

Relaxation as an intervention to improve emotional and behavioural outcomes for children

Rebecca Ashton

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Abstract

Relaxation is a broad term, encompassing physiological, emotional and behavioural aspects. This paper reviews the literature evaluating the effectiveness of relaxation techniques in improving emotional and behavioural outcomes for children. The fifteen studies meeting the search criteria are reviewed in some depth. Relaxation techniques covered by this review include breathing, progressive muscle relaxation, yoga and visualisation, although many programmes combine a range of approaches. Analysis of the selected studies shows that the current body of evidence is far from conclusive about what works, and practitioners should be extremely cautious about spending time on relaxation at the expense of other interventions with greater evidence of effectiveness. From the information that is available, guidelines for practitioners are provided. The use of a range of techniques should be considered, including progressive muscle relaxation which appears to be accessible even to young children. Interventions are more likely to show impact if targeted at an identified group rather than universally provided, and practitioners should take care to monitor and evaluate any relaxation intervention. Future research could usefully evaluate relaxation interventions over longer periods of time, and could focus on identifying which aspects of the programme work best for which children.

Key words— Relax; intervention; evaluation; breathing; yoga; visualisation

Introduction

This article considers the evidence base for the effectiveness of teaching relaxation techniques to children. It aims to review the behavioural outcomes that can be expected from relaxation programmes, and therefore indicate which children are likely to benefit from such interventions. In addition, information on how best to deliver relaxation programmes has been abstracted from the evidence base. This article identifies gaps in the evidence base, where research has not yet provided answers to these questions.

Relaxation techniques, for the purposes of this review, include physiological exercises such as controlled breathing and deliberate muscle relaxation, as well as basic focused thinking exercises such as visualisation. There are other methods which can be seen as relaxation techniques, including hypnosis and biofeedback. These methods are not addressed here, as they go beyond the basic mechanisms of physical and mental relaxation and require specialist training or equipment not available in most educational settings.

Context

Over the last decade, there has been a national focus on teaching social and emotional skills in schools. Weare and Gray (2003) produced a re-

search report for the Department for Education and Skills outlining the evidence for what works in this area. Shortly afterwards, the Government produced a pack of materials as part of the Primary Strategy called “Social, Emotional and Behavioural Skills”, which later became “Social and Emotional Aspects of Learning” (SEAL) (Department for Education & Skills, 2005). With the change of government in 2010, these materials have been moved to the National Archives website and will not be further promoted or updated. However, many schools in the author’s experience are continuing to work on social and emotional skills using SEAL and other resources and national organisations have continued to publish guidelines and resources for promoting wellbeing in education (e.g.(NICE, 2008; NICE, 2009).

In parallel, during this period, commercial companies have developed products and services for schools and others to use when teaching social and emotional skills. Some of these companies make impressive claims and charge for their products without citing any evidence of effectiveness beyond anecdotal testimonials.

A further issue of relevance is the increased interest in educational psychologists’ role in direct interventions with children. Two reviews of the role of educational psychologists (Department for Education & Employment, 2000; Farrell et al., 2006) identified the value of therapeutic work and the demand for more of it. Educational psychologists themselves have published reflections on the need to engage in high quality casework (Boyle & Lauchlan, 2009), and specifically in direct therapeutic interventions (MacKay, 2007). Research into educational psychologists’ understanding and use of therapy has been conducted at the University of Manchester, with preliminary findings identifying factors which enable or impede EPs in delivering direct interventions (Atkinson, Corban, & Templeton, 2011).

Literature selection

Three databases (PsychInfo, ERIC and PubMed) were searched on 14th February 2012 using the terms child* and relax*. In total, 240 articles were returned. The results were filtered to include:

- articles published in English;
- articles published in the last 30 years (since 1982);
- articles reporting original research;
- availability of the full text must be available (thus excluding dissertation abstracts);
- articles including participants of school age;
- use of “relax” to mean aiming for physical and / or mental relaxation (thus excluding articles referring to other meanings of the word such as “relaxing the rules”);
- relaxation as an independent rather than a dependent variable; and
- articles which report some evaluative results (thus excluding descriptions of study designs or interventions without results).

Relaxation was taken to include muscle relaxation (including yoga poses), breathing exercises and imagery/visualisation, since these are techniques that can be implemented by school staff without substantial further training or equipment. Studies using methods that do require such resources, for example mindfulness, hypnosis and biofeedback, were excluded unless they also reported on use of the identified relaxation techniques.

Articles considering emotional and behavioural outcomes were selected for further analysis. Table 1 gives a summary of other outcome areas, to give a broad overview of the possible effects of relaxation for children in different circumstances.

Outcome Area	Example Study
anxiety	Parslow et. al. (2008)
asthma symptoms	Dobson et. al. (2005)
cancer-related stress	Hildenbrand et. al. (2011)
handwriting	Carter and Synolds (1974)
headache symptoms	Larsson et. al. (2005)
insomnia	Tikotzsky and Sadeh (2010)
obsessive compulsive symptoms	Freeman et. al. (2008)
pain relief	Ball et. al. (2003)
post traumatic stress	Catani et. al. (2009)
tics	Verdellen et. al. (2011)

Table 1: Studies using relaxation for outcomes other than emotional and behavioural skills

Some of the identified studies used relaxation as part of a wider intervention, such as physical exercise (Lowden, Powney, Davidson, & James, 2001) or psycho-education to improve children's understanding of their own internal states (Zaichkowsky & Zaichkowsky, 1984). Since the focus here is on relaxation alone, these multi-element designs were excluded from further analysis. The remaining 15 articles are summarised in Table 2 and analysed below.

It is clear from the summary of studies in Table 2 that there are few published studies of the effects of relaxation on behavioural and emotional outcomes, and that those come from a small number of research populations. In addition, research designs and outcome measures vary widely. The fifteen studies are discussed here with a view to identifying what they could contribute in informing practitioners' use of relaxation in schools today. The discussion is organised to address different relaxation methods: yoga, progressive muscle relaxation, visualisation and combined approaches. Several of the studies use more than one method, and these have been

placed according to the main focus of the article.

Yoga

Three empirical studies evaluated the effects of yoga on children's emotional and behavioural outcomes. Yoga is an ancient practice originating from India, which has been developed into different schools (see Galantino, Galbavy, & Quinn, 2008 for a summary of yoga forms). The key element common to all forms of yoga is holding postures, and many include breath control and meditation (Birdee et al., 2009).

Berger, Silver and Stein (2009) invited inner-city primary school children to attend after school clubs. One club involved yoga, including breathing, postures and meditation, while the other involved non-yoga physical activity and acted as a control group. Both the yoga and non-yoga clubs were run by two adults for groups of around 20 children, one hour a week for 12 weeks. It is unclear whether students were allocated to a club or chose whether to participate in yoga. The study compared the yoga and control groups at two times: pre- and post-intervention. The analysis might have been more informative had the authors included a comparison of the improvement between the two groups. For example, the authors state that, "postintervention, the yoga group had significantly better scores than the non-yoga group on the Negative Behaviours subscale (3.2 vs 2.9, $p=.04$)" (p. 40). However, the two groups differed by the same amount before the intervention (3.1 vs 2.8) which suggests that any difference between the groups may not be due to the yoga intervention. No measures other than self-report were used, making it impossible to draw reliable conclusions about whether yoga resulted in any observable behavioural changes.

A second study (Jensen & Kenny, 2004) looked specifically at using yoga with boys with ADHD. Although a randomised controlled trial was used, the authors acknowledge that the number of participants was too small to provide adequate statistical power for detecting differences between groups. It is not surprising, therefore, that their

statistical tests showed, “essentially null findings” (p. 213).

The Jensen and Kenny (2004) article, however, is useful for its insights into methodology and practical issues. The authors attempted to use actigraphy to measure whether activity levels changed as a result of the intervention. Actigraphy involves participants wearing a device on their wrists which can measure and record the amount of movement over a period of time. However, it was found that the actigraph devices were too fragile to give reliable results. The authors also note that the Test of Variables of Attention (TOVA, Greenberg et al., 1997), while claiming to be of diagnostic value for ADHD, proved neither valid nor reliable with this group. A large proportion of Jensen and Kenny’s (2004) participants obtained “invalid” scores on the TOVA due to responding too quickly, which might be expected in a group whose diagnosis includes impulsivity in the criteria.

In addition, the intervention and control groups are well described in this article, and Jensen and Kenny (2004) provide some guidance on how the implementation might have been improved. The “yoga” intervention included breathing, yoga postures, progressive muscle relaxation and visualisation. The intervention itself appeared to be acceptable to the students, and parents reported some anecdotal evidence of their children using the techniques successfully outside the sessions. The intervention was delivered weekly in a hospital setting, and the authors acknowledge that a school-based intervention might have increased participation and attendance. Providing the intervention at school may also support generalisation, since the environment could act as a cue and staff could be involved both in the sessions and in prompting the use of the techniques at other times.

A further study was found using yoga (Stueck & Gloeckner, 2005). The programme itself involved 15 one-hour sessions, each with an initial activity (breathing or focusing on parts of the body), yoga postures and closing activities. The closing activities were selected from a range

including peer massage, sensory exercises and guided visualisations. However, the authors do not report how children were assigned to groups, nor do they give a clear account of the outcome measures used. It is therefore not possible to assess the effects of their intervention programme, so the study is not included in Table 2.

A broader review of the clinical applications of yoga for children was conducted by Birdee et al (2009). Low numbers of studies and methodological shortcomings were noted for a range of outcomes and age groups. However, the findings of the current review echo Birdee et al’s (2009) conclusion that studies of yoga as an intervention, “show potential, but are far from conclusive” (p 217). Overall, the studies also reveal that the use of yoga is usually embedded within a programme including related activities such as breathing exercises and visualisation.

Progressive muscle relaxation

Progressive muscle relaxation involves focusing on one muscle group at a time, inviting the participant consciously to relax (or tense and then relax) those muscles. Six of the selected studies focus on progressive muscle relaxation: three case studies and three studies using group comparison designs. Three further studies compared progressive muscle relaxation with visualisation, and these papers are discussed in the next section.

Mullins and Christian (2001) present a single case study of a young man with autism, in which relaxation was taught in an effort to reduce disruptive behaviours. The boy was trained in progressive muscle relaxation, with a set script which he was taught to use himself. A behavioural approach was used to measure outcomes, with observations of how many steps of the script were implemented as well as observations of how many relaxed and how many disruptive behaviours were shown. This study suggests that it may be possible for young people with autism to learn how to relax, and provides some evidence that the aim of reducing disrupt-

tive behaviours was met in this case. However, the boy required cuing to practise relaxation before activities, suggesting that he had not fully mastered the skills and so had not gained any generalised benefit over the course of the study.

Two further case studies, both from the 1980s, evaluated progressive muscle relaxation with boys who had a diagnosis of hyperactivity. Donney and Poppen's (1989) three participants provide an example of parent-led training, in which the parents noted improvements. However, teacher ratings of behaviour did not change, suggesting that either the parents were experiencing positive response bias or that the behavioural improvements had not generalised beyond the home setting. Dunn and Howell (1982) do not describe the techniques taught on the relaxation audiotapes used in their intervention, but since the intervention resulted in lower electrical activity in the muscles, it could logically be assumed that muscle relaxation was involved so their study is considered here. Their study used a stronger research design, triangulating activity and concentration measures from electromyography, parent report, psychometric testing and structured observations. These case studies suggest that participants were able to learn to relax from audiotapes and from biofeedback approaches.

Of the group studies, Bornmann, Mitelman and Beer (2007) present the strongest evidence that progressive muscle relaxation can be effective in reducing behaviour problems. They worked with children referred for in-patient psychiatric services, taking all admissions over a set period for their control ($n = 23$) and then all admissions over the next period of time for their intervention ($n = 25$) groups. Progressive muscle relaxation is described as the main intervention, with drama therapy used as an introductory activity and visualisation as a plenary. The study focused on daily structured observation of aggressive behaviours at the hospital school as the outcome measure (Modified Overt Aggression Scale; Kay et al., 1988) and children who received the intervention had significantly lower

scores than those who had not. Unfortunately the authors do not report how the scores changed over time, as this would have enabled an analysis of how long participants needed to receive the intervention before reaching a plateau of fewer aggressive behaviours. In addition, follow-up data would be required in order to evaluate transfer effects outside the in-patient setting.

Lopata (2003) also concluded that progressive muscle relaxation was effective, but the selection and use of measures in this study weakened the research design. Two outcome measures were taken: observed incidents of aggression (per student per week) and the Aggression Scale from the Child Behaviour Checklist (Achenbach, 1991). On both measures, the control group showed lower levels of aggression at pre-test than the intervention group, suggesting that there were systematic differences between the groups which could confound the effects of the intervention. The Aggression scale was completed by teachers who also delivered the intervention, thus introducing potential bias in their ratings. The study would have benefited from measures taken from staff who were blind to, or at least not involved in, the intervention. In addition, the overall levels of observed aggression were low at pre-test in both groups (0.42 and 2.08 incidents per student per week), thus making it difficult to show clinically significant improvements for either group. There were follow-up data, but only for 3 weeks after the intervention had finished, so again longer-term evaluation would enable any lasting improvements or wash-out effects to be identified.

The final study (Norlander, Moas, & Archer, 2005) investigated the hypothesis that relaxation training would decrease noise levels in classrooms. As secondary outcomes, the researchers measured teachers' perceptions of how well the students in their class concentrated and pupils' perceptions of stress. The study design was unbalanced, with 84 children (5 classrooms) in the intervention group and only 11 children (one classroom) in the control group. There were systematic differences between the intervention

and control groups. For example, the control group reported significantly greater subjective stress than the intervention group before the intervention began. It is therefore difficult to draw valid conclusions about the differences between conditions. The intervention was novel, with the children being asked to do “stretch exercises”. Unfortunately the exercises are not described in enough detail to allow replication, and there is no explanation of why this technique was used rather than those described elsewhere in the literature. The authors claim that the intervention increased concentration levels, but the measure was simply to ask teachers ($n = 7$) to rate on a 9-point scale how well they felt their class were able to concentrate before and after the intervention. Given that the teachers had delivered the intervention themselves, this is a very subjective measure of concentration compared to other methods which could have been used (for example, observers blind to experimental condition, psychometric testing of sustained attention, or structured observation methods such as criterion-referenced time-sampling).

Overall, the evidence from these studies suggests that children with a range of needs can be taught successfully to use progressive muscle relaxation. There is some evidence to suggest that this type of relaxation can reduce aggression and hyperactivity, but the extent to which these effects can be generalised or sustained over time is unclear.

Visualisation

No studies were found which investigated the effects of visualisation techniques alone. However, three studies from Germany (Klein-Hessling & Lohaus, 2002; Lohaus, Klein-Hessling, Vogeles, & Kuhn-Hennighausen, 2001; Lohaus & Klein-Hessling, 2000) considered both imagery-based and progressive muscle relaxation, comparing the two methods.

The first two studies (Lohaus & Klein-Hessling, 2000; Lohaus et al., 2001) took community samples of primary school children and

trained them using either progressive muscle tensing and relaxing (PMR) or visualisation methods. Measures of physiological response were taken, as well as self-ratings of perceived wellbeing. Both studies found that visualisation produced more physiological relaxation than did PMR. However, recordings were taken during the training session itself and for only 5 minutes afterwards, meaning that data captured periods when the children were deliberately tensing their muscles in the PMR condition. It is therefore unsurprising that PMR led to an increase in heart rate. Perhaps of more relevance for the current purpose was the finding that children reported feeling calmer following both types of relaxation training, and indeed following their “neutral” condition. The description of this neutral condition suggests that the children listened quietly to stories about the natural world, which may have inadvertently induced feelings of relaxation. From a physiological point of view, then, visualisation was found to be more effective than PMR in producing a relaxation response, but in terms of subjective experience both were successful.

The second study (Klein-Hessling & Lohaus, 2002) investigated whether a longer course or explicit training in generalising the skills would enhance the impact of a relaxation programme. Again, children were trained using either PMR or visualisation. Unfortunately the basic results for pre- and post-intervention measures were not reported. The article states that there was no significant difference between interventions for any measure except heart rate, but does not report whether there was an improvement on any measure. Instead, there was an assumption that the programme would improve outcomes measured and the focus was placed on comparing experimental conditions, where no significant differences were found. Of interest to practitioners considering the use of visualisation, Klein-Hessling and Lohaus (2002) found that age correlated with physiological outcomes in children receiving this intervention. This may indicate that older children gain more benefit from visualisation than younger ones, and/or it may re-

flect maturation of children's capacity to exercise general physiological self-control.

Overall, the findings suggest that visualisation is at least as effective as progressive muscle relaxation for primary-aged children.

Combined programmes

In practice, many of the interventions reported here are combined programmes, but with an emphasis on one method of relaxation or another. However, one British team has attempted to design an explicitly multi-element relaxation course which they term the Self Discovery Programme (SDP). The SDP is described as a flexible programme which can be adapted to meet the needs of the children in the group. It includes self and peer massage, yoga postures, breathing exercises and visualisation, but notably progressive muscle relaxation is not mentioned. The SDP is aimed at children with emotional and behavioural difficulties.

The Self Discovery Programme is reported in a series of articles by Lesley Powell and colleagues (Cullen-Powell, Barlow, & Bagh, 2005; Cullen-Powell & Barlow, 2005; Powell, Gilchrist, & Stapley, 2008a; Powell, Gilchrist, & Stapley, 2008b; Powell & Potter, 2010). Although there are five reports, both of the 2008 articles appear to describe the same study. These reports describe the implementation of the SDP with children considered to have behavioural difficulties in mainstream and special schools. One study involved children aged 11-15 years; all others were conducted with primary schools.

None of these reports provides valid quantitative evidence for the effects of this programme. Of the four studies, two have no control group (Cullen-Powell et al., 2005; Powell & Potter, 2010) and one of those reports no pre- post-intervention comparisons (Cullen-Powell et al., 2005). One study with a comparison group states that the teachers chose which children would receive the intervention, resulting in systematic differences between the two groups (Cullen-Powell & Barlow, 2005). The fi-

nal study does not state how children were allocated to groups (Powell et al., 2008a). This last study provides a power calculation for how many participants would be required in order to detect a medium effect size, but unfortunately fails to recruit enough children to meet this criterion. None of the studies uses objective outcome measures; instead they use teacher report methods which could be influenced by knowledge of each child's intervention status. Generally, data trends did not reach statistical significance for pre- post- intervention change.

The qualitative comments suggest that the programme was generally received well by teachers and students. The weak study designs and null results do not mean that the programme is ineffective, but that the evidence does not yet exist to demonstrate effectiveness. Given the apparent difficulties in carrying out a group design study, it might be more useful to adopt a case-study approach to measure each child's outcomes systematically over time.

Literature summary

The research evidence to support relaxation as an intervention to improve emotional and behavioural outcomes for children is limited and often methodologically weak. Results suggest that children can learn to relax physiologically and mentally, but the effects of such relaxation on emotional and behavioural outcomes are not yet established. There is no evidence to suggest that one method of relaxation is superior to another.

Research issues

A key difficulty in using this evidence base for practice is that research rarely evaluates different methods of relaxation. Although a small number of studies have compared approaches (Dunn & Howell, 1982; Klein-Hessling & Lohaus, 2002; Lohaus & Klein-Hessling, 2000; Lohaus et al., 2001), most use a combined programme which cannot distinguish the effects of breathing, yoga postures, visualisation and muscle relaxation. It

is therefore not yet possible to make practice recommendations about how best to spend time on relaxation. Further studies could add to our understanding of whether each of these relaxation techniques works on its own, and whether they have a greater effect in combination.

It may be that different children respond better to different methods of relaxation. To investigate this possibility, research would need to employ individualised analysis rather than group comparisons. Mixed qualitative and quantitative methods may be useful, to identify which children benefited from which interventions, and then theorise possible reasons for these individual differences.

These methodological issues are relevant within the field of relaxation - specifically. Similar issues occur in evaluations of wider programmes. As King, Ollendick, Murphy and Molloly (1998) note, relaxation often forms part of cognitive-behavioural intervention programmes, but the individual elements of the programme are not evaluated. This observation means that there could be a much greater evidence base for relaxation, if we were able to tease out its effects within a broader intervention.

A further issue with this field of research is identifying and measuring the desired outcomes. First, it could be helpful to distinguish between proximal and distal outcomes: did the children learn to relax during the sessions, and if so, has this affected their behaviour outside relaxation sessions? Some studies have successfully incorporated measures of outcomes at different levels (Dunn & Howell, 1982), which enable empirical assessment of a theoretical model. For example, if participants improved on classroom behaviour measures, but not on physiological or self-report measures of relaxation, then the hypothesis that relaxation caused the behavioural improvement would have to be re-examined.

Table 2 demonstrates a wide variation in outcome measures, within just the 15 studies which met the inclusion criteria for this review. While some research employs widely used and well-validated measures, such as Goodman's (1997)

Strengths and Difficulties Questionnaire (Powell et al., 2008a; Powell & Potter, 2010), others use their own questionnaires (e.g. Norlander et al., 2005; Klein-Hessling & Lohaus, 2002). These variations make it difficult to compare data between studies and, in the case of tailored measures, ascertain reliability and validity (e.g. Berger, Silver, & Stein, 2009). Access to unstandardised measures should be made available so that the research can be properly scrutinised and can be replicated. Alternatively (or additionally) researchers could make use of established tools commonly found in the wider literature on evaluating interventions to improve child behaviour, such as the Eyberg Child Behaviour Inventory (Eyberg & Ross, 1978).

Another issue with the outcome measurements in this literature review is the length of follow-up. Most studies provide pre- and post-intervention data, but few continue to monitor children's use of the techniques or behavioural change after the end of the intervention. Of the 15 studies meeting the criteria for inclusion in this review, nine collected no data after the immediate post-intervention measures were taken. Those which did report follow-up data ranged from 3 weeks to 24 weeks after the end of the intervention. Physiological measures showed that short-term improvements had washed out after 2 months without relaxation sessions (Klein-Hessling & Lohaus, 2002; Lohaus & Klein-Hessling, 2000). Behavioural ratings and observations have shown more sustained improvements, which may reflect the participants continuing to use the relaxation techniques in these studies (Donney & Poppen, 1989; Lopata, 2003; Mullins & Christian, 2001; Powell et al., 2008a). An alternative possibility is that relaxation prompts other changes which sustain behavioural improvement, such as a change in the way adults perceive the child's ability to be still.

Future research directions

Gaps which could be addressed in future research include:

- comparing the effects of specific relaxation techniques, such as breathing, yoga poses, progressive muscle relaxation and visualisation;
- testing whether a combined programme is more effective than any individual technique;
- identifying individual differences in responses to relaxation interventions;
- comparing the effects of relaxation on different groups of children, for example different age groups or genders;
- evaluating proximal and distal outcomes of relaxation; programmes, such as physiological responses and behavioural responses;
- use of standardised measures to assess emotional and behavioural outcomes;
- longer-term follow-up studies, and
- systematic investigation of how long and how frequent an effective relaxation programme needs to be, which may vary by characteristics such as the age of the children or the types of difficulties they are experiencing.

Practice issues

Practitioners need to know how to identify children who might benefit from relaxation, what methods to use, how to organise the intervention sessions (including duration, frequency, group size) and how to evaluate the success of the intervention. The current evidence base provides limited guidance in these areas.

In terms of identifying children, very little attention has been paid in the research to analysing which participants benefit from relaxation. For research purposes, often community samples are used or children are selected by their teachers as having behavioural difficulties. Some studies used psychiatric criteria to select their participants, but none has compared the effects of

relaxation on different groups (for example, to investigate whether children with a diagnosis of hyperactivity have similar responses to relaxation compared to those without a diagnosis), nor probed beyond group outcome trends to explore individual differences in response to intervention, and factors which may have contributed toward these.

The research challenges of teasing out the effects of each relaxation technique have already been discussed. Almost all the studies use a combination of breathing, direct muscle relaxation and visualisation approaches, which makes it impossible to give recommendations about which might be more effective. Two studies have compared different relaxation techniques (Lohaus et al., 2001; Lohaus & Klein-Hessling, 2000), finding that all the methods they tried were about equally effective. No published research has yet addressed the practical question of whether a combination of relaxation techniques is more effective than teaching children to use just one method.

Turning now to logistical issues, there is little evidence to inform how often sessions should be held, for how long and for how many weeks. Programmes in the selected studies range from twice daily for four weeks (Norlander et al., 2005), to 16 sessions over 12 months (Cullen-Powell et al., 2005). Interestingly, most of the interventions added up to around 12 hours of direct work.

One study (Klein-Hessling & Lohaus, 2002) did attempt to identify variables which affected the success of their participants in achieving a relaxed physiological state. They looked at pre-intervention variables, compared different methods of relaxation and varied the length and frequency of programmes. In its attempt to analyse a large number of variables in one study, this research does demonstrate that these practical questions can be systematically investigated. The disadvantage of trying to research technique (direct muscle relaxation vs visualisation); programme duration (5 vs 10 weeks); and frequency (tapes to use at home vs no additional input) in a 2x2x2 design is that there are few children

in each condition, in this case only $n = 16$ in each condition, despite the relatively large overall sample size of 128.

In the absence of other studies addressing these issues, Klein-Hessling and Lohaus' (2002) results are discussed here wherever they give some direction for practice. First, older (Year 6) children and those with higher pre-intervention anxiety tended to benefit more from visualisation techniques than younger (Year 4) and less anxious children. However, analysis revealed no consistent trend by age, gender or any of the other characteristics measured, for outcomes of progressive muscle relaxation. Although further research is needed to investigate individual differences in response to relaxation, this study might suggest that programmes could include progressive muscle relaxation for everyone and introduce visualisation techniques only for the over-10s. Only very small effects of overall intervention duration or frequency were found by Klein-Hessling and Lohaus (2002), suggesting that a shorter programme might be just as effective (and more efficient) than carrying on beyond a half-term. Again, this finding remains to be confirmed, and it may be that some children need more sessions than others in order to gain any benefit.

This literature review does provide some ideas about evaluation tools that practitioners could use. While the variety of outcome measures makes it difficult to compare studies, it does offer a range of possibilities for practitioners to consider. For example, Bornmann, Mitelman and Beer (2007) used the Modified Overt Aggression Scale, which was developed for inpatient observation, but could be a useful model for a school-based observation schedule. Powell, Gilchrist and Stapley (2008a) demonstrate that the widely used Strengths and Difficulties Questionnaire (Goodman, 1997) can be sensitive to change over a 7-month period and could be particularly useful if completed by informants who are not involved in delivering the intervention. The only standardised self-report measure used in the selected studies was the Harter Self-Perception Scales (Harter, 1985), used by Berger

et al (2009), which did not show any change after 12 weekly sessions of yoga.

Guidance for practitioners

This review provides little evidence that practitioners can draw upon with confidence, to select and / or design relaxation interventions with confidence. Indeed, the evidence that relaxation itself can affect emotional and behavioural outcomes is extremely limited. Practitioners should be clear that any relaxation intervention intended to improve behaviour would be exploratory rather than evidence-based. If practitioners do wish to try a relaxation intervention, perhaps to generate data for a local evaluation, from the literature available the following guidelines could be suggested:

- Include a range of relaxation methods, since they all appear to be effective at a group level (Lohaus & Klein-Hessling, 2000; Lohaus et al., 2001) and children are more likely to find one that suits them if given several options.
- Progressive muscle relaxation should be included for all ages as it appears to be something that most school-aged children can do straight away (Dunn & Howell, 1982; Lohaus et al., 2001).
- Visualisation could be introduced as well, although younger children may not benefit as much as older children at the beginning (Klein-Hessling & Lohaus, 2002).
- Relaxation as a universal intervention is not consistently found to have an impact on emotional and behavioural outcomes (possibly due to ceiling effects) and training effects reduce over time (Klein-Hessling & Lohaus, 2002; Lohaus & Klein-Hessling, 2000) – so intervention targeted at those with difficulties is likely to be more effective.
- Children with ADHD (Donney & Poppen, 1989), learning difficulties (Cullen-Powell et

al., 2005) challenging behaviour (Powell & Potter, 2010), autism (Mullins & Christian, 2001) and psychiatric problems (Bornmann, Mitelman, & Beer, 2007) can all be taught to relax, so relaxation should be considered as a possible intervention for these groups.

- Evaluation tools can be chosen which help to identify which children to include in the intervention, and which relate to the intended outcomes of the intervention, e.g. SDQ (Goodman, 1997).
- Monitor progress towards intended outcomes, since a short intervention may be effective and could therefore be discontinued once the goals have been achieved (Klein-Hessling & Lohaus, 2002).

Concluding comments

The literature on using relaxation to help children with emotional and behavioural difficulties is remarkably sparse, and it is not possible to conclude that teaching relaxation in general is likely to improve children's emotional and/or behavioural outcomes. We have much to learn about how best to intervene and how to tailor programmes for particular children. Suggestions for future research and practice guidelines have been made, albeit based on this small existing literature. Additions to this scant body of evidence would be very welcome, and well-designed case studies as well as larger trials may be very useful in answering some of the remaining questions.

Correspondence

Rebecca Ashton ashtonpsychology@yahoo.co.uk

Appendix 1

Reference	Participants	Study design	Relaxation methods	Outcome measures
Berger, Silver and Stein (2009)	Inner city primary school students in after-school programmes, n = 71	Non-randomised controlled trial	Yoga techniques (group)	Harter's Self Worth and Physical Appearance subscales (Harter, 1985) and unstandardised self-report scales
Bornmann, Mitelmann and Beer (2007)	Children admitted for in-patient psychiatric treatment aged 5-13, n = 48	Non-randomised controlled trial	Drama therapy, progressive muscle relaxation, visualisation and art	Staff report using Modified Overt Aggression Scale (Kay, Wolkenfeld, and Murrill, 1988)
Cullen-Powell and Barlow (2005)	Children already receiving learning and behaviour support aged 6-8 years, n = 18	Non-randomised controlled trial	Self-discovery programme (includes massage, breathing, yoga postures and reflections)	Observations of classroom behaviour, unstandardised behavioural profile and SDQ (Goodman, 1997), both by teacher report.
Cullen-Powell, Barlow and Bagh (2005)	Children judged in need of additional learning support aged 10-13, n = 34	Intervention study, no comparison group or direct pre-post measures	Self-discovery programme (includes massage, breathing, yoga postures and reflection)	Observations of children's use of relaxation techniques, focus group reviews with teachers
Donney and Poppen (1989)	Boys with a diagnosis of ADHD aged 8-10 years, n = 3	AB case study (baseline and intervention) design	Direct teaching of the ten relaxation behaviours in the Behavioral Relaxation Scale	Electromyograph recordings of muscle tension, Conners Parent Scale (Goyette, Conners, and Ulrich, 1978), Home and School Situations Questionnaire (Barkley, 1981)
Dunn and Howell (1982)	Boys with a diagnosis of hyperactivity aged 6-12 years, n = 10	AB case study design	Biofeedback, relaxation tapes or both	Electromyograph recordings of muscle tension, observations of a set task, Bender Gestalt Visual Motor Test (Bender, 1938), Weschler Intelligence Scales for Children (WISC) subtests (Wechsler, 1974) and parent ratings of hyperactivity (Davids, 1971).
Jensen and Kenny (2004)	Boys with a diagnosis of ADHD aged 8-13 years, n = 19	Randomised controlled trial	Yoga techniques (group)	Conners Rating Scales (Conners, 1997) and Test of Variables of Attention (Greenberg, Corman, and Kindschi, 1997)

Klein-Hessling and Lohaus (2002)	Children aged 9-12 years, n = 128	Randomised controlled trial	Progressive muscle relaxation or visualisation (audiotapes)	Heart rate, skin temperature, skin conductance, unstandardised self-report of mood, well-being and stress
Lohaus and Klein-Hessling (2000)	Children aged 7-14 years, n = 826	Non-randomised controlled trial	Progressive muscle relaxation or visualisation (audiotapes)	Heart rate, skin temperature, skin conductance, unstandardised self-report of mood, well-being and stress
Lohaus, Klein-Hessling, Vogele and Kuhn-Hennighausen (2001)	Children aged 9-13 years, n = 64	Randomised controlled trial	Progressive muscle relaxation or visualisation (audiotapes)	Heart rate, skin temperature, skin conductance, unstandardised self-report of mood and well-being
Lopata (2003)	Children attending a special school for emotional and behavioural difficulties aged 6-9 years, n = 24	Non-randomised controlled trial	Progressive muscle relaxation	Observed frequency of aggression, Child Behavior Checklist (Achenbach, 1991)
Mullins and Christian (2001)	12-year-old boy with autism, n = 1	Single case with three training conditions	Progressive muscle relaxation	Observation using Behavioral Relaxation Scale (Poppen, 1998)
Norlander, Moas and Archer (2005)	School children in 4th-6th year classes, n = 95	Non-randomised controlled trial	Stretching exercises, counting breaths	Noise levels in classrooms, unstandardized questionnaires for self-report of stress and teacher report of concentration
Powell and Potter (2010)	Boys attending a special school for emotional and behavioural difficulties aged 11-15 years, n = 36	Intervention study, no comparison group	Self-discovery programme (includes massage, breathing, yoga postures and reflections)	Unstandardised behavioural profile and SDQ (Goodman, 1997), both by teacher report. Unstandardised self-report scale.
Powell, Gilchrist and Stapley (2008a); Powell, Gilchrist and Stapley (2008b)	Children with special needs aged 8-11 years, n = 107	Non-randomised controlled trial	Self-discovery programme (includes massage, breathing, yoga postures and reflections)	Unstandardised behavioural profile and SDQ (Goodman, 1997), both by teacher report.

Table 2: Studies using relaxation for emotional and behavioural skills

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