researchers with data collection.

Each research participant was assigned a unique confidential code to identify the school, DRUMBEAT group and student. A risk management plan was created by the research team and school staff whereby the research team alerted the school when a student scored equal to or higher than 13 on the K5, or 11 on the A PCL-C.

A hard copy of the questionnaire was completed at the first session (or second session for first week absent members). The questionnaires were designed to be self-completed, and the DRUMBEAT facilitators and/or UWA researchers were available to assist students with questionnaire completion. Questions were read aloud (quietly to avoid student discomfort) to any students experiencing literacy issues. The post-program questionnaire was completed at the final DRUMBEAT session after the performance. Students who did not attend the last DRUMBEAT session were asked by the school liaison or DRUMBEAT facilitator to complete the questionnaire as soon as possible after program completion.

Of the eight DRUMBEAT programs, 4 were held within a northern corridor school, 3 at the eastern corridor school, and 1 at the southern corridor school. One program at the eastern corridor school finished early

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(after only seven sessions) due to the co-facilitator being unwell and a late start. This program did not include a performance and these data were excluded from analysis. The final dataset included; three 'girl only' groups (grades 8-9, 9-10, 8-10), three 'boy only' groups (all grades 8-9) and the one 'mixed gender' group (8-9). Group sizes ranged from 8-10 participants, however one grade 8-9 boy only group had only five participants.

### Data treatment and analysis

Analyses of questionnaire data were completed by the first author using SPSS V21. Total scores for each student were calculated for the WEMWBS, K5, A PCL-C and ASRDC scales from the pre- and post-program questionnaires. If one response was missing within an individual measure construct (e.g. A PCL-C) the individual's mean for that construct was imputed. Data were excluded from analysis if two or more responses were missing within a construct.

Previously published thresholds were used to categorise mental stress for each student into binomial categories. For the K5 (Commonwealth of Australia, 2005); scores less than or equal to 11 were classified as none to mild psychological distress (consistent with a diagnosis of no or mild depression and/or anxiety disorder), scores 12 or greater were classified as moderate to severe psychological distress (consistent with a diagnosis of moderate to severe depression and/or anxiety disorder). For the post-traumatic stress symptoms variable (Lang & Stein, 2005); scores less than 14 were classified as *PTSD unlikely*, scores 14 or a greater were classified as *possible PTSD* (i.e. showing signs of PTSD thus should be referred for clinical assessment). These categories were used to provide information to the school psychologist student names of those exceeding thresholds.

Descriptive statistics were also generated for each outcome continuous variables (see Table 1) and age. Repeated measures tests for differences between means were used to examine for differences between

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pre and post program for WEMWBS, K5, A PCL-C and ASRDC scores (see Table 1). Analysis by gender was then undertaken (see Table 1). Due to the small sample size further analysis by subgroup was not appropriate.

*INSERT TABLE 1 ABOUT HERE*

### RESULTS

Baseline data were available for 63 adolescents. These results indicated that 57.1% (n=36) of participants were experiencing moderate to severe psychological distress (i.e. exceeded normal threshold score for the K5), 49.2% (n=31) high PTSS (exceeded normal threshold score for A PCL-C) and 34.9% (n=22) both moderate to severe psychological distress and high post-traumatic stress symptoms. Antisocial behaviour (ASRDC scores) were strongly positively associated with both psychological distress (K5 scores) (Spearman's  $r=0.36$ ,  $p=0.009$ ) and post-traumatic stress symptoms (A PCL-C scores) (Spearman's  $r=0.42$ ,  $p=0.002$ ).

Of the 84 students who enrolled in a DRUMBEAT program, 62 (73.8%) students completed the whole program (due to incomplete program at one school and students withdrawing from the program or leaving school). Of these, only 41 (66.1%, 24 girls and 17 boys) completed the program and both the pre- and post-program questionnaires (mainly due to school absences). The mean age of the final 41 sample was 13.8 years (sd=0.7) with 17.0% (n=7) identifying themselves as an Aboriginal and/or Torres Strait Islander. Country of origin was not asked due to perceived sensitivities relating to tensions at two of the schools between different cultural groups.

At baseline, boys were more likely to report higher antisocial behaviour than girls ( $p=0.003$ ). No significant differences were detected between boys and girls baseline mental wellbeing, psychological distress or

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post-traumatic stress symptoms. Bivariate analysis of all participants suggested reduced antisocial behaviour ( $p=0.05$ ) and improved mental wellbeing post DRUMBEAT ( $p=0.07$ ); no changes were observed for psychological distress or post-traumatic stress symptoms scores. Gender split results however, indicated that there were significant improvements in boys' mental wellbeing ( $p=0.05$ ), post-traumatic stress symptoms ( $p=0.05$ ) and antisocial behaviour ( $p=0.02$ ) after DRUMBEAT when compared to program start. Following participation in the DRUMBEAT program, on average boys' recorded 7.6% higher WEMWBS scores (mental wellbeing), 19.3% lower A PCL-C scores (post-traumatic stress symptoms) and 23.9% lower ARSDC (antisocial behaviours). These changes were not evident for girls. No significant differences were detected for psychological distress changes between pre and post DRUMBEAT program for either gender.

## **DISCUSSION**

With youth mental health being such a catastrophic issue in Australia and internationally (World Health Organization, 2001), ascertaining which group programs are most effective in reducing psychological distress and improving mental wellbeing in children and adolescents is essential. In our study, boys reported significantly higher mental wellbeing, reduced post-traumatic stress symptoms and lower antisocial behaviour after participating in the DRUMBEAT program. This program holds promise in being able to assist large numbers of disadvantaged boys experiencing mental and behavioural issues.

In this study, sample baseline post-traumatic symptom scores indicated that 34.9% of the participants were likely to be experiencing PTSD highlighting the importance of addressing this mental health problem. Participation in the DRUMBEAT program led to a nearly 20% average decrease in boys post-traumatic stress symptoms. Program content within DRUMBEAT does not specifically address traumatic experiences or symptoms, however it is likely that some program components assist with trauma recovery. Research exploring drumming and its impact on PTSD is rare. However one published study noted that returned soldiers experiencing PTSD who participated in a group drumming program experienced reduced post-

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traumatic stress symptoms after the program (Bensimon, Amir, & Wolf, 2008). Research exploring the potential impact of DRUMBEAT on post-traumatic stress symptoms within children and young people is warranted.

Our study also signified that higher average mental wellbeing was evident after DRUMBEAT participation. Mental wellbeing is increasingly being recognised as an important protective factor against mental illness (Gargiulo & Stokes, 2009). Maximising mental wellbeing in adolescent populations is considered a priority in attempts to reduce the burden of mental illness in populations, and as a preventive strategy for future physical and mental health (Clarke A et al., 2011). Prior research with adolescents also indicated that DRUMBEAT increases self-esteem (Wood et al., 2013), it is likely that DRUMBEAT contributes to supportive bi-directional relationships between self-esteem and mental wellbeing.

These study results demonstrate that boys participated in significantly less antisocial behaviour after participating in DRUMBEAT. This aligns closely with previous research (Wood et al., 2013) in which objective measures of antisocial behaviours in school (behavioural incident reports) reduced for 29% of DRUMBEAT participants. Antisocial behaviour leads to high social, interpersonal and financial costs to individuals, families and communities (Piotrowska, Stride, Croft, & Rowe, 2015). Further, excessive antisocial behaviour exhibited by adolescents is an ongoing stress and burden for teachers and school administrators (Sullivan, Johnson, Owens, & Conway, 2014). The time taken by school staff to address antisocial behaviour is significant, with 90% of school teachers and leaders reporting that behaviour management accounts for at least 10% of their time (Australian Government Department of Education and Training, 2014). Bringing together groups of boys exhibiting antisocial behaviours is certainly a challenge for DRUMBEAT facilitators, however the potential impact of this is likely to have far-reaching benefits for the boys as they mature, and well as for school staff and peers alike.

The findings that psychological distress was not lower after being involved in DRUMBEAT was contrary to what we expected. It is possible that changes to psychological distress changes take time and that

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DRUMBEAT may reduce psychological stress in the longer term. Longer term follow up would assist with examining such potential.

Our analyses of baseline data highlight the inter-relationships between post-traumatic stress symptoms, psychological distress and antisocial behaviour. This aligns with evidence about the relationship between delinquent behaviour and mental health disorders in adolescents (Vermeiren, 2003). This is relevant as the incorporation of multiple program components including didactic (e.g. behavioural/emotional domains such as emotional education, relationships) and sensory (e.g. auditory via music, coordinated movement, visual) can potentially impact the many aetiologies that contribute to mental and behavioural dysfunction (Durlak & Wells, 1997). Notably, DRUMBEAT includes educational strategies evidenced as being characteristic of effective social and emotional school interventions (e.g. teaching cognitive and affective skills, competence enhancement and empowering, interactive teaching methods) (Clarke A et al., 2011). The musical component of DRUMBEAT may assist adolescents diagnosed with anxiety or adjustment disorder with the normalising of emotional status and of cardiovascular functioning autonomic regulation as described in prior research (Kazymov et al., 2014). Due to a strong neuronal connection between motor experience and empathic processes coordinated movement is noted to be an important base for the empathy and pro-social behaviour development (Behrends, Müller, & Dziobek, 2012). Behavioural mirroring is another component within DRUMBEAT that could contribute to emotional and social changes. Participants sit in a circle and observe and the actions of both the facilitators and other participants. Behavioural mimicry has been suggested to play an important role in creating affiliation, rapport, and social cohesion (Lakin & Chartrand, 2003). Thus, the mirroring of movement and eye contact, combined with the sensorimotor activities associated with the drumming itself may improve mood (Shuman, Kennedy, DeWitt, Edelblute, & Wamboldt, 2016) and strengthen group cohesion. Further exploration of mechanisms underpinning changes to mental health and delinquent behaviours via programs such as DRUMBEAT would be valuable.

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It is important to consider alternative explanations for the study findings. Another change in the participants' environments unrelated to DRUMBEAT could have led to the changes in outcomes. Although a waitlist group had been proposed to generate a comparison group, due to the difficulty in retrieving signed consent forms and program timing, this was not achievable. Another factor impacting the mental health and antisocial behaviour of participants may have been changes to behaviour or extra support offered by school staff after being informed about students exceeding normal K5 and/or post-traumatic stress symptoms thresholds (however, in nearly all cases, staff reported they were aware of the mental health states of these students).

Unfortunately, the uptake of the DRUMBEAT was only approximately 50% of children within the invited sample. The school liaison staff did note this as being related to students forgetting to return consent forms (and a common dilemma faced in schools based programs at these low SES schools), however this does indicate potential selection bias within this study. For example, the participants in our sample may be more receptive of new programs or have increased connectedness to the school. Not being able to compare differences for students who did not return consent forms is also a limitation of the study. Without consent we were not able to collect any data for those students who did not bring back their consent forms. Social acceptability bias may have impacted the self-reporting of participants with the adolescents being aware of expected changes following DRUMBEAT participation. Due to higher than expected absences, student withdrawal from the program or school and the one incomplete program, sample size was lower than anticipated thus reducing the power to detect changes. This study did not follow up participants after they had participated in DRUMBEAT thus it is unclear if self-reported mental health states and behaviour returned to pre-program states.

The strengths of this study include the pre and post design using population validated measures of psychological distress, mental wellbeing and antisocial behaviour (although note the A PCL-C has only been used in adolescents in a Chinese adapted version (Hou et al., 2011). Further, the DRUMBEAT



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program was held at multiple sites increasing external generalisability. Despite the challenges involved, the evaluation of a program within a real-world setting enhances the relevance of the results.

Additional research with larger samples and a control/comparison group will assist with strengthening evidence. A larger sample size will also enable exploration of outcomes related to participant characteristics (e.g. higher antisocial behaviours) and/or program components (e.g. facilitator, number of sessions attended). Sex differentials are also important to further explore, and this is particularly relevant with evidence that adolescent girls report higher stressors in certain contexts (e.g., interpersonal), and respond more strongly to stressors (Hankin, Mermelstein, & Roesch, 2007). For girls, DRUMBEAT may have impacted 'internalising' behaviours, such as self-harm and thus further research is needed to establish the possible impact of DRUMBEAT on other domains.

## **CONCLUSION**

The DRUMBEAT program shows promise as a potentially effective targeted strategy to significantly improve mental wellbeing and reduce post-traumatic stress symptoms and antisocial behaviour in socioeconomically disadvantaged adolescent boys. Further research incorporating larger samples and a control group will assist with verifying these findings and exploring potential moderators or confounders impacting program success.

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**Table 1: Participant mental wellbeing, psychological distress, post-traumatic stress symptoms and antisocial behaviour scores pre and post DRUMBEAT; all participants and by gender**

		All mean (sd)	Boys (n= 17) mean (sd)	Girls (n=24) mean (sd)
<b>Mental wellbeing (WEMWBS) Range 14-70.</b>	Pre	51.2 (8.8) <sup>^ b</sup>	<b>52.4 (7.6) *<sup>b</sup></b>	50.4 (9.7)
<i>Higher score = higher mental wellbeing</i>	Post	53.5 (8.8) <sup>^ b</sup>	<b>56.4 (9.0) *<sup>b</sup></b>	51.5 (8.2)
<b>Psychological distress (Kessler 5) Range 5-25.</b>	Pre	11.9 (3.6)	10.8 (3.7)	12.7 (3.4)
<i>Higher score = higher psychological stress</i>	Post	11.6 (4.2)	10.9 (4.3)	12.0 (4.1)
<b>Post-traumatic stress symptoms (A PCL-C)</b>	Pre	13.9 (5.5)	<b>14.2 (5.0)</b>	13.7 (5.9)
<i>Range 5-30. Higher score = higher post-traumatic stress symptoms</i>	Post	13.1 (5.4)	<b>11.9 (5.1) *</b>	13.9 (5.5)
<b>Antisocial behaviour (ASRDC) Range 11-66.</b>	Pre	<b>25.1 (11.3) *<sup>b</sup></b>	<b>31.1 (13.7) *<sup>a,b</sup></b>	20.9 (6.8) * <sup>a</sup>
<i>Higher score = more antisocial behaviour</i>	Post	<b>22.4 (10.3) *<sup>b</sup></b>	<b>25.1 (13.0) *<sup>b</sup></b>	20.5 (7.6)

<sup>^</sup>p<0.08, \*p<.05, a; difference between boys and girls mean scores, b; differences between pre and post DRUMBEAT mean scores, sd, standard deviation