

Observations of Students with Disruptive Behaviour in Yoga Classes and in the Classroom

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Abstract: *Disruptive behaviour (DB) refers to both diagnosed and undiagnosed behaviour that disrupts the learning environment in the school context. Yoga can reduce disruptive behaviour because it is inexpensive and non-intrusive and is conducive to self-management. This paper reports on a randomised control field study which examined the effects of Yoga on the behaviour of students (n=71) enrolled in schools for disruptive behaviour in Sydney, NSW, Australia. Over a thirteen-week period, during 2-3 classes per week, students participated in a yoga program comprising of postures, breathing practices and relaxation. Measures employed were the Behaviour Assessment System for Children-Portable Observation Program (BASC-POP) and teachers' observations. Results on the BASC-POP, indicated some significant group by time interaction improvement in disruptive behaviours favouring the Yoga group in the classroom. Over time, both the Yoga group's classroom behaviours and Yoga class behaviours indicated some significant improvement. The control group (n=16) showed no significant changes in classroom behaviours. Subgroup analysis was also conducted. Teacher observations of Yoga classes indicated on-task behavioural descriptors outnumbered off-task descriptors by 4.26:1 for the total group and for 14 randomly selected students results were comparable at 3.65:1 Yoga as an intervention for students enrolled at behaviour school appears to have positive effects for students.*

Key words: *disruptive behaviour, yoga, behavioural observations*

Introduction

Disruptive behaviour (DB) in schools refers to behaviour that disrupts the learning environment. DB has a negative impact on educational outcomes, social relations, families, schools and communities. The constellation of disruptive behaviours include inattention, impulsivity, distraction, restlessness, hyperactivity, inappropriate unacceptable levels of interrupting, verbal and physical aggression towards others and property, disregard for school and class rules in the form of defiance, violence, theft, lying and not taking responsibility for personal behaviour (APA, 2013). Young people displaying these behaviours are often diagnosed with the externalising disorders (outwardly directed behaviours) of Attention Deficit Hyperactivity Disorder (ADHD) (eg. hyperactive, inattentive), Oppositional Defiant Disorder (ODD) (eg. argumentative, anti-authority, rule breaking) and/or Conduct Disorder (CD) (eg. aggressive, criminal behaviour). Internalising disorders (inwardly directed behaviour such as Anxiety, Depression and Mood Disorders are frequently comorbid.

Common treatments are psychopharmacotherapy (if a diagnosis is present), behaviour modification and reinforcement/management strategies often in combination. Cognitive Behaviour Therapy (CBT), psychosocial and family programs are also available. Less utilised but with increasing interest are

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psychophysiological treatments such as Yoga, Tai Chi and neurofeedback. Chiropractic treatment and dietary regimes are also available.

Pharmacotherapy treatments for ADHD, ODD and CD include central nervous system stimulants (e.g. Methylphenidate,) antipsychotics (e.g. clonidine), tricyclic anti-depressants anti-convulsants (Hodgkins, Shaw, Coghill, Hechtman, 2012; Wicks-Nelson and Israel, 2003; Plizska 2003). Although medication can address the various presenting symptoms of ADHD, ODD, and CD (Pelham et al., 1993, Plizska 2003, Greenhill, Halperin & Abikoff, 1999; Biederman & Farone, 2005), the safe use of these medications has not been fully established and they do not address the constellation of problems which can occur (Kean, 2004, 2005, 2007, Lambert, 1998, 2005). Additionally, parents can deny there is a problem, refuse to medicate their children and can be inconsistent in delivery of medication (Jensen, 1999-2012 - Personal experience). Unacceptable side-effects of medication can also be a deterrent for some parents (Greenhill, Halperin, & Abikoff, 1999; Swanson et al., 1998; El Zein, et al., 2005, Graham, 2008). Additionally, the long-term effects of medication effects remains inconclusive (Kean, 2007; Nelson, Scott, & Polsgrove, 1999).

Behaviour modification and reinforcement, cognitive-behavioural approaches and appropriate curriculum modification and delivery are the primary strategies for managing disruptive behaviour in the classroom and school environment (Barkley, 1998; Damico, Armstrong, 1996; Jarman, 1996; Wicks-Nelson, Israel, 2003; Wilkinson, Meiers, 2007). However, for behaviour modification and reinforcement strategies to be effective, teachers need to be trained in behaviour management and strategies need to be consistently and diligently implemented, otherwise their effectiveness is compromised (Nelson et al., 1999).

Primary and secondary schools frequently have behaviour policies that are based on a levels system. Students with disruptive behaviour often find themselves on the lower levels resulting in detention which can culminate in expulsion (DEC, 2014). Hence the underlying problems are not addressed. A USA National study on school programs for children with emotional and behavioural disorders found that programs overemphasized and misused token economies used academic teaching strategies minimally, and rarely offered social skills programs or sufficient counselling/therapy (Knitzer, Steinberg, & Fleisch, 1990). Greene (1995) also noted that teacher variables such teacher flexibility, teacher-student compatibility, tolerance for disruptions and competence in implementation and management play a major role in the effectiveness of behaviour and classroom management.

In NSW, Australia, the Department of Education and Communities – (DEC) provides DB students who are deemed unmanageable in mainstream schools, with the option of (with parental approval) of an alternative school setting. In this setting students receive intensive academic and behavioural interventions for varying periods of time. When behaviours are not adequately addressed these young people often end up in the juvenile justice system (Babinski, Hartsough, Lambert, 1999; Kenny, Nelson, 2008).

The use of cognitive problem-solving skills training emphasises thinking about solutions to problematic situations. This approach incorporates the use of positive affirmations, games, academic activities and stories that have direct application to real life situations. The use of modelling, prompting and feedback are also provided by the therapist. However, the need for consistency and availability are essential. Such services often have long waiting lists and are reliant on parents regularly taking their children for treatment. In dysfunctional families this is often problematic. Brestan & Eyberg (1998) found that parent training to be a most successful means of reducing aggressive, non-compliant and anti-social behaviours however dysfunction within the family can hinder this process.

Families affected by ADHD, are increasingly becoming interested in alternatives to conventional treatment (Baumgaertel, 1999; Doggert; Rojas & Chan, 2005; Stubberfield & Parry, 1999). Respondents

of an ADHD caregivers survey (n=290) indicated that 64% had used alternative therapies. (Stubberfield & Parry, 1999).

Yoga is one of these alternatives and has been reviewed by Rogas and Chan (2005) Krisanaprakornkit, Ngamjarus, Witoonchart, Piyavhatkul (2010); Field (2012) with encouraging but inconclusive outcomes in insufficient studies. Unlike pharmacology and behaviour management, Yoga, like cognitive behaviour therapy (CBT) encourage participants to be actively and independently involved in their own treatment and self-management. Yoga is increasingly being taught in schools by school teachers who have received yoga training and by yoga teachers. A successful example is a program called Life Skills Group which operates in 160 Australian schools (www.lifeskillsgroup.com.au). Recently in France, an international organisation started in France in 1978, 'Research on Yoga and Education' (RYE), has been asked by the Ministry of Education to be a training reference for teachers willing to introduce Yoga into their schools (Flak, 2013 Personal Communication).

Yoga is an ancient system which approaches the health of the human in a holistic way. The mind, body and emotions are influenced by the various components of Yoga. Patanjali, a 2nd Century sage was the first to compile a set of these components which included eight limbs of Yoga. These limbs comprise of the yamas (restraints), niyamas (observances), asanas (postures), pranayama (breath awareness and control), pratyahara (deep relaxation), dharana (concentration), dhyana (mental concentration) and samadhi (self-realization) (Hewitt, 1983).

A growing body of empirical research over the last four decades, is indicating that Yoga directly effects the neuro/psycho/physiological systems of the body. The particular yoga techniques employed determine the influence. Within the central nervous system, brain wave frequencies are altered (Satyanarayana et al., 1992; Arambula 2001; Aftanas & Golocheikine, 2005; Aftanas & Golocheikine, 2001); glucose metabolism is effected (Herzog et al., 1990; Lou et al., 1999; Telles and Desiraju 1991; Telles et al., 1994; Telles et al., 1996); neurotransmitter activity changed (Kennedy, Ziegler and Shannahoff-Khalsa, 1986) and vagal nerve activity stimulated (Lu WA, 2003). Additionally, the autonomic nervous system is affected (Pal, Velkumary and Madanmohan, 2004, Vempati and Telles, 2002; Lu WA, 2003; the endocrine system influenced (Schell, Allolio and Schonecke (1994); and the respiratory system altered (Arumbula et al., 2001; Lou et al., 1999; Robert McComb et al., 2004; Vempati & Telles 2002; Stovik, 2000). These neuro-psycho-physiological parameters have been found to be functioning atypically in young people with diagnosed behavioural problems, in particular ADHD (Arnsten 2009, Fields, 2012). In the central nervous system brain wave frequencies are slower (Chabot & Serfontein, 1996; Clarke et al., 1998; Lubar, 1991; Mann et al., 1991), glucose metabolism is reduced (Ernst, Leibenauer, & King, 1994; Zametkin et al., 1993; Zametkin et al., 1990; Zametkin & Liotta, 1998) neurotransmitter activity can be atypical (Pliszka et al., , 1996; Swanson et al., 2007). The sympathetic nervous system within in the autonomic nervous system can be overactive (Boyce et al., 2001; Garralda, Connell, & Taylor, 1991; Rogeness, Cepeda, Macedo, Fischer, & Harris, 1990; van Lang et al., 2007; Zahn & Kruesi, 1993; Ramos& Arnsten, 2007) the endocrine system there are higher levels of stress and aggression hormones (Dmitrieva, Oades, Hauffa and Eggers, 2001; Garalda, Connell, Taylor's, 1991; McBurnett, Lahey, Rathouz, Loeber, 2000; Pine, et al.,1998) and in the respiratory system, breathing can be unstable because there is a tendency towards higher breath rates (Stovik, 2000; Ramos & Arnsten, 2007, Jensen & Kenny 2012). All these parameters influence behaviour manifesting in the symptoms characteristic of behaviour disorders.

There are some encouraging results on the effects of yoga on a range of mind/body approaches on the behaviour of young people with mental health problems including disruptive behaviour. These have been discussed in reviews by Fields (2012), Rogas and Chan (2005) and Krisanaprakornkit et al., (2010). Studies have found reduced levels of hyperactivity, impulsivity and inattention (Jensen and Kenny, 2004; Harrison, et al., 2004; Haffner, Roos, Goldstein, Parzer, & Resch, 2006); aggression and anxiety

(Rauhala, Alho, Hanninen, & Helin, 1990; Suarez, 2002) social problems (Telles, Rajhraj, Nagarathna, Nagendra, 1997) as well as improved memory (Naveen, Nagarathna, Nagendra, & Telles, 1997).

However there are limitations in the research to date. Very few have taken place in the school environment where DB has its most severe impact. Studies have generally employed small numbers and have taken place with parental support and participation or been conducted in highly controlled environments (e.g. community homes where young people reside). More research needs to be carried out in the school environment, where the problems are most evident and where inexpensive, non-intrusive and self-management strategies are needed. One such study by Jensen and Kenny (2012) found that the breathing rates of students with disruptive behaviour attending behaviour schools in NSW, Australia became more stable and in some cases slower during and after a Yoga Nidra relaxation practice. Stabilised and slower breathing rates are an indication of reduced sympathetic nervous system activity (Stovik, 2000). These preliminary findings indicate a need for further research in school environments. Currently, a Yoga program is being conducted in a Boston school to evaluate which psychological constructs that would be useful in future research. Preliminary results have revealed improvements in resilience, mood, self-regulation skills for emotions and stress (Khalsa, 2013).

In the DB field, several measures are utilized for behavioural diagnosis and behavioural change. Behavioural observation is one such measure. Behavioural observations, in both clinical and natural settings are regarded as valid and reliable indicators of symptoms of disorders such as ADHD and ODD.

Aim of the study

The aim of the study was to demonstrate that:

- Yoga is a useful intervention in reducing the ADHD behaviours of inattention, hyperactivity, impulsivity and ODD behaviours of oppositional, argumentative and aggression in comparison to controls in yoga classes and in the classroom.
- Behaviour observations can be a useful tool in measuring behavioural changes in young people with DB during yoga classes and in the classroom.
- That teachers would observe 1. attention to task, 2. positive mood and self-state, 3. increased awareness and self-regulation, 4. a positive attitude towards and response to Yoga, 5. competence in learning Yoga techniques, 6. motivation to learn and participate in Yoga classes

Ethical approval for the study was obtained from the University of Sydney Human Research Ethics Committee and the Strategic Research Directorate of the Department of Education and Training (DET), NSW.

Participants

All participants were students enrolled in a NSW Department Education and Training (DET) special school (n=9) for disruptive and/or emotionally disturbed behaviour. Altogether 78 students began the study, 16 students acted as their own controls (wait-listed) by participating in the control then the Yoga phase, 55 (4 female) participated in Yoga intervention only and seven (1 female) were in the control condition only. In total, 71 students participated in the Yoga intervention and 23 participated in the control condition. The 71 Yoga participants had a mean age of 12.2 years (SD 2.31 years) and the 23 control participants had a mean age of 11.09 years (2.095). Placement in a DET special school was determined by a DET regional welfare team. The cohort included students with a paediatric diagnosis or assessment by school counsellor of Externalising Disorders (51.3%) Attention Deficit Hyperactivity Disorder (ADHD), Oppositional Defiant Disorder (ODD), and/or Conduct Disorder (CD); internalising disorders (5.1%) such as Emotional Disorder (ED) and Anxiety Disorder (AD) and 32% with both Internalising and Externalising Disorders. 9.4% of the students were not classified. Learning Disorders (LD) and Aspergers Syndrome were also evident.

Twenty-eight percent (28.20%) of the participants were taking medication, which included psychostimulants (methelphenidate, dexamphetamine and concerta) and anti-psychotic medications (Risperdone) and alpha agonists (Catapress); 51.28% students were not taking medication, either due to refusal or because they were undiagnosed by a paediatrician; for the remaining 20.51%, medication status was unknown.

Procedures and settings

The alternative school setting (Behaviour Schools) provided a teacher and teachers' aide for every seven students in schools with up to approximately 24 students attending the school.

Nine schools agreed to participate in the study. For ethical reasons students could not be randomised into control or yoga group as all students needed to be given the opportunity to participate. To establish a control group researchers proposed that all participating students be wait listed to form a control group but six schools withdrew from this phase thus reducing the size of the control group. The randomisation process could only occur in the order of schools participating.

The 13 week Yoga intervention was a comprehensive program consisting of two to three 30-40 minute sessions per week, in the nine behaviour schools over an 18 month period. Yoga classes were taught by a qualified, experienced Yoga teacher, unknown to the students and who was also a specialist teacher for behaviourally disordered students. The control group experienced the standard school program provided by the special school.

In total, students were offered from 32 to 39 Yoga classes. Average length of session depended on the behaviour of the participants and the number of students willing or able to attend on the day. The number of students in each session differed due to absenteeism but generally no more than five students attended each class. On average, two sessions were conducted at each school on the days the program took place.

Independent teacher observers, blind to the treatment phase were trained in the use of the Behaviour Assessment System for Children-Portable Observation Program (BASC- POP) before conducting observations in the Yoga class and in the classroom. Control and Yoga participants were observed using the BASC-POP in both the classroom (for control and Yoga groups) and the Yoga classes by blind independent observers.

Teachers were requested to record observation notes on each student in each Yoga class in a notebook.

Instruments

This article considers two observational measures – Behaviour Assessment System for Children-Portable Observation Program (BASC-POP) and teacher observational notes

According to Wicks-Nelson & Israel (2003) behaviour observations are the most direct method of assessment and require the least interference. However the cost and problems that arise in maintaining reliable observers can be an issue. Two observational measures were used to maximize the data collected. The BASC-POP is a standardised measure used in current empirical research as reliable measure. The BASC-POP rated the frequency of ADHD and ODD behaviours in the yoga class and in the classroom. However the teachers' notes revealed a daily account of the students' behaviour giving a fuller and more detailed account of behaviour both on task and off task which the BASC- POP didn't do.

Behaviour Assessment System for Children-Portable Observation Program (BASC- POP)

BASC-POP is a computerised coded observation program. The targeted behaviours are entered into the program and appear by an abbreviated name on a grid. The observer places the cursor on the targeting behaviour by clicking on the behaviour and the observation is entered into the system. The externalising disruptive behaviours of inattention, hyperactivity and impulsivity associated with ADHD primary symptoms (DSM-IV-TR) and oppositional behaviours associated with primary symptoms of ODD (DSM-IV-TR) were identified as targeted behaviours. BASC-POP enables momentary time sampling during observation and rating periods and systematic coding during observation and rating periods. This provision facilitates consistency among observers. The length of each observation was set at 15 minutes and targeted behaviours were recorded each time they were observed within 15 second time periods. For example, if a student was out of his seat for the total of 15 seconds he was scored once. If he was up and down from his seat three times in the 15 second period he was scored three times.

BASC-POP an effective way of standardising observations of this population. The BASC-POP complies with the requirements for validity and reliability i.e. that targeted behaviours are established, observers are blind to treatment phases and are independent and trained to observe according to a set of established codes (Abikoff et al., 2002; Pelham et al., 2005).

Teacher observation notes

Teacher observers were instructed by the researcher to record both on- and off-task behaviours (terms familiar to all staff at participating schools) in the form of note taking. Each Yoga lesson was visually displayed with text and graphics and presented in sequence. This sequence was written by the staff member in the notebook and observational notes on each student were recorded beside the appropriate component of the class

The use of teachers as observers reduces the issue of reactivity which has been cited as the greatest impediment to the use of direct observation (Wicks- Nelson & Israel, 2003). Reactivity refers to whether the knowledge that if one is being observed one changes one's behaviour.

However, the teacher observations used in this study did not comply with all the requirements for validity and reliability mentioned above. Teacher observers were not able to be blind to the treatment phase nor were they independent as they taught the children. However they were well trained and experienced as a teacher of students with disruptive behaviour and were acutely aware of what comprised of on-task and off-task behaviour.

The Yoga program

The Manual of Yoga Practices used in the study comprised of yogic practices selected from the teachings of Satyananda Yoga (Saraswati, 1990) and the Vivekananda Yoga Research Foundation Practices were chosen based on suggested benefits. Benefits regarded as appropriate were practices to reduce anger and aggression, to lift the mood, deepen and regulate the breath, increase concentration and focus and to promote calmness and relaxation. A consistent program structure was applied throughout the intervention. The displayed daily program fostered student engagement and knowledge of expectations of the day's session.

Each session comprised of a short relaxation, joint and spinal warm ups, asanas-(posture), breathing practices, single sounds chanting and Yoga Nidra, (a longer relaxation). The short relaxation involved coming into a quiet and still prone position, listening to sounds and feeling body parts in touch with the surface they were lying on. Joint and spinal warm ups involved systematically stretching and rotating all

the joints and gently stretching and rotating the spine. Asanas included many classical yoga postures excluding inversions which were contra-indicated in young people (Satyananda (1985). Breathing practices (pranayama) included nadi shodan (alternate nostril breathing); kapalbhathi (forceful breathing out through the nostrils); and brahmi (humming bee breath). Single sounds chanting involved chanting the sounds ah, oo and um. The longer relaxation was a modified version of Yoga Nidra relaxation (psychic sleep) that involved withdrawing the awareness from the external environment and focusing the attention on breath and body.

The Yoga teacher practised the yogic yamas (restraints) and encouraged the yogic niyamas (observances) (Hewitt, 1991) by responding to verbal or physical aggression in a non-violent (ahimsa yama) way and ensuring a safe and conducive environment to practice in; by talking to the students in a truthful way (satya yama) and honest (asteya yama) way by not using coercion or intimidation; by expressing contentedness (santosa niyama) when children were progressing at their own rate and affirming the children when peaceful.

The teacher encouraged the awareness of the yamas in the students in the following ways: 1) by advising them not to be violent towards themselves by pushing hard to get into a pose and retaining tension in the body (ahimsa yama); 2) by being honest toward themselves by working according to one's capacity (satya and asteya yamas); 4) and helping them to overcome a need to adversely compare themselves with others by being happy with their progress and work towards remaining calm even when others around them became agitated and angry (santosa niyama); 5) to practice regularly to build up self-discipline and willpower (tapas niyama); and 6) by drawing attention to body sensations, feelings and thoughts (swadhyara niyama).

Analysis

SPSS (Statistical Package for the Social Sciences) software was used to conduct general linear modelling using repeated measures analysis to compute the significance of changes over the time within and between groups. An interaction term was included to assess whether rate of change was different between the two study groups. The dependent variables measuring the impact of the Yoga intervention were each analysed separately. Means plots were produced to help interpret the P values. Independent t-tests were used to compare the post-intervention mean values between the two groups and to obtain effect sizes using a mean difference and 95% confidence intervals.

Results from the children who completed the control study arm were compared with results from the children who completed the Yoga study arm of the trial. Thus, a total of 16 children who completed both arms (19% of the sample) were included in both groups. This had the effect of making the results from the control and Yoga arms more alike and therefore may have produced conservative effect sizes and P values that are biased towards the null. Null refers to there being no relationship between two measured phenomena or that a potential treatment has no effect.

The results of children who acted as their own controls were analysed initially with polynomial orthogonal contrast analyses to ascertain significant effects. If there was a significant effect, Simple contrasts were conducted to ascertain whether significant change occurred between the pre-Yoga to post-Yoga condition.

Where measures were not repeated, means and standard deviations served to indicate levels of response.

All observation notes of on-task and off-task behaviour during the Yoga classes were typed and examined by researchers. Staff descriptions were content analysed for on-task/positive and off-task/ negative statements about behaviour during the sessions and numerically compared. The 'find' icon in the word

program was used to locate descriptors (singular words and phrases) of on- task- and off-task behaviours. This observational tool provided extensive, detailed information about each student's Yoga class behaviour.

Single word descriptors and phrases were coded. For each participant, a ratio of on-task to off-task statements was computed. Data was utilized in two ways: (i) the observational comments about 16 randomly selected students were extracted and divided into on-task and off-task columns and (ii) on and off-task behaviour descriptors for all participants were categorised and numerically totalled. Subtotals were then totalled for all on-task and off-task behaviours. Analysis for all descriptors is admittedly less precise than the methodology used for the categories but it served to emphasize the predominance of on-task comments in addition to indicating the predominating aspects of off-task behaviours.

Results

Attendance and participation

Of the 88 students (5 female) initially recruited, 10 withdrew before completing the control phase, six students left the school and four were truant. The seventy-eight students remaining in the study were divided into three conditions. Sixteen students participated in a wait listed control condition followed by the Yoga intervention (i.e. acted as their own controls). Fifty- five students participated in the Yoga intervention only and seven students were in the control condition only (students who did not participate in the yoga phase). Students were taught between 23 and 39 Yoga classes. Variations were unavoidable. The frequency of attendance was considered an important factor for treatment efficacy.

It was hypothesised that students would develop a positive attitude and response towards treatment and that they would be motivated to learn and participate in the Yoga classes.

Of 71 participants in the Yoga group 12 (16.9%) attended from 7 to 10 classes; 36 (50.5%) attended from 11 to 20 classes and 23 (32.5%) attended from 21 to 35 classes.

Of the 71 students who began the Yoga study, 12.48% were medicated on stimulant medication although teachers reported some days medication was apparently not taken. This is an indication that for the majority, medication couldn't be attributed to behavioural changes.

It was hypothesised that observations of classroom and Yoga class ADHD behaviours of inattention, hyperactivity, impulsivity and ODD behaviours of oppositional, argumentative and aggression would reduce over time and in comparison to controls. It was also hypothesised that on-task behaviours in the Yoga classes would be high.

Classroom behaviours observed on the BASC-POP did not differ significantly at pre-test for the Yoga or control groups. At post-test, significant group by time interaction reductions favouring the Yoga group were found for ODD behaviours $p > 0.004$ and there was a trend for a reduction in Total Hyperactive behaviours $p > .10$. However the control group showed insignificant reductions in inattentive behaviours compared with the yoga group. Both groups showed insignificant reductions in symptoms. This therefore could be attributed to the behaviour school's influence on behaviour with some added effect with yoga. Observing behaviours in the Yoga classes was considered important for detecting the levels of ADHD and ODD behaviour problems and for comparisons with classroom behaviours. The same set of behaviour criteria was used. Table 5 presents results for student behaviour in the Yoga classes on the BASC-POP.

Borderline significant improvement was evidenced in the Yoga participants ADHD Total Impulsive behaviours from pre-test to post-test ($p > .10$) with all other behaviours showing non-significant improvements.

Observations were conducted in the second yoga session Time 1 and the last yoga session Time 2 and in the classroom at Time 1 (pre) and Time 2 (post). This comparison was made to detect the behavioural differences between the two environments. This comparison revealed significant differences. Reductions favouring the Yoga class students' behaviours are indicated in Inattentive behaviours Time 2 $p < 0.032$ and Hyperactive behaviours Time 1 $p < .006$ and Time 2 $p < 0.001$; in Impulsive behaviours at Time 1 $p < .004$ with non-significant improvement at Time 2 and in Total ADHD behaviours at Time 1 $p < .002$ and Time 2 $p < .002$. ADHD and ODD behaviours in Yoga classes were overall less evident than in the classroom.

The videoed yoga classes were observed using the using the BASC-POP. Observers recorded on-task and off-task behaviours at 15 second intervals. Off-task behaviours were identified as ADHD and ODD behaviours but no distinction was made between them as in the previously reported BASC-POP results. This observation was easier to conduct and potentially furnished greater accuracy. Table 7 presents the on-task behaviour percentages on the BASC-POP at the beginning, middle and end of Yoga classes for students.

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On-task behaviour on the BASC-POP in the yoga classes at the beginning of the intervention ($n=27$) is high at 86.82% with decreases to 77.32 % in the middle of the intervention ($n=12$) and increases to 95.46% at the end of the intervention ($n=13$). Standard deviations for the Yoga classes also decrease considerably over time.

Subgroup analysis for BASC-POP

Subgroup analysis of eight students who acted as their own controls was seen as a more sensitive indicator of the effect of Yoga on behaviour. Total ADHD behaviours were compared from five assessment times 1. Pre-Control; 2. Post Control/Pre-Yoga; 3. Yoga Class beginning. 4. Yoga Class end; 5. Post-Yoga in the classroom. Significant changes favouring the Yoga group's behaviour at the end of the intervention were seen when compared with all other time phases (see Table 2). The reason why all times are compared with Time 4 is that it was deemed to be the time when students had received the maximum amount of yoga practice/treatment and in the environment (the yoga class) in which they were given the treatment. Therefore, the maximum effect was expected. Table 1 and Table 2 present the means, standard deviations and tests of within subject contrasts for this subgroup.

Table 1. Mean and SD on the BASC-POP for ADHD Behaviours at Pre-Control/Pre-Yoga/Begin Yoga/End Yoga/Post-Yoga

Time	Mean	SD
Time 1 Pre-Control Classroom	28.38	18.02
Time 2 Post-Control Pre-Yoga Classroom	22.00	9.83
Time 3 Yoga class Beginning	10.38	7.23

Time 4 Yoga Class End	3.88	7.18
Time 5 Classroom Post-Yoga	16.75	7.94

Table 2. Tests of Within-Subjects Contracts Using the BASC-POP

Source		F	p	Eta2
Time	Time 1 vs Time 4	21.36	0.001	0.75
	Time 2 vs Time 4	18.24	0.001	0.72
	Time 3 vs Time 4	4.68	0.070	0.40
Source		F	p	Eta2

Significant improvement in ADHD behaviours was evidenced at Time 4 (Post Yoga) compared with Time 1 (pre Control) ($p < 0.001$), Time 2 (Post control/ Pre Yoga) (0.001), Time 3 (Beginning of Yoga Intervention –Second class) (0.070) and Time 5 (Post Yoga in the classroom) (0.001).

Inter-Rater Reliability

To check for inter-rater reliability, ratings were compiled for three raters of the Yoga classes. Ratings of on-task behaviours were within 10% agreement for the majority of the 12 ratings. The averages for each rater of the 12 children's ratings indicated a maximum of 3% difference. These results indicate close agreement and strong inter-rater reliability. The more complex observations involving observing ADHD and ODD behaviours for seven children were not as close in agreement when comparing ratings for each child (largest difference was 11 counts and the smallest was 1) however the averages for each rater are within 1 count which indicates strong inter-rater reliability.

Teacher observation notes of Yoga classes

Daily observations provided data on the children's motivation, self-regulation, competence in accessing treatment, attitude towards and response to treatment and an ability to relax which were hypothesised to be developed in Yoga classes.

Table 3. Example of an Observation Grid Completed by School Staff

16/8/5	Participant 1	Participant 2	Participant 3
Introduction	Playing with mat: 'What does Yoga mean?'	Attentive and calm, centred and interested.	Playing with mat, follows another student's behaviour, not looking at teacher: 'Can we go now?'
About the program	Lying on stomach and fidgeting.		Anxious to know when it finishes, copying another student.
Relaxation	Making noise with hands on floor, kept on task.	Hands on his chest, kept on task.	
Deep breathing	Exited: 'Can I do the bridge?' Not on task, hand crossed over his chest, needs to be	'Don't touch me!'	Cooperative, on task.

	prompted.		
Warming up joints	Lying down when doing exercises, can't do it on his right leg (pins).	On task, very focused and calm.	'It's 10 o'clock.' On task, but easily distracted.

On- and off-task teacher comments were recorded in note form in the format in Table 3 by either teachers or teacher's aides while observing students during all yoga classes. This comprised of approximately 150 pages of notes. These notes were examined for on and off-task key descriptive words. On-task and off task behaviours were divided into Compliance (participated, engaged, joined in, interested, eager, followed directions, willing, compliant, cooperative, listening) 1593 descriptives or 43.31% of on task behaviours and Non-Compliance (not participating, not joining in, not interested, not following directions, reacting, refusing, resistant, unwilling, uncooperative, not involved, not listening) 242 descriptives or 27.13% of all off-task behaviours; Non- Disruptive (quiet, calm, relaxed, settled and silent) 426 descriptives or 11.58% of all on -task behaviours and Disruptive behaviours(hyperactive, impulsive, talkative, fidgety, distracted, unsettled, calling out, silly) 624 or 69.9% of all off-task behaviours; and Satisfaction (confident, successful, excellent, good, did well, did very well) 1659 descriptive or 45.1 % of all on-task behaviours and Aggressive behaviours (aggressive, teasing, angry, threatening) 26 descriptors or 2.9 of all off -task behaviours. This observational tool provided extensive, detailed information about each student's Yoga class behaviour. Students were not disturbed by this process as they were familiar with the teacher

The ratio of on-task behaviour to off-task behaviour for the total group was 4.26:1. Mean on-task behaviours were 80.06% of all recorded behaviours. Compliant behaviour (43.31%) and satisfaction (45.1%) were the most represented in on-tasks behaviours. Hyperactive /Impulsive/Inattentive behaviours (69.9%) were the most represented behaviours in the off-task behaviours.

For the 16 randomly selected students, the proportion of on-task to off- task behaviours varied considerably with the highest being 23/1 and the lowest 1.7/1 with an average of 5.52/1 (SD 6.99). This is another indicator of the variance of response. Total on-task behavioural comments were a mean 84.19 (SD 42.28) 73.59% of total behaviours observed and off- task behaviours were mean 31.87(SD 42.16) 36.4%.

The first analysis of the total group concluded that positive/on-task comments outnumbered negative statements by 4.27 to 1. The second analysis was student focused and there were at least eight raters/observers involved from eight schools. The mean score of the 16 students was 5.52 (SD 6.99):1 When two students' scores (who were from different schools with different observers) were removed from analysis due to their scores being outliers (22.5:1 & 23:1) the ratio was 3.07 (SD 2.076) to 1. It could be assumed that the mean score for the total group (i.e. all observed yoga participants) 4.27:1, would have involved some students who had a disproportionate number of on-task/off-task descriptors. This would have reduced the mean average and make it comparable to the results of the subgroup. This result contributes to the reliability of the measure.

Discussion

The results of this study indicate that yoga has potential as a school intervention for students with disruptive behaviour. Although BASC-POP results are limited due to the unavailability of full sets of data for some participants and teachers observations were loosely quantified, the extensive findings drew upon a wait-listed control group and a Yoga group in two settings ie the yoga class and the classroom and two observational measures, making a case for the potential for the viability of yoga to treat disruptive behaviour in the school setting.

The results were in keeping with the aims of the study. Yoga was found to be useful and viable intervention for improving behaviour in young people with disruptive behaviour both in yoga classes and in the classroom.

Behaviour observations were found to be a useful tool in measuring behavioural changes in young people with DB during yoga classes and in the classroom.

Teachers were found to be effective observers. Observations of 1. attention to task, 2. positive mood and self-state, 3. increased awareness and self-regulation, 4. a positive attitude towards and response to Yoga, 4. competence in learning Yoga techniques, 5. motivation to learn and participate in Yoga classes were included in observations of each yoga class.

The two measures were found to complement one another. Whereas, the BASC-POP provided specific data about the occurrence of ADHD and ODD behaviours through a coded and timed system, it was limited to these behaviours and was also compromised due to technical problems and an unreliable rater, in addition to absences on assessment days and attrition. However the number of participants whose data was analysed was comparable to other yoga studies involving children with behaviour and social problems. In comparison, the teachers written notes on the students' behaviour during the yoga classes reported on all students (n=71 and wasn't limited to pre and post assessment times. However, unlike the BASC-POP, behaviours were not coded and timed but reported on a variety of behaviours which reflect the diversity of on-task and off-task behaviours displayed by young people with DB. Additionally, behaviours specific to yoga practice were also reported.

Behaviour observations using Behaviour Assessment System for Children-Portable Observation Program (BASC-POP)

Observing behaviour using the computerised BASC-POP was considered a valuable measure because specific behaviours could be customised to suit the predicted problematic behaviours of the sample in addition to providing observers the means to rate according to a set of prescribed practices.

The BASC-POP was employed to observe students in their normal classroom setting, in the behaviour school as well as in the Yoga classes to investigate the hypotheses that Yoga would decrease off-task behaviours of inattention, hyperactivity, impulsivity and oppositional behaviour. Classroom and yoga class observations were conducted by independent blind raters. DSM-IV, ADHD and ODD diagnostic criteria were customised on the BASC-POP, enabling behaviours specific to the externalising behaviour to be observed. Videoed Yoga classes enabled multiple observations by multiple observers increasing the reliability of the observations.

The results indicated some significant improvements in classroom behaviour over time for the students who received the yoga treatment. However the yoga class behaviour indicated greater significance. Results from observations of videoed yoga classes indicated significantly less problematic behaviour during their second yoga class and in their last yoga class compared with pre-test and post-test classroom observations. For the yoga group, on- and off-task behaviour observations of students (n=33), indicated increasing levels of compliance from the beginning to the end of the intervention. Compliance in the Yoga classes indicates that the students were following instructions and demonstrations which required the ability to focus attention and control movement. In performing these skills, the students were less hyperactive and less impulsive and more attentive. Students also demonstrated a willingness to follow the directions of a teacher without the need for questioning their authority or feeling threatened by the task. These observations infer support for the hypotheses that motivation, competence, awareness and self-regulation would be increased and relaxation skills developed as a result of the yoga intervention.

Observing students is a direct means of assessing behaviour and if conducted correctly can be a highly reliable source of data collection. Unfortunately, the behaviour observations conducted in the classroom

in this sample underwent some problems. Valid observations were reduced due to one observer's observations being discarded due to falling below inter-rater reliability levels. Another fourteen sets of data were lost due to technical problems. This technical problem could not be rectified because the company that produced the BAS-POP was sold to another company and requests for support were not answered by the new company. These problems resulted in the loss of the majority of data leaving only nineteen valid sets of observational data from classroom observations. The problem with the unreliable rater would have been addressed if inter-rater reliability had been conducted on classroom observations and not just on Yoga class observations. This is acknowledged as a methodological fault that was hard to address due to lack of other available raters and equipment (extra laptop not available) at the time to do the number of ratings required to test for inter-rater reliability.

Unavoidable inconsistencies in classroom observations arose in relation to the timing and type of lesson from pre-test to post-test. This could have contributed to changes in behaviour independent of possible changes due to the intervention. It is well known that the time of the day and how engaging a lesson is can affect behaviour in healthy students and even more so in students with behaviour problems (Harris 2008; Nichols 2008; Yoga Bhakti 1985). None of these problems were encountered in the Yoga class BASC-POP observations.

Regardless of these shortcomings, the reduction of off-task ADHD behaviours and Oppositional Defiant behaviour in the classroom, was comparable with other Yoga interventions (Peck et al.) and non-yogic relaxation interventions (Redfering and Bowman, 1981) that controlled for time and type of lesson. The Peck (2005) and the Redfering and Bowman (1981) trials simplified observational data collection by recording on-task and off-task behaviours only. Students were regarded as attending or not attending to class tasks set by the teacher. Although descriptors of off-task or non-attending behaviour were not specified in these studies, such terminology includes hyperactive, impulsive, inattentive, aggressive, and oppositional behaviour. In review, it may have been more effective to measure on-task and off-task behaviours only in the classroom instead of the complex set of behaviours reflecting the DSM-IV diagnosis criteria for ADHD and ODD behaviours.

The program could not control for the home environment, diet, or the school's delivery of curriculum or behaviour policies. In the course of a 30 hour school week, the Yoga program occupied up to 2 hours. However behaviours not generally associated with students with DB were occurring frequently in Yoga classes.

Inter-rater reliability was high. This indicates that this measure as evaluating behaviour in the classroom and in Yoga classes was reliable.

Regular observations documented the students' responses to the relaxation aspect of the program. Lying still and not talking for up to 20 minutes indicated compliance with expectations of the Yoga teacher and a learnt ability to be less distractible, less reactive and less restless, all conditions characteristic of disruptive behaviour.

The Yoga program constituted for up to 8% of the school week and ran for 13 weeks. The length of the program in each school was restricted due to the labour intensive nature of this field study, conducted in nine schools across the Sydney metropolitan region. The dosage was thus low compared with other yoga interventions. Although a longer program may have produced greater effect this was not feasible as the turnover in behaviour schools is unpredictable. However some interventions have shown effects of comparative lengths of time.

The question of optimum dose for optimum outcomes is an important consideration. Other effective Yoga interventions, involving children with behaviour problems, have ranged from three weeks to one year of regular practice (Peck et al., 2005; Haffner et al., 2005; Harrison, Manocha & Rubia, 2004; Telles et al.,

1993; Rauhala, et al., 1990). From this wide variance, it is difficult to say what length of time is optimum to see changes. The 13 week duration of this study, when compared with other studies could be regarded as an acceptable duration but when fluctuating attendance and attrition, the volatile environment in which the research was conducted and the severity of the disruptive behaviour are taken into account reduced exposure feasibly compromised treatment effects.

Although this was a short term program, effects were observed in close proximity to the practice of Yoga. High percentages of on-task behaviour in the observed Yoga classes and to a lesser extent in the classroom. Psycho-stimulant treatments, effects diminish with time and problematic behaviours return (Spencer et al., 1996). However, Yoga, when practiced over longer periods of time, has been shown to have a positive accumulative effect (Aftanas & Golocheikine, 2001), therefore longer, ongoing programs would be preferable. It must also be considered, that a relatively short program of short Yoga session (30-40 minutes, twice a week for 13 weeks) could not have a major effect in environments where behaviour dysfunction has been evident, often from infancy and where the Yoga program had no control over the environments to which the child returned after Yoga sessions.

But are longer interventions feasible in the behaviour school environment? The literature indicates (Kazdin, 1995; 2003) and teachers report (Laws, Personal Communication, 16.7.04; Yates, Personal Communication, 8.6.05) that children with disruptive behaviour have difficulties remaining committed to programs designed to improve their wellbeing. Growing up in dysfunctional families also impacts on children's willingness and ability to expose themselves to positive initiatives offered to them.

Limitations

Considering the school atmosphere was not created from a yogic perspective, the exposure to Yoga had a relatively small but distinct impact compared to the impact of the school, family, and community environment.

Conclusion

The results of this study contribute to the growing body of evidence suggesting that Yoga can be applied in the school setting for students who are struggling to comply with behavioural expectations. As Fields (2012) suggests there is sufficient evidence now available to indicate that Yoga and aerobic exercise improves the physical and emotional wellbeing. Researchers agree with Fields that this knowledge now needs to become a part of schools curriculum, hospitals programs and family activities.

Some significant transference effects of Yoga class behaviours was detected via the BASC-POP observations of both ODD behaviours compared with control and of ADHD behaviours over time in the classroom. High percentages of on-task behaviours were observed in the Yoga classes. This outcome could be due to the specificity of the measure used. Behaviours being directly observed are arguably less subjective than teacher and parent impressions but adherence to strict behavioural codes are necessary to achieve this. Considerably fewer ODD and ADHD behaviours and a high percentage of on-task behaviours were observed on the BASC-POP in the Yoga classes. This could possibly be explained by the highly structured nature and physicality of the program.

The daily observations of all Yoga classes that were recorded by teachers proved to be a valuable record of the children's attitude to Yoga.

The hypotheses about aspects that teachers would observe was supported through the great variety and high proportion of positive descriptors used by teachers in the 150 pages of on- and off-task observational notes of all students in all Yoga classes and in the observed behaviours of the randomly selected students.

More long term randomized control field research trials are needed to further substantiate the results attained in this study.

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