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Behavioural and cognitive-behavioural interventions for outwardly-directed aggressive behaviour in people with intellectual disabilities (Review)

Ali A, Hall I, Blickwedel J, Hassiotis A

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Behavioural and cognitive-behavioural interventions for outwardly-directed aggressive behaviour in people with intellectual disabilities (Review)

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[Intervention Review]

Behavioural and cognitive-behavioural interventions for outwardly-directed aggressive behaviour in people with intellectual disabilities

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ABSTRACT

Background

Outwardly-directed aggressive behaviour is a significant part of problem behaviours presented by people with intellectual disabilities. Prevalence rates of up to 50% have been reported in the literature, depending on the population sampled. Such behaviours often run a long-term course and are a major cause of social exclusion. This is an update of a previously published systematic review (see Hassiotis 2004; Hassiotis 2008).

Objectives

To evaluate the efficacy of behavioural and cognitive-behavioural interventions on outwardly-directed aggressive behaviour in people with intellectual disabilities when compared to standard intervention or wait-list controls.

Search methods

In April 2014 we searched CENTRAL, Ovid MEDLINE, Embase, and eight other databases. We also searched two trials registers, checked reference lists, and handsearched relevant journals to identify any additional trials.

Selection criteria

We included studies if more than four participants (children or adults) were allocated by random or quasi-random methods to either intervention, standard treatment, or wait-list control groups.

Data collection and analysis

Two review authors independently identified studies and extracted and assessed the quality of the data.

Main results

We deemed six studies (309 participants), based on adult populations with intellectual disabilities, suitable for inclusion in the current version of this review. These studies examined a range of cognitive-behavioural therapy (CBT) approaches: anger management (three studies (n = 235); one individual therapy and two group-based); relaxation (one study; n = 12), mindfulness based on meditation (one study; n = 34), problem solving and assertiveness training (one study; n = 28). We were unable to include any studies using behavioural interventions. There were no studies of children.

Only one study reported moderate quality of evidence for outcomes of interest as assessed by the Grades of Recommendations, Assessment, Development and Evaluation (GRADE) approach. We judged the evidence for the remaining studies to be of very low to low quality. Most studies were at risk of bias in two or more domains: one study did not randomly allocate participants and in two studies the process of randomisation was unclear; in one study there was no allocation concealment and in three studies this was unclear; blinding of assessors did not occur in three studies; incomplete outcome data were presented in one study and unclear in two studies; there was selective reporting in one study; and other biases were present in one study and unclear in four studies.

Three of the six studies showed some benefit of the intervention on improving anger ratings. We did not conduct a meta-analysis, as we considered the studies too heterogeneous to combine (e.g. due to differences in the types of participants, sample size interventions, and outcome measures).

Follow-up data for anger ratings for both the treatment and control groups were available for two studies. Only one of these studies ($n = 161$) had adequate long-term data (10 months), which found some benefit of treatment at follow-up (continued improvement in anger coping skills as rated by key workers; moderate-quality evidence).

Two studies ($n = 192$) reported some evidence that the intervention reduces the number of incidents of aggression and one study ($n = 28$) reported evidence that the intervention improved mental health symptoms.

One study investigated the effects of the intervention on quality of life and cost of health and social care utilisation. This study provided moderate-quality evidence, which suggests that compared to no treatment, behavioural or cognitive-behavioural interventions do not improve quality of life at 16 weeks ($n = 129$) or at 10 months follow-up ($n = 140$), or reduce the cost of health service utilisation ($n = 133$).

Only one study ($n = 28$) assessed adaptive functioning. It reported evidence that assertiveness and problem-solving training improved adaptive behaviour.

No studies reported data on adverse events.

Authors' conclusions

The existing evidence on the effectiveness of behavioural and cognitive-behavioural interventions on outwardly-directed aggression in children and adults with intellectual disabilities is limited. There is a paucity of methodologically sound clinical trials and a lack of long-term follow-up data. Given the impact of such behaviours on the individual and his or her support workers, effective interventions are essential. We recommend that randomised controlled trials of sufficient power are carried out using primary outcomes that include reduction in outward-directed aggressive behaviour, improvement in quality of life, and cost effectiveness.

PLAIN LANGUAGE SUMMARY

Behavioural and cognitive-behavioural therapies for treating aggressive behaviour in people with intellectual disabilities

Review question

This review is an update of a previous version. The aim of the review was to find out whether behavioural and cognitive-behavioural therapies are more effective in reducing aggressive behaviour in adults and children with intellectual disabilities, compared to a control group that received no intervention.

Background

Challenging behaviour is a significant cause of social exclusion for people with intellectual disabilities. There is no firm evidence about which therapies are most helpful in reducing aggressive behaviour in people with intellectual disabilities.

Study characteristics

We searched a number of electronic databases in April 2014 to ensure that the review was up-to-date. We included six studies in the review with a total number of 309 participants. Three studies examined anger management, one study examined assertiveness training and problem solving, one study examined 'mindfulness' based on meditation, and one study examined modified relaxation. All the studies were conducted in community settings apart from one, which was conducted in a forensic inpatient setting. Five of these studies were small, comprising between 12 and 40 participants, and one was a large study of 179 participants, which was funded by the National Institute for Health Research (NIHR) Health Technology Assessment (HTA) programme. Information on funding was not available for the other studies. Follow-up data were available only for two studies.

Key results

We found improved outcomes in five studies, including reduction in anger ratings and in aggressive incidents, at the end of treatment. One study found improvements in anger coping skills as reported by key workers at 16 weeks and 10 months, but no other long-term benefit. One large study did not find improvements in quality of life or reduced costs to health services. Due to differences in the types of interventions, populations and assessments, we could not combine the results of the studies.

Quality of evidence

There was one large study which presented moderate-quality data on the outcomes of interest. The other included studies were small and of poor methodological quality. Based on a 'Grades of Recommendation, Assessment, Development and Evaluation' (GRADE) assessment, we judged the quality of evidence on the outcomes of interest to range from very low to moderate quality. Moreover, the diversity of the interventions and participant groups makes it difficult for us to draw firm conclusions about the effectiveness of any particular approach. Therefore, more good-quality studies with longer-term follow-up data are needed.

SUMMARY OF FINDINGS

Summary of findings for the main comparison.

Anger management using cognitive-behavioural therapy compared with wait-list control group for outwardly-aggressive behaviour

Patient or population: People with learning disability and outwardly-directed aggressive behaviour*

Settings: Community settings

Intervention: Anger management

Comparison: Wait-list control group

Outcomes	Illustrative comparative risks* (95% CI)		Relative effect (95% CI)	Number of participants (studies)	Quality of the evidence (GRADE)	Comments
	Assumed risk	Corresponding risk				
	Wait-list control group	Anger management intervention group				
Aggressive behaviour: Severity of incidents: Modified Overt Aggression Scale (MOAS) - key worker report: Post-treatment	The mean score in the control group was 8.3	The mean score was 1.70 higher in the intervention group (2.55 lower to 5.95 higher)		158 (1 study)	⊕⊕⊕⊖ moderate ¹	
Ability to control anger: Provocation Inventory (PI) - self report: Post-treatment (scale range 0 to 75; higher scores indicate higher levels of aggression)	The mean score was 47.8 in the control group	The mean score in the intervention groups was 6.30 lower (13.53 lower to 0.93 higher)		162 (1 study)	⊕⊕⊕⊖ moderate ¹²	
Ability to control anger: Provocation Inventory (PI) - key worker report: Post-treatment (scale range 0 to 75; higher scores indicate higher levels of aggression)	The mean score in the control group was 37.7	The mean score was 6.90 lower (13.09 to 0.71 lower)		161 (1 study)	⊕⊕⊕⊖ moderate ^{1,2}	
Mental state: Depression: Post-treatment	The mean score in the control group was 9.8	The mean score in the intervention group was 0.70 lower (3.06 lower to 1.66 higher)		157 (1 study)	⊕⊕⊕⊖ moderate ¹	

(Glasgow Depression Scale for people with an Intellectual Disability (GDS-ID); scale range 0 to 40; higher scores indicate more depressive symptoms)				
Mental state: Anxiety: Glasgow Anxiety Scale for people with an intellectual disability (GAS-ID): Post-treatment (scale range 0 to 54; higher score indicates more anxiety symptoms)	The mean score in the control group was 18.3	The mean score in the intervention group was 2.30 lower (5.39 lower to 0.79 higher)	154 (1 study)	⊕⊕⊕⊖ moderate ¹
Quality of life - self reported: Comprehensive Quality of Life Scale: Intellectual Disability (COMQoL-ID: Post-treatment)	The mean score in the control group was 99.9	The mean score in the intervention group was 5.60 lower (18.11 lower to 6.91 higher)	129 (1 study)	⊕⊕⊕⊖ moderate ^{1,2}
Cost of service utilisation: Client Service Receipt Inventory (CSRI): Cost per person per week of health and social care resource (in British Pounds):10-month follow-up	The mean score in the control group was 867.09	The mean score in the intervention group was 102.99 higher (117.16 lower to 16.323 higher)	133 (1 study)	⊕⊕⊕⊖ moderate ^{1, 2}
*The basis for the assumed risk (e.g. the median control group risk across studies) is provided in footnotes. The corresponding risk (and its 95% confidence interval) is based on the assumed risk in the comparison group and the relative effect of the intervention (and its 95% CI). CI: confidence interval; COMQoL-ID: Comprehensive Quality of Life Scale - Intellectual Disability; GAS-ID: Glasgow Anxiety Scale - Intellectual Disability; GDS-ID: Glasgow Depression Scale - Intellectual Disability; GRADE: Grades of Recommendation, Assessment, Development and Evaluation; MOAS: Modified Overt Aggression Scale; PI: Provocation Inventory GRADE Working Group grades of evidence High quality: Further research is very unlikely to change our confidence in the estimate of effect. Moderate quality: Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate. Low quality: Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate. Very low quality: We are very uncertain about the estimate.				

¹Results based on 1 study.

²Imprecision (wide CIs).

Summary of findings 2.

Anger management using cognitive-behavioural therapy compared with a wait-list control group for outwardly-aggressive behaviour

Patient or population: Participants with learning disabilities with outwardly-directed aggressive behaviour

Settings: Forensic settings

Intervention: Anger management

Comparison: Wait-list control group

Outcomes	Illustrative comparative risks* (95% CI)		Relative effect (95% CI)	Number of participants (studies)	Quality of the evidence (GRADE)	Comments
	Assumed risk	Corresponding risk				
	Wait-list control group	Anger management intervention group				
Ability to control anger: Provocation Inventory (PI) - Total score: Post-treatment (higher scores indicate more aggression)	The mean score in the control group was 70.7	The mean score in the intervention group was 8.70 lower (19.27 lower to 1.87 higher)		36 (1 study)	⊕⊕⊕⊕ very low ^{1 2 3}	
Ability to control anger: Ward Anger Rating Scale (WARS) - staff report: Post-treatment (higher scores indicate more anger)	The mean score in the control group was 6.75	The mean score in the intervention group was 2.06 lower (5.50 lower to 1.38 higher)		36 (1 study)	⊕⊕⊕⊕ very low ^{1 2 3}	
Mental state: Depression; Mental state: Anxiety	Not estimable	Not estimable				No studies available
Quality of life	Not estimable	Not estimable				No studies available

Cost of service utilisation	Not estimable	Not estimable	No studies available

*The basis for the **assumed risk** (e.g. the median control group risk across studies) is provided in footnotes. The **corresponding risk** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

CI: Confidence interval; **GRADE:** Grades of Recommendation, Assessment, Development and Evaluation

GRADE Working Group grades of evidence

High quality: Further research is very unlikely to change our confidence in the estimate of effect.

Moderate quality: Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.

Low quality: Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.

Very low quality: We are very uncertain about the estimate.

¹Results based on 1 small study.

²Risk of bias due to lack of blinding of assessors and no intention-to-treat analysis.

³Imprecision of results (wide CIs).

Summary of findings 3.

Assertiveness and problem solving compared with a no-treatment control group for outwardly-directed aggressive behaviour

Patient or population: Participants with learning disabilities and outwardly aggressive behaviour

Settings: Community settings

Intervention: Assertiveness and problem solving

Comparison: No-treatment control group

Outcomes	Illustrative comparative risks* (95% CI)		Relative effect (95% CI)	Number of participants (studies)	Quality of the evidence (GRADE)	Comments
	Assumed risk	Corresponding risk				
	No-treatment control group	Assertiveness and problem solving intervention group				
Ability to control anger: Role Play Test (RPT) of Anger Arising Situations: Post-treatment (range of scale 5 to 35;	The mean score in the control group was 13.70	The mean score in the intervention group was 11.69 higher (7.06 to 16.32 higher)		28 (1 study)	⊕⊕⊕⊕ low ^{1 2}	

higher score indicates better response)				
Ability to control anger: Problem-Solving Task (PST): Post-treatment (range of scale 0 to 100; higher scores indicate a better response)	The mean score in the control group was 41	The mean score in the intervention group was 24.84 higher (10.18 to 39.50 higher)	28 (1 study)	⊕⊕⊕⊕ low ^{1 2}
Mental state: Psychiatric symptoms: Brief Symptom Inventory (BSI): Post-treatment (higher scores indicate more symptoms)	The mean score in the control group was 1.22	The mean score in the intervention group was 0.48 lower (0.79 to 0.17 lower)	28 (1 study)	⊕⊕⊕⊕ low ^{1 2}
Mental state: Psychological distress: Subjective Units of Distress Scale (SUDS): Post-treatment (higher scores indicate more symptoms)	The mean score in the control group was 7.4	The mean score in the intervention group was 4.36 lower (6.85 to 1.87 lower)	28 (1 study)	⊕⊕⊕⊕ low ^{1 2}
Quality of life	Not estimable	Not estimable	0	No studies available
Cost of service utilisation	Not estimable	Not estimable	0	No studies available

*The basis for the **assumed risk** (e.g. the median control group risk across studies) is provided in footnotes. The **corresponding risk** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

BSI: Brief Symptom Inventory; **CI**: Confidence interval; **GRADE**: Grades of Recommendation, Assessment, Development and Evaluation; PST: Problem-Solving Task; RPT: Role Play Test; SUDS: Subjective Units of Distress Scale

GRADE Working Group grades of evidence

High quality: Further research is very unlikely to change our confidence in the estimate of effect.

Moderate quality: Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.

Low quality: Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.

Very low quality: We are very uncertain about the estimate.

¹Results based on 1 small study.
²Imprecision of results (wide CIs).

Summary of findings 4.

Meditation based on mindfulness compared with a wait-list control group for outwardly-directed aggressive behaviour

Patient or population: Participants with learning disabilities and outwardly-directed aggressive behaviour

Settings: Community settings

Intervention: Meditation based on mindfulness

Comparison: Wait-list control group

Outcomes	Illustrative comparative risks* (95% CI)		Relative effect (95% CI)	Number of participants (studies)	Quality of the evidence (GRADE)	Comments
	Assumed risk	Corresponding risk				
	Wait-list control group	Meditation based on mindfulness intervention group				
Aggressive behaviour: Frequency of incidents: Number of incidents of physical aggression per week during treatment (12 weeks): Post-treatment	The mean score in the control group was 5.80	The mean score in the intervention group was 2.80 lower (4.37 to 1.23 lower)		34 (1 study)	⊕⊕⊕⊕ low ^{1 2}	
Aggressive behaviour: Frequency of incidents: Number of incidents of verbal aggression per week during treatment (12 weeks): Post-treatment	The mean score in the control group was 6.1	The mean score in the intervention group was 3.3 lower (5.05 to 1.55 lower)		34 (1 study)	⊕⊕⊕⊕ low ^{1 2}	
Mental state: Depression; Mental state: Anxiety	Not estimable	Not estimable		0		No studies available
Quality of life	Not estimable	Not estimable		0		No studies available

Cost of service utilisation	Not estimable	Not estimable	0	No studies available

*The basis for the **assumed risk** (e.g. the median control group risk across studies) is provided in footnotes. The **corresponding risk** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

CI: Confidence interval; **GRADE:** Grading of Recommendation, Assessment, Development and Evaluation

GRADE Working Group grades of evidence

High quality: Further research is very unlikely to change our confidence in the estimate of effect.

Moderate quality: Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.

Low quality: Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.

Very low quality: We are very uncertain about the estimate.

¹Results based on 1 small study.

²Randomisation and concealment of allocation unclear. Lack of blinding of assessors.

Summary of findings 5.

Modified relaxation training compared with no-treatment for outwardly-directed aggressive behaviour

Patient or population: Participants with learning disability with outwardly-directed aggressive behaviour

Settings: Community settings

Intervention: Modified relaxation training

Comparison: No-treatment control group

Outcomes	Illustrative comparative risks* (95% CI)		Relative effect (95% CI)	Number of participants (studies)	Quality of the evidence (GRADE)	Comments
	Assumed risk	Corresponding risk				
	No-treatment control group	Modified relaxation training intervention group				
Aggressive behaviour: Frequency of incidents: Number of incidents of all types of disruptive behaviour per person per 30 minutes of ob-	The mean score in the control group was 10.9	The mean score in the intervention group was 7.3 lower		10 (1 study)	⊕⊕⊕⊕ very low ¹²³	P value stated in the paper was 0.04. SD not available therefore CIs could not be calculated

servation: Post-treatment					
Aggressive behaviour: Frequency of incidents: Number of incidents of verbal disruptive behaviour per person per 30 minutes: Post-treatment	The mean score in the control group was 5.4	The mean score in the intervention group was 2.9 lower	10 (1 study)	⊕⊕⊕⊕ very low ¹²³	P value stated in the paper was 0.03. SD not available therefore CIs could not be calculated
Mental state: Depressive; Mental state: Anxiety	Not estimable	Not estimable	0		No studies available
Quality of life	Not estimable	Not estimable	0		No studies available
Cost of service utilisation	Not estimable	Not estimable	0		No studies available

*The basis for the **assumed risk** (e.g. the median control group risk across studies) is provided in footnotes. The **corresponding risk** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

CI: Confidence interval; **GRADE:** Grading of Recommendation, Assessment, Development and Evaluation; **SD:** Standard deviation

GRADE Working Group grades of evidence

High quality: Further research is very unlikely to change our confidence in the estimate of effect.

Moderate quality: Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.

Low quality: Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.

Very low quality: We are very uncertain about the estimate.

¹Results based on 1 very small study.

²Randomisation and concealment of allocation unclear. Selective reporting of data (e.g. SDs and CIs not given and data on follow up limited).

³Imprecision of results likely (CIs could not be estimated).

BACKGROUND

Description of the condition

Intellectual disabilities

Intellectual disabilities, also known as 'learning disabilities' in the UK, are defined as a condition of global cognitive delay that occurs during the developmental period. It is associated with low cognitive ability as indicated, for example, by an intelligence quotient (IQ) below 70 on an appropriately standardised and administered test. It is also characterised by additional deficits in areas of adaptive functioning such as education, occupation, self direction, personal relationships, and community utilisation. Intellectual disabilities are known as 'Mental Retardation' in the International Classification of Diseases, 10th Revision (ICD-10) (WHO 1993) and as 'Intellectual Disability' in the Diagnostic and Statistical Manual of the American Psychiatric Association, Fifth Edition (DSM-5) (APA 2013). We use the term 'Intellectual disabilities' throughout the present review as it is used internationally.

Problem behaviours in people with intellectual disabilities

Challenging behaviour is a term used to describe longstanding patterns of maladaptive behaviour in people with intellectual disabilities. While not currently a diagnostic entity, it is nonetheless considered a potential comorbidity in people with intellectual disabilities in the DSM-5 (APA 2013). However, the ICD-10 provides a diagnostic code, not only for 'Repetitive Self Injury', but also 'Aggression towards Other' (WHO 1993).

The social perspective of challenging behaviour is very important because it is the complex interaction between the individual and the setting in which he or she lives that determines whether a behaviour is considered to be unacceptable. It will, for example, have to be interpreted as frightening or distressing by another person (RCPsych 2007). Emerson 1995 emphasised this 'two-way' interaction between the individual and his or her environment in his definition of challenging behaviour:

"It refers to culturally abnormal behaviour of such intensity, frequency or duration that the physical safety of the person or others is likely to be placed in serious jeopardy, or behaviour which is likely to seriously limit the use of, or result in the person being denied access to, ordinary community facilities"

In clinical practice in the United Kingdom (UK) and Ireland, the consensus Diagnostic Criteria for behavioural and mental disorders in Learning Disabilities (DC-LD (RCPsych 2001)) have adopted the following general diagnostic criteria for problem behaviours in people with intellectual disabilities:

A The problem behaviour is of significant frequency, severity or chronicity as to require clinical assessments and special interventions or support;

B The problem behaviour must not be a direct consequence of other psychiatric disorders (for example, pervasive developmental disorders, non-affective psychotic disorders, depressive episode, generalised anxiety disorders, personality disorders), drugs or physical disorders;

C One of the following must be present:

- the problem behaviour results in significant negative impact on the person's quality of life or that of others
- the problem behaviour presents significant risks to the health or safety of the person or others

D The problem behaviour is persistent and pervasive.

Throughout this systematic review, we use the term 'problem behaviours' to refer to challenging behaviour.

A wide range of problem behaviours may occur in people with intellectual disabilities. These include:

1. physically aggressive behaviour;
2. destruction of environment;
3. self injury;
4. sexually inappropriate behaviour;
5. offending type behaviour (arson, stealing, other crime);
6. other (may include behaviour problems as varied as ripping clothes, eating non-edible objects, mannerisms or bizarre rituals) (RCPsych 2001).

It has been shown that several problem behaviours can coexist in the same individual (Borthwick-Duffy 1994). Severity has been shown to correlate with level of IQ, gender, institutional setting, age, and other disabilities. Problem behaviours may also form part of the phenotype of specific genetic disorders such as overeating in Prader-Willi syndrome or severe self injury in Lesch-Nyhan syndrome. Behaviours associated with specific genetic conditions are sometimes referred to as a 'behavioural phenotype' for that condition (Skuse 2002). McClintock 2003 also identified a series of predictors for problem behaviours in people with intellectual disabilities in a meta-analytic study, such as male gender, deficit in expressive communication, and a diagnosis of autism, which appeared to be particularly associated with aggressive behaviour. Jones 2008 replicated some of the previous findings and found, in addition, that problem behaviours were associated with female gender, living in shared-care settings or with a paid carer (rather than with family), not having Down Syndrome or severe physical disability, and suffering from urinary incontinence and visual impairment.

The prevalence of problem behaviours in school children has been reported to range from 8.2% if severe to 22.2% if less severe (Kiernan 1994). Studies of adult populations with intellectual disabilities have shown a variable prevalence of all problem behaviours, ranging from 6.1% in the community to 40% among those in long-stay hospitals (Emerson 1995) and 10% to 15% in the total intellectually-disabled population (Emerson 2001). More recently, in a population-based study, the prevalence of challenging behaviour was found to be 25% based on clinical opinion or 18.7% based on the DC-LD criteria (Jones 2008).

A prospective study of incidence of mental ill-health in an epidemiological sample of adults with intellectual disabilities found a two-year incidence rate of problem behaviour of 4.6% (Smiley 2007).

One of the most difficult-to-manage behaviours is episodic aggression towards others or property. Such behaviours have a significant impact on the individual and his or her carers and are linked to exclusion, long-term hospitalisation, increased

likelihood of relocating individuals to 'out of area' placements and being prescribed antipsychotics (Lundqvist 2013). Estimates of the prevalence of aggressive behaviour are variable and depend on context. An American survey of 91,164 people with intellectual disabilities identified aggressive behaviours (physical aggression and property destruction) in 9.2% of all those who presented with any type of problem behaviours (14%) (Borthwick-Duffy 1994). One study of 3165 adults with intellectual disabilities receiving rehabilitation services in Canada found a 12-month prevalence of aggressive behaviour of 51.8%; property damage of 24%; verbal aggression of 37.6%; physical aggression of 24.4%, and sexual aggression of 9.8% (Crocker 2006). However, only 4.9% of individuals exhibited aggressive behaviour that led to another person being injured. A community-based epidemiological study found that the prevalence of aggression was 9.8% and the two-year incidence was 1.8% (Cooper 2009). The prevalence of aggression in individuals with profound intellectual disability or multiple disabilities has been reported to be as high as 45% (Poppes 2010).

The chronic course of aggressive behaviour, and its serious consequences for the individual and his or her social network, suggest that there is a great need for immediate and accessible specialised support and for the development of effective interventions for its management.

Scope of this review

This review is concerned with behavioural and cognitive-behavioural interventions for outwardly-directed aggressive behaviour, which refers to aggressive and destructive behaviour directed towards others and property, including verbal and physical aggression. The review does not include studies of self injurious behaviour, examined in another Cochrane review (Rana 2013), or other types of behaviour such as stereotypical behaviour or sexually inappropriate behaviour.

Description of the intervention

Management of aggressive behaviour

Established patterns of aggressive behaviour usually require intensive and individualised management. Generally the acute management of aggression requires the removal of the individual or others from the vicinity by implementing techniques, which may include de-escalation, appropriate forms of restraint, time-out or psychotropic medication. Psychosocial techniques can then be adopted to promote more adaptive responses in the individual.

A range of psychosocial interventions, in particular behavioural and cognitive-behavioural techniques, are available to manage aggressive behaviour within the intellectually-disabled population. While we make a distinction between behavioural and cognitive-behavioural interventions, it may be a false dichotomy to think of them as unconnected methodologies. Most modern interventions integrate elements stemming from both cognitivism and behaviourism to elicit change, but may differ in levels of emphasis of the two.

Behavioural approaches involve carrying out a functional analysis of behaviour. A clear description of the behaviour, factors that predict the behaviour, and factors or consequences that maintain the behaviour are identified. A hypothesis about the function of the behaviour is formulated, followed by direct observations that provide evidence supporting the hypothesis. Behavioural

approaches utilise the principles of reinforcement and extinction. Positive Behavioural Support is one framework used frequently in the UK (Allen 2005). It aims to encourage a clear understanding of the individual's behaviour within his or her social context.

Cognitive-behavioural therapy (CBT), a widely-used approach for a range of psychological problems, aims to allow the individual to identify how his or her thoughts and feelings and physiological response are linked, to allow him or her to address present maladaptive cognitions. The therapist and individual develop a formulation of the causes behind the behaviours and factors that maintain it, and work together to identify new strategies to reduce distress and cope with difficult situations. The therapist helps the patient learn to recognise errors in thinking style and explore potential alternative explanations for his or her beliefs. The therapist makes necessary technical modifications based on the level of intellectual disability and the individual needs of their client, for example, visual aids, repetition or proceeding at a slower pace. Cognitive-behavioural therapy has been used mainly for the management of aggression and anger in people with intellectual disabilities.

Emerging interventions, such as mindfulness, are being adapted in adjunction to behavioural approaches, or as a stand-alone intervention. Mindfulness has its roots in key principles found in Buddhist teaching (Bishop 2004) and utilises meditation to identify patterns in thinking. Cognitive-behavioural exercises can then be used to develop the above-mentioned understanding of the interlinked nature of body, thoughts, emotions, and behaviour.

In practice, there is often a multi-component approach to the management of aggressive behaviour, as it is important to bring about significant changes rapidly and to ensure the safety of the person and others, including carers. The objective, however, is to promote long-term emotional well-being and reduce challenging behaviours.

How the intervention might work

Positive behavioural support involves using functional analysis to identify the purpose of a particular behaviour, and then teaching the person the necessary social, behavioural, and communication skills to replace the original behaviour (Allen 2005). The approach demands a multi-component intervention as it acknowledges that challenging behaviours may be provoked by multiple variables. It therefore involves the development of a new support plan and focuses on achieving physical, environmental, and social well-being for the individual. It relies on the use of positive strategies and reinforcement to maintain positive behaviour, avoiding any punitive measures.

Cognitive-behavioural therapy-based interventions for anger management can be delivered either individually or within a group setting. In order to successfully implement the intervention, the therapist and individual work collaboratively to identify and develop awareness of situations that evoke anger in the individual and when he or she is becoming angry. It teaches new skills to manage and control anger when such situations arise. Anger management strategies involve a range of cognitive, behavioural and physiological skills such as problem solving, removing oneself from the situation, being assertive, seeking help, or employing relaxation techniques.

Mindfulness teaches the individual to focus and refocus their attention on the here and now during meditation and to observe his or her thoughts and feelings without judgement (Bishop 2004). In practice this means realising when they have feelings of anger or upset without trying to censor or analyse these feelings or thoughts. Individuals learn to develop the ability to let such feelings arise and subside without having to react to them, thus changing patterns of behaviour. An intervention based on mindfulness called 'Meditation on the Soles of the Feet' teaches individuals with aggressive behaviour to identify behaviours or emotions that give rise to anger or aggression and then to alter the focus of their attention from these precursors to a neutral part of their body, in this case, the soles of the feet (Singh 2003).

Why it is important to do this review

The importance of effectively managing problem behaviours, particularly aggression, has led to considerable research into different types of interventions. These are usually published as single-case reports, which lack data on long-term evaluation of clinical outcomes and the economic costs of those interventions (Meinhold 1990). Four reviews of treatment efficacy for problem behaviours have been identified (Didden 1997; Didden 2006; Heyvaert 2012; Scotti 1991).

All four reviews based their meta-analyses mostly on single-case experimental designs and covered published research in several specialist journals over a 10-year period.

Scotti 1991 suggests that formal functional analysis of behaviour prior to treatment may improve clinical outcomes.

The Didden reviews describe their analyses in more detail and include more papers. Didden 1997 searched 30 journals, which focused on intellectual disabilities and included four groups of interventions: pharmacological management, antecedent control procedures, response contingent procedures, and non-contingent procedures.

The participants had a diagnosis of severe intellectual disability or developmental disorders such as autism. The authors used 'elimination of problem behaviour' as their main outcome. They compared pre- and post-intervention effects and concluded that the majority of problem behaviours can be treated with variable degrees of efficacy. Aggressive behaviour (aggression, destruction, public disrobing) was less amenable to treatment when compared to self injury or socially disruptive behaviours such as tongue protrusion, non-compliance, hyperactivity or food theft. The authors concluded that externally destructive behaviours "are associated with the lowest levels of treatment efficacy".

Didden 2006 conducted a meta-analysis of single-case studies of individuals with mild intellectual disabilities to borderline intelligence. The authors concluded that behavioural interventions based on functional behavioural analysis pre-treatment can improve several types of problem behaviours, including destructive behaviour, physical and verbal aggression, self injury, and stereotypies.

Heyvaert 2012 conducted a multilevel meta-analysis examining 285 single-case and small-n studies for the effectiveness of contextual, behavioural, and pharmacological interventions for problem behaviours in people with intellectual disabilities. Contrary to previous meta-analyses, the authors did not find pre-

treatment functional assessment to be a significant moderator. Only aggression and the manipulation of antecedent factors were found to have significant moderating effects. Outwardly-directed aggression appeared to be associated with significantly lower effectiveness of interventions for problem behaviours, while the presence of a component manipulating antecedent factors, such as environmental or social factors, was associated with a better outcome than when no such component was present.

A recent systematic review and meta-analysis of the effectiveness of CBT in the management of anger (Nicoll 2013) included 12 studies. Nine studies were deemed suitable for meta-analysis. The authors found that CBT treatment had large effect sizes, but suggested that this should be regarded with caution due to the inclusion of studies with small sample sizes. They included non-randomised studies and studies with no control groups.

All of these reviews suggest that CBT and behavioural approaches may be effective in the management of problem behaviours and aggression. However, these reviews have methodological shortcomings, including broad definitions of problem behaviours (as well as the inclusion of several different types of problem behaviours) and the inclusion of studies that were not randomised, or lacked a control group, or were based on single-case studies. We therefore consider that there is a need for the present systematic review.

OBJECTIVES

To evaluate the efficacy of behavioural and cognitive-behavioural interventions on outwardly-directed aggressive behaviour in people with intellectual disabilities when compared to standard intervention or wait-list controls.

METHODS

Criteria for considering studies for this review

Types of studies

Randomised controlled trials (RCTs) or quasi-randomised controlled trials (q-RCTs).

Types of participants

Children and adults with intellectual disabilities (mild-to-severe/profound) who exhibit aggressive behaviour. We considered studies of participants with pervasive developmental disorders, such as autism, if they stated that the participants also met criteria for intellectual disabilities by some standardised measure or were recorded as having been assessed in the past (APA 2000; WHO 1993). We also include studies where participants had other comorbid conditions in addition to intellectual disabilities and aggressive behaviour if it was possible to extract data on aggressive behaviour as distinct from other symptoms. We exclude studies where the participants had an adult-onset organic brain disorder such as dementia.

In this updated version of the review, we include syndromes associated with an aggressive behavioural phenotype such as Prader-Willi syndrome, Williams syndrome, fragile X syndrome, and tuberous sclerosis, as studies of interventions targeting these behaviours may have been completed and published in the interim. We decided to include these syndromes in this update as people

with aggressive behavioural phenotypes are often the most difficult to treat, and the evidence base for the management of aggressive behaviour in these people is limited. Including these participants in the review would therefore increase the generalisability of the results, and help clinicians to make better decisions about the treatment of people with aggressive behaviour and intellectual disabilities, including those with behavioural phenotypes.

Types of interventions

The interventions examined were:

1. Behavioural modification interventions, e.g. differential reinforcement of other behaviour; applied behavioural analysis (ABA); positive behaviour support (PBS);
2. Cognitive-behavioural treatment, e.g. anger management, problem-solving skills training, relaxation, and meditation or 'mindfulness'.

We did not restrict interventions to specific settings but covered hospitals, community day centres, and individuals' own homes. We included individual and group treatments. We did not examine interventions provided to carers (e.g. parent training), unless carers were involved in the delivery of the intervention to individuals with intellectual disabilities.

The control groups either 1) received standard care, that is, general physical and psychological care but no specific intervention programme, or pharmacological treatment for the expressed aim of treating the behaviour; or 2) were on a waiting list.

Types of outcome measures

Studies had to include at least one of the following primary outcomes, measured by means of a standardised instrument ([Aman 1991](#)) with changes reported by individuals, family or paid carers:

- reduction in aggressive behaviour (frequency/severity of incidents);
- improved ability to control anger;
- improvement in adaptive functioning;
- adverse effects, such as death, or side effects from treatment.

Secondary outcomes of interest were specified as:

- improvement of mental state;
- reduction in (additional) medication;
- reduction in care needs;
- improvement in quality of life;
- frequency of service utilisation (and costs if available);
- user satisfaction data (or dissatisfaction if known).

We categorised the follow-up periods as medium-term (three to six months) and long-term (nine months or longer) from the end of treatment.

Main outcomes for 'Summary of findings' tables

We selected the following outcomes for inclusion in the 'Summary of findings' tables:

- reduction in aggressive behaviour (frequency or severity of incidents, or both);
- improved ability to control anger;

- improvement in mental state;
- improvement in quality of life;
- frequency and costs of service utilisation.

We assessed the quality of evidence for each outcome according to the Grades of Recommendations, Assessment, Development, and Evaluation (GRADE) approach ([Schünemann 2008](#)). We rated the quality of evidence as high, moderate, low or very low according to the following criteria: presence of limitations in the design and implementation; indirectness of evidence; unexplained heterogeneity or inconsistent results; imprecision of results; and a high risk of publication bias.

Search methods for identification of studies

In this updated version of the review, we revised the search terms to take into account the addition of syndromes with aggressive behavioural phenotypes and to ensure that a broader range of therapies were identified. We ran searches for all available years for each database, to reduce the likelihood of missing studies. We modified the search terms where necessary for each of the databases searched. We ran searches for this update in May 2013, applying no date or language limits. We updated the searches on 8th April 2014, limiting them (where possible) to the period following the previous search.

Electronic searches

- Cochrane Central Register of Controlled Studies (CENTRAL), 2014, Issue 3, part of the Cochrane Library.
- Ovid MEDLINE, 1946 to March week 4 2014.
- Enbase (Ovid), 1980 to 2014 week 14.
- PsycINFO (Ovid), 1967 to April week 1 2014.
- CINAHL: Cumulative Index to Nursing and Allied Health Literature (EBSCOhost), 1937 to current.
- ERIC: Education Resources Information Centre (Proquest), 1966 to current.
- Social Services Abstracts (Proquest), 1979 to current.
- Cochrane Database of Systematic Reviews (CDSR), 2014, Issue 4, part of the Cochrane Library.
- Database of Abstracts of Reviews of Effects (DARE), 2014, Issue 1, part of the Cochrane Library.
- WorldCat (worldcat.org/).
- OpenGrey (opengrey.eu/).
- Clinical Trials.gov (clinicaltrials.gov/).
- International Clinical Trials Registry Platform (ICTRP) (who.int/ictip/en/).

The search strategies for this update are reported in [Appendix 1](#). The search strategies for the previous review are reported in [Appendix 2](#).

Searching other resources

We handsearched the following journals from 1990 to 2000 for the original review, and from 2000 to 2014 for this update: American Journal on Mental Retardation, Journal of Intellectual Disability Research, and Journal of Applied Research in Intellectual Disabilities. We also scrutinised the reference lists of articles retrieved through the electronic searches.

Data collection and analysis

Selection of studies

Two review authors (AA and JB) independently screened titles and abstracts of all records returned by the search. We then retrieved the full text of papers that appeared relevant, or for which we needed more information, and assessed them for eligibility. For studies where there was a difference of opinion, we reached a consensus through discussion with a third review author (AH).

Data extraction and management

We developed a data extraction form for this review. Two review authors (AA and JB) independently undertook data extraction. Extracted information included study location, methods, participant details, type of intervention, intensity and duration of intervention, and outcomes. Where there were gaps in the available data, we attempted to contact the authors for further information (e.g. where a study claimed to be randomised but gave little detail of the exact process).

Assessment of risk of bias in included studies

Two review authors (AA and JB) independently assessed the quality of the papers according to the Cochrane tool for assessing risk of bias (Higgins 2011), which covers the following seven domains.

1. Random sequence generation (selection bias), which we judged according to whether there was evidence of an adequate generation of a randomisation sequence.
2. Allocation concealment (selection bias), which we judged according to whether there was a detailed description of the method used to conceal the allocation sequence in order to prevent the intervention allocation from being predicted or foreseen in advance of or during enrolment into the study.
3. Blinding of participants and personnel (performance bias), which we assessed according to whether the participants or personnel involved in the study were aware of which intervention the participants received.
4. Blinding of outcome assessment (detection bias), which we assessed according to whether the outcome assessors were blinded to the allocation group.
5. Incomplete outcome data (attrition bias), which we assessed by the presence of incomplete outcome data.
6. Selective outcome reporting (reporting bias), which we assessed by examining whether the study reported all prespecified outcomes.
7. Other sources of bias, which we assessed by recording any noteworthy concerns about other sources of biases not addressed in the above domains, if present.

For each included study, we assigned a judgement of unclear, low or high risk of bias to each of the seven domains according to the criteria outlined in the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2011). See [Characteristics of included studies](#) and accompanying 'Risk of bias' tables.

Measures of treatment effect

Binary data

Dichotomous data were not available for inclusion in this review. Please see [Appendix 3](#) on how we will analyse dichotomous data in future updates of this review.

Continuous data

We analysed continuous data if the mean and standard deviations were available or could be extrapolated from the data using test statistics (standard errors, 95% confidence intervals (CIs), P values).

Please see [Appendix 3](#) on how we will analyse data if different measures are used to assess the same outcome in future updates of this review.

Unit of analysis issues

Cluster-randomised controlled trials

We included data from cluster-randomised trials if clustering by centre had been taken into account in the analysis. See [Appendix 3](#) for our approach if clustering is not taken into account in the study.

Dealing with missing data

We assessed the missing data for each included study and reported the numbers of dropouts in the 'Risk of bias' tables, beneath the [Characteristics of included studies](#) tables. We attempted to contact the authors to obtain any missing data. Where we were unable to obtain missing data, we based the analyses on the data provided in the papers. Please see [Appendix 3](#) for additional methods for dealing with missing data archived for future updates of this review.

Assessment of heterogeneity

We assessed clinical heterogeneity by examining differences in the characteristics of the samples, methodology, interventions and types of outcome measures that were used. We have not addressed statistical heterogeneity in this review, as we have not combined data from studies in a meta-analysis. Please see [Appendix 3](#) for further information on how we will assess statistical heterogeneity in future updates of the review.

Assessment of reporting biases

The impact of reporting biases was reduced by our undertaking comprehensive searches of multiple sources and identifying whether all outcomes had been reported by the studies. Only one study had published their protocol prior to the publication of the study findings.

Due to the small number of studies included in the review (fewer than ten), we were unable to assess reporting bias. For information on how we intend to assess reporting biases in future updates of the review, see [Appendix 3](#).

Data synthesis

We did not conduct a meta-analysis in this review, as study interventions, populations, and outcome measures were not sufficiently homogeneous for a pooled analysis. Instead, we present a narrative description of the study findings. For information on how we plan to undertake a meta-analysis in subsequent updates, please see [Appendix 3](#).

Subgroup analysis and investigation of heterogeneity

We have not conducted these in this review. See [Appendix 3](#).

Sensitivity analysis

We have not conducted these in this review. See [Appendix 3](#).

RESULTS**Description of studies****Results of the search**

We ran searches for the original review in December 2002 and identified three included trials ([McPhail 1989](#); [Nezu 1991](#); [Willner](#)

[2002](#)). The searches were repeated in February 2007 with the addition of a new search term 'anger management'. We identified one new included study ([Taylor 2005](#)).

We updated the searches in May 2013 and most recently in April 2014, having revised the strategy to include search terms to describe behavioural phenotypes associated with aggression. We found a total of 5042 records. After removal of duplicates, 3701 records remained, of which we considered 35 new titles and abstracts to be relevant. After obtaining the full papers, only two new additional studies ([Singh 2013](#); [Willner 2013](#)) met the inclusion criteria, giving a total of six included studies in this review ([Figure 1](#)). We assessed one study as awaiting classification because only the abstract was available ([Collada-Castillo 2011](#)).

Figure 1. Study flow diagram

Included studies

Participants

The total number of participants from the six included studies was 309. The number of participants in each study ranged from 12 (McPhail 1989) to 179 (Willner 2013). One study included only men (Taylor 2005) and in all studies, apart from McPhail 1989, the majority of participants were men. All studies focused on adults; only Singh 2013 included participants aged 17 years. The mean ages were 23.1 and 23.4 for control and treatment arms respectively (Singh 2013) to 36 (Nezu 1991). Willner 2013 reported a median age of 38 years. Ethnicity was only available for two studies (Nezu 1991; Taylor 2005), with both reporting a majority of white participants.

The majority of included studies focused on participants with mild intellectual disabilities. Taylor 2005 included participants with mild-to-borderline intelligence quotients (IQs). Willner 2013 included participants with mild or moderate intellectual disabilities and McPhail 1989 included participants across the range of intellectual disabilities.

None of the identified studies included participants with aggressive behavioural phenotypes.

Location

Four studies were conducted in the United Kingdom (UK), and the remaining two in the United States of America (USA). The majority of studies recruited participants from the community. However, Willner 2013 also included participants from a hospital setting and Taylor 2005 focused exclusively on an inpatient forensic service.

Study Design

All six included studies were randomised controlled trials (RCTs). One study was a cluster-randomised controlled trial (Willner 2013). Five studies employed a wait-list or treatment-as-usual (TAU) control group. Only one study used an 'active' control group (McPhail 1989).

Interventions

Type of intervention

One study compared modified relaxation training to a control group receiving 'story reading' (McPhail 1989). Four studies compared cognitive-behavioural treatment to a wait-list control group (Nezu 1991; Taylor 2005; Willner 2002; Willner 2013), and one study compared a mindfulness-based approach ('Meditation on the Soles of the Feet') to a wait-list control group (Singh 2013). Four studies delivered a manualised intervention (Nezu 1991; Singh 2013; Taylor 2005; Willner 2013).

Delivery of intervention

In two studies, the therapy was delivered by carers or support staff ('lay therapists') (Singh 2013; Willner 2013) who received training prior to the intervention. In Willner 2013, fortnightly supervision was provided by psychologists to the 'lay therapists' delivering group-based cognitive-behavioural therapy (CBT). In all of the other studies the therapy was delivered by trained therapists/psychologists or the researchers. In one study, the therapists received peer supervision (Taylor 2005).

Adherence to intervention

Fidelity checks and adherence to the intervention were assessed in four studies: Nezu 1991; Singh 2013; Taylor 2005; Willner 2013.

Outcomes and Measures

Please see Appendix 4 for the list of scales and their associated abbreviations used in this review.

1. Reduction in aggressive behaviour (frequency/severity of incidents)

Two studies reported the number of incidents of aggressive behaviour. Singh 2013 recorded the number of incidents of physical and verbal aggression on a scale developed for the study, which was rated by parents and support staff. McPhail 1989 recorded the level of disruptive behaviour (aggressive, verbal, 'movement', and 'other') observed by staff three times a week over a duration of 45 minutes. The scale was also developed for the study.

The severity/intensity of aggressive (challenging) behaviour was measured by Willner 2013 using the Aberrant Behaviour Checklist (ABC), Hyperactivity and Irritability subscales; Modified Overt Aggression Scale (MOAS); and the Controllability Beliefs Scales (CBS).

2. Improved ability to control anger

The most frequently used measure was the Provocation Inventory (PI; Novaco 2003), used by Taylor 2005, Willner 2002, and Willner 2013 to record self-reported levels of aggression in anger-inducing situations. Willner 2002 and Willner 2013 also used the PI to record carer-reported levels of aggression in anger-inducing situations.

Taylor 2005 measured anger disposition and capacity to regulate anger using the Novaco Anger Scale (NAS) and the Anger Expression (AX) subscale from the Spielberger State-Trait Anger Expression Inventory (STAXI; Spielberger 1996). Taylor 2005 also employed the Ward Anger Rating Scale (WARS; Novaco 1994), which was completed by a member of staff, to investigate anger attributes.

Nezu 1991 used the Role-Play Test of Anger Arousing Situations (RPT). Other measures used were the Anger Inventory (AI) (Willner 2002) and the Profile of Anger Coping skills (PACS) (Willner 2013).

3. Improvement in adaptive functioning

Nezu 1991 used the Adaptive Behaviour Scale-Revised-Part II (ABS-R-II) as a measure of adaptive functioning and used the Problem-Solving Task (PST) to measure problem-solving ability in hypothetical situations.

4. Improvement of mental state

Two studies included psychological symptoms. Nezu 1991 used the Brief Symptom Inventory (BSI) and the Subjective Units of Distress Scale (SUDS) to measure psychological distress. Willner 2013 measured depression using the Glasgow Depression Scale for people with an Intellectual Disability (GDS-ID); anxiety was measured using the Glasgow Anxiety Scale for people with an Intellectual Disability (GAS-ID); and self esteem was measured using the Rosenberg Self Esteem Scale (SES).

5. Improvement in quality of life

Willner 2013 was the only study to assess quality of life, which was measured using the Comprehensive Quality of Life Scale: Intellectual Disability (COMQoL-ID).

6. Frequency of service utilisation (and costs)

[Willner 2013](#) was the only study to measure costs of service utilisation. This was measured using the Client Service Receipt Inventory (CSRI).

7. Other outcomes

None of the included studies measured health-related quality of life or adverse outcomes (e.g. death, hospitalisation, change of accommodation).

Duration of follow up

Follow-up data for both control and treatment groups were available for only two studies: [Taylor 2005](#) followed up participants for four months and [Willner 2013](#) provided follow-up data at 10 months.

Excluded studies

In this update, we excluded 32 studies following the search in April 2014. Of these, 16 studies were not randomised ([Baker 1971](#); [Bearss 2013](#); [Bornstein 1980](#); [Eikeseth 2007](#); [Eikeseth 2012](#); [Eldevik 2006](#); [Fava 2011](#); [Grey 2007](#); [Lindsay 2004](#); [Lovaas 1987](#); [Lowe 1996](#); [Roeden 2014](#); [Rose 2009](#); [Schnitzer 2007](#); [Strauss 2012](#); [Willner 2007](#)); four studies did not have an appropriate control group ([Brookman-Frazee 2012](#); [Feldman 2002](#); [Murphy 1978](#); [Rickards 2009](#)); two studies included an intervention about

parent training ([Bagner 2007](#); [Roberts 2006](#)); five studies did not include participants with intellectual disabilities ([Amerikaner 1982](#); [Clement 1967](#); [Durand 2013](#); [Koenig 2010](#); [Mate-Kole 1999](#)); and five studies were not specifically about aggressive behaviour ([Carr 2006](#); [Hassiotis 2009](#); [Reitzel 2013](#); [Shechtman 2005](#); [Wiggs 1999](#)).

In the previous version of this review, 16 studies were excluded: six studies were not randomised ([Benson 1986](#); [Bird 2000](#); [Gresham 1982](#); [Hall 1973](#); [Rose 2005](#); [To 2000](#)); four studies were of an intervention on parent training ([Brightman 1982](#); [Gates 2001](#); [Tavormina 1975](#); [Wacker 1998](#)); one study did not include participants with intellectual disabilities ([Edmonson 1983](#)); and three studies did not specifically target aggressive behaviour ([Hagiliassis 2005](#); [Leblanc 1995](#); [Smith 1997](#)). Two studies were excluded as data were supplied in later studies ([Rose 2000](#); [Taylor 2002](#)).

The studies that were excluded, and the main reason for their exclusion, are listed under [Characteristics of excluded studies](#).

Risk of bias in included studies

See 'Risk of bias' tables beneath the '[Characteristics of included studies](#)' tables. See also 'Risk of bias summary' (review authors' judgements about the risk of bias in the included studies; [Figure 2](#)) and the 'Risk of bias graph' (review authors' judgements about each risk of bias item presented as percentages across all included studies; [Figure 3](#)).

Figure 2. Risk of bias summary: review authors' judgements about each risk of bias item for each included study

	Random sequence generation (selection bias)	Allocation concealment (selection bias)	Blinding of participants and personnel (performance bias)	Blinding of outcome assessment (detection bias)	Incomplete outcome data (attrition bias)	Selective reporting (reporting bias)	Other bias
McPhail 1989	?	?	-	+	+	-	+
Nezu 1991	+	?	-	+	?	+	?
Singh 2013	?	?	-	-	+	+	?
Taylor 2005	+	+	-	-	-	+	?
Willner 2002	-	-	-	-	+	+	-
Willner 2013	+	+	-	+	+	+	?

Figure 3. Risk of bias graph: review authors' judgements about each risk of bias item presented as percentages across all included studies

Sequence generation

The studies that we rated at low risk of selection bias for sequence generation were [Nezu 1991](#) (randomisation by coin tossing; [Nezu 2000 \[pers comm\]](#)); [Taylor 2005](#) (computer-generated randomisation codes); and [Willner 2013](#) (minimisation with a random component set at 80%). The study that was considered as being at high risk of bias was [Willner 2002](#) (randomisation by alternate allocation of referrals). The methods used by [McPhail 1989](#) and [Singh 2013](#) were not reported and we therefore judged these studies as being at unclear risk of bias.

Allocation

The studies that we considered to be at low risk of selection bias for allocation were [Willner 2013](#) (all the centres were randomised at the same time) and [Taylor 2005](#) (the groups were balanced on key variables but the person involved in this did not conduct any of the assessments, and other personnel involved in the study were not aware of group allocation). [Willner 2002](#) reported that they did not conceal allocation of their participants and we therefore rate this study as being at high risk of selection bias. Three studies made no reference to whether any process of concealment of allocation was used ([McPhail 1989](#); [Nezu 1991](#); [Singh 2013](#)) and we therefore rate these studies at unclear risk of bias.

Blinding

In all of the studies, blinding of participants was not possible due to the nature of the intervention and we thus rated all studies at high risk of performance bias.

Studies that we considered to be at low risk of detection bias were [McPhail 1989](#), [Nezu 1991](#), and [Willner 2013](#), where the outcome assessors were blinded to the allocation group. However, [Willner 2013](#) reported that the allocation group often became apparent during conversations with participants and carers. Studies that we considered to be at high risk of detection bias were [Singh 2013](#), [Taylor 2005](#), and [Willner 2002](#), where the outcome assessors were not blinded to group allocation.

Incomplete outcome data

We considered two studies to be at low risk of attrition bias ([Singh 2013](#); [Willner 2013](#)). There were no dropouts in the study by [Singh 2013](#), and although [Willner 2013](#) had a large number of dropouts (19% data missing), there was the same number of dropouts in both arms (17 dropouts in each), and an intention-to-treat analysis was conducted.

[McPhail 1989](#) excluded two participants from the analysis (one from each group) despite completing treatment, and [Willner 2002](#) excluded one participant from the analysis and one participant dropped out, but we rated both of these studies at low risk, as the dropouts or removal of participants from the analysis were unrelated to the outcome. [Nezu 1991](#) did not report whether there were any dropouts and we judged this to be at unclear risk of bias. We considered the study by [Taylor 2005](#) to be at high risk of attrition bias because the four participants that dropped out of the study were in the treatment group and no intention-to-treat analysis was performed. In previous versions of this review (see [Hassiotis 2004](#); [Hassiotis 2008](#)), we attempted to contact the authors for clarification and to obtain the missing data, but received no response. No further attempts were made to contact the authors in this updated version. Therefore, subsequent analyses are based on the data provided in the papers.

Selective reporting

We rated one study at high risk of reporting bias, as follow-up data were not included in the analysis ([McPhail 1989](#)). In all other studies, the prespecified outcomes appear to have been reported and we therefore judged the risk of reporting bias to be low.

Other potential sources of bias

We judged [Willner 2002](#) to be at high risk of 'other potential sources of bias', due to the use of non-validated instruments. We judged [McPhail 1989](#) to be at low risk, as no other risk of bias, including differences in baseline characteristic of the participants, was identified. We judged three studies to be at unclear risk of other bias: [Taylor 2005](#) and [Nezu 1991](#) included participants with mental

health problems who were also on psychotropic medication, and it is not clear whether inclusion of these participants influenced the results. [Singh 2013](#) and [Willner 2013](#) had a strong allegiance to the intervention and their desire for the intervention to succeed could have affected data collection, but the likelihood of this impacting the results is unclear.

Effects of interventions

See: [Summary of findings for the main comparison](#); [Summary of findings 2](#); [Summary of findings 3](#); [Summary of findings 4](#); [Summary of findings 5](#)

Comparison 1: Anger management versus wait-list control group (community sample)

See [Summary of findings for the main comparison](#) for a summary of the results.

Primary outcomes

1. Reduction in aggressive behaviour (frequency/severity of incidents)

There were significant differences in key-worker reports of ABC-Hyperactivity and ABC-Irritability subscales at 16 weeks between the intervention and control groups but not at 10 months (see [Analysis 1.1](#) and [Analysis 1.2](#) respectively). However, we found no differences in the ABC-Hyperactivity ([Analysis 1.3](#)) or Irritability ([Analysis 1.4](#)) subscales at 16 weeks or at 10 months as reported by home carers. Also, we found no differences in the modified overt aggression scale (MOAS) by key workers and carers (see [Analysis 1.5](#) and [Analysis 1.6](#) respectively) and no differences in the controllability beliefs scale (CBS) for key workers (see [Analysis 1.7](#)). Home carers did not complete the CBS.

2. Improved ability to control anger

[Willner 2002](#) found significant improvements in the self-reported provocation inventory (PI) in the treatment group compared to the control group post-treatment (mean difference (MD) -20.50, 95% confidence intervals (CI) -38.64 to -2.36; $n = 14$; see [Analysis 1.8](#)) and also in the carer-reported PI (MD -15.25, 95% CI -26.99 to -3.51; $n = 14$; see [Analysis 1.9](#)). They also found significant improvements in the self-reported Novaco anger scale (NAS) (MD -0.75, 95% CI -1.39 to -0.11; $n = 14$; [Analysis 1.10](#)). However, there were no differences in the carer-reported NAS ([Analysis 1.11](#)).

[Willner 2013](#) reported the adjusted MD between treatment and control groups for their measures but, for the purpose of this review, we have reported the unadjusted MD and corresponding 95% CIs. There was no difference between the treatment and control group on the PI at 16 weeks (MD -6.30, 95% CI -13.53 to 0.93; $n = 162$) or at 10 months (MD -3.70, 95% CI -10.55 to 3.15; $n = 143$) as reported by participants ([Analysis 1.8](#)). However, there was a significant reduction in the PI reported by key workers in the treatment group at 16 weeks (MD -6.90, 95% CI -13.09 to -0.71; $n = 161$), and at 10 months compared to the control group (MD -9.10, 95% CI -15.29 to -2.91; $n = 161$); see [Analysis 1.9](#). Home carers did not report a significant reduction in service users' anger at 16 weeks (MD -2.60, 95% CI -8.26 to 3.06; $n = 104$; see [Analysis 1.9](#)) or 10 months (MD 1.50, 95% CI -5.68 to 8.68; $n = 84$; see [Analysis 1.9](#)).

[Willner 2013](#) reported significant differences between the intervention and control group in the self-reported profile of anger coping skills (PACS) at 16 weeks (MD 8.70, 95% CI 0.98 to 16.42;

$n = 156$) but not at 10 months (MD 7.70, 95% CI -0.72 to 16.12; $n = 138$; [Analysis 1.12](#)). Key workers' reported PACS was significant at 16 weeks (MD 7.00, 95% CI 2.09 to 11.91; $n = 157$), and at 10-months (MD 7.40, 95% CI 1.92 to 12.88; $n = 140$); see [Analysis 1.13](#). There were no differences in the PACS reported by home carers (see [Analysis 1.14](#)).

3. Other primary outcomes

No studies reported data on the following primary outcomes: improvement in adaptive functioning and adverse effects.

Secondary outcomes

1. Improvement of mental state

[Willner 2013](#) reported that there were no differences between the treatment and control groups at 16 weeks or at 10 months on measures of depression ([Analysis 1.15](#)), anxiety ([Analysis 1.16](#)), and self esteem ([Analysis 1.17](#)).

2. Improvement in quality of life

[Willner 2013](#) reported that there were no differences between the treatment and control groups at 16 weeks ($n = 129$) or at 10 months ($n = 140$) on quality of life ([Analysis 1.18](#)).

3. Frequency of service utilisation (and costs)

[Willner 2013](#) reported that there were no differences between the treatment and control groups at 10 months ($n = 133$) in the cost of service utilisation ([Analysis 1.19](#)).

4. Other secondary outcomes

No studies reported data on the following secondary outcomes: reduction in (additional) medication, reduction in care needs, and user satisfaction (or dissatisfaction).

Comparison 2: Anger management versus wait-list control group (forensic sample)

See [Summary of findings 2](#) for a summary of the results.

Primary outcomes

1. Reduction in aggressive behaviour (frequency/severity of incidents)

[Taylor 2005](#) ($n = 36$) found no difference in the NAS - Total score post-treatment or at four months between treatment and control groups ([Analysis 2.1](#)), or the following subscales of the NAS: Cognitive subscale ([Analysis 2.2](#)), Arousal subscale ([Analysis 2.3](#)), and the Behavioural subscale ([Analysis 2.4](#)).

2. Improved ability to control anger

[Taylor 2005](#) ($n = 36$) reported that there were no significant differences in measures of ability to control and regulate anger between treatment and control groups post-treatment or at four-months follow-up, as measured by the PI - Total score ([Analysis 2.5](#)), or the following subscales of the PI: Disrespect subscale ([Analysis 2.6](#)), Unfairness subscale ([Analysis 2.7](#)), Frustration subscale ([Analysis 2.8](#)), and Annoying traits subscale ([Analysis 2.9](#)). However, [Taylor 2005](#) did report a significant difference in the ability to control and regulate anger between treatment and control groups at post-treatment only as measured by the PI - Irritations subscale (MD -2.36; 95% CI -4.67 to -0.05; see [Analysis 2.10](#)).

Taylor 2005 (n = 36) found no difference in the ability to control and regulate anger post-treatment or at four months between treatment and control groups as measured by the Anger expression (Analysis 2.11) and Anger control (Analysis 2.12) subscales of the Spielbergers' State-Trait Anger Expression Inventory, or the Ward Anger Rating Scale (Analysis 2.13).

3. Other primary outcomes

No studies reported data on the following primary outcomes: improvement in adaptive functioning and adverse effects.

Secondary outcomes

No studies reported data on the following secondary outcomes: improvement of mental state, reduction in additional medication, reduction in care needs, improvement in quality of life, frequency of service utilisation (and costs), and user satisfaction (or dissatisfaction).

Comparison 3: Assertiveness and problem solving versus no-treatment control group

See Summary of findings 3 for a summary of the results.

Primary Outcomes

1. Improved ability to control anger

Nezu 1991 (n = 28) found positive treatment effects in the problem-solving task (PST) measure (MD -24.84, 95% CI -39.50 to -10.18; see Analysis 3.1) and the role-play test (RPT) of anger arising situations (MD -11.69, 95% CI -16.32 to -7.06; see Analysis 3.2) in the intervention group compared to the control group.

2. Improvement in adaptive functioning

Nezu 1991 (n = 28) reported that participants who received assertiveness and problem-solving training had significantly improved adaptive behaviour compared to the control group (shown by reduction in ABS-R-II): MD -21.73, 95% CI -36.44 to -7.02; see Analysis 3.3).

3. Other primary outcomes

No studies reported data on the following primary outcomes: reduction in aggressive behaviour (frequency/severity of incidents) and adverse effects.

Secondary Outcomes

1. Improvement of mental state

Nezu 1991 (n = 28) found an improvement in psychiatric symptoms (reduction of score on Brief Symptom Inventory (BSI): MD -0.48, 95% CI -0.79 to -0.17; see Analysis 3.4) and lower levels of subjective distress as measured by the Subjective Units of Distress Scale (SUDS) in the intervention group compared to the control group (MD -4.36, 95% CI -6.85 to -1.87; see Analysis 3.5).

2. Other secondary outcomes

No studies reported data on the following secondary outcomes: improvement of mental state, reduction in (additional) medication, reduction in care needs, improvement in quality of life, frequency of service utilisation (and costs), and user satisfaction (or dissatisfaction).

Comparison 4: Meditation based on mindfulness versus wait-list control group

See Summary of findings 4 for a summary of the results.

Primary Outcomes

1. Reduction in aggressive behaviour (frequency/severity of incidents)

Singh 2013 found that the number of incidents of both physical and verbal aggression was significantly lower in the group that received the 'mindfulness' intervention compared to the control group. The effect size (Cohen's d) reported for physical aggression was 1.43 (following a 12-week mindfulness training phase), and MD -2.80 (95% CI -4.37 to -1.23; n = 34; see Analysis 4.1). For verbal aggression Cohen's d 1.35 (following a 12-week mindfulness training phase), and MD -3.30 (95% CI -5.05 to -1.55; n = 34; see Analysis 4.2).

2. Other primary outcomes

No studies reported data on the following primary outcomes: improved ability to control anger, improvement in adaptive functioning, and adverse effects.

Secondary Outcomes

No studies reported data on the following secondary outcomes: improvement of mental state, reduction in (additional) medication, reduction in care needs, improvement in quality of life, frequency service utilisation (and costs), and user satisfaction (or dissatisfaction).

Comparison 5: Modified relaxation training versus no-treatment control group

See Summary of findings 5 for a summary of the results.

Primary Outcomes

1. Reduction in aggressive behaviour (frequency/severity of incidents)

In the McPhail 1989 study, standard deviations (SDs) for outcome measures in the treatment and control groups were not presented in the paper and we therefore could not calculate CIs. Overall, there was a 74% reduction in total incidents of disruptive behaviours in the treatment group from a mean of 14.3 incidents per person per 30 minutes at baseline to 3.6 incidents on the final day of treatment. The control group showed no improvement (mean number of incidents at baseline 10.2 and at end-of-treatment 10.9) and MD in number of incidents 7.3 (F(6, 48) = 2.3, P value = 0.04). The mean measure of verbal disruptive behaviour decreased from 5.6 incidents per person per 30 minutes to 2.5 at the end of treatment, whereas the number of incidents in the control group increased from 3.6 to 5.4 (groups x weeks effect F(3,24) = 3.3, P value = 0.03; MD 2.9). There was also an improvement in aggressive disruptive behaviour from 1.6 incidents at baseline in the treatment group to no incidents at the end of treatment whereas the number of incidents in the control group increased from 1.9 to 4 (group effect F(1,3) = 10.2, P value = 0.04; MD 4.0). There were no differences between the two groups in the mean number of movement disruptive incidents and 'other' disruptive incidents. However, at three-month follow-up, disruption levels had returned to those at baseline.

2. Other primary outcomes

No studies reported data on the following primary outcomes: improved ability to control anger, improvement in adaptive functioning, and adverse effects.

Secondary outcomes

No studies reported data on the following secondary outcomes: improvement of mental state, reduction in (additional) medication, reduction in care needs, improvement in quality of life, frequency of service utilisation (and costs), and user satisfaction.

DISCUSSION

Summary of main results

This updated review contains two new studies, and six studies overall, of adults with intellectual disabilities, examining a range of Cognitive-behavioural therapy (CBT) approaches (individual- and group-based anger management, relaxation, mindfulness-based meditation, problem solving and assertiveness training). No studies of behavioural interventions were included. Overall, the participants were recruited from community-based facilities in all but one of the included studies (Taylor 2005), and are similar to those with problem behaviours likely to be seen by other community-based services in the United Kingdom (UK). Taylor 2005 included detained male service users with serious aggression. The majority of the participants had mild intellectual disabilities or borderline intelligence quotients (IQs).

Follow-up data for both treatment and control groups were available for two studies, of which only one had long-term data of 10 months. One of the new studies (Willner 2013) is large, with moderate-quality evidence (based on the Grades of Recommendation, Assessment, Development and Evaluation (GRADE) assessment) that the anger management intervention improves anger coping skills as reported by participants post-treatment, and anger coping skills as reported by key workers post-treatment and at follow-up (10 months). There were also improvements in anger ratings by carers (key workers) post-treatment and at follow-up, and some improvements in the measures of overall problem behaviours post-treatment but not at follow-up. The other new study included in the review found that the number of incidents of physical and verbal aggression decreased post-treatment in those receiving the intervention (i.e. mindfulness); however, we judged this evidence to be of low quality (Singh 2013). Of the remaining four studies, one found almost no benefit from the intervention, but the intervention was carried out in a forensic sample (Taylor 2005). The other three studies showed improvements in anger ratings post-treatment in the intervention group (Willner 2002), improvements in psychiatric symptoms and subjective distress (Nezu 1991), and improvements in disruptive behaviour, including aggressive disruptive behaviour (McPhail 1989). We judged the evidence reported by these studies to be of moderate-to-low quality, and that CBT-based interventions improve anger ratings, reduce the number of aggressive incidents, and improve psychiatric symptoms.

Only one study investigated the effects of the intervention on quality of life and the cost of health and social care utilisation (Willner 2013). This study found that the intervention did not improve quality of life or reduce the cost of health service utilisation compared to 'no treatment'. There was

heterogeneity in the types of interventions adopted by the different studies (i.e. anger management based on modified relaxation or meditation (mindfulness); social skills training based on behavioural techniques; problem solving and assertiveness training; and anger management using cognitive-behavioural principles); the patient populations studied (e.g. community versus forensic population; presence of comorbid mental health problems), and the outcome measures used. Because of these differences, we did not perform a meta-analysis.

Based on the available data, there is limited evidence that CBT-based interventions are effective in the long-term management of people with outwardly aggressive behaviour, because of the lack of long-term follow-up data comparing the intervention and control groups. There is therefore a need for further high-quality studies reporting such data comparing the outcomes of interest, including cost effectiveness.

Quality of the evidence

We used the GRADE approach to rate the quality of the body of evidence. Based on this assessment, we downgraded the quality of the evidence for outcomes addressing anger management in community settings from high to moderate quality because the results come from only one study and because the confidence intervals were wide (i.e. imprecision). We judged the quality of the evidence for outcomes addressing anger management in forensic settings and modified relaxation training as very low quality (downgraded by three levels), again because the results came from only one study and the confidence intervals were wide (i.e. imprecision), but also because the samples were small, we rated them as being at risk of bias, and the authors did not conduct an intention-to-treat analysis. Finally, we judged the evidence for outcomes assessing assertiveness, problem solving and meditation based on mindfulness as low-quality evidence (downgraded by two levels), again because of risk of bias, imprecision (wide confidence intervals), small samples or being the only published study.

As regards risk of bias, one study did not randomly allocate participants, and in two studies the process of randomisation was unclear. In one study there was no allocation concealment and in three studies this was unclear. Blinding of participants was not possible, given the type of interventions examined, and blinding of assessors did not occur in three studies. One study was at high risk of attrition bias, and in another study this was unclear. There was selective reporting in one study, and other biases were present in one study and unclear in four studies.

Another methodological limitation was the lack of stringent definition criteria for outwardly-directed aggression. Also, only two studies reported follow-up data for both the treatment and control groups, with only one study reporting a follow-up period of up to 10 months (Willner 2013).

Potential biases in the review process

For this updated version of the review, due to the introduction of new search terms, we re-ran searches of key databases. The electronic search was thorough but limited by the search terms that we used. The review process could be further enhanced through more extensive handsearching of journals and contact with experts in the field.

Agreements and disagreements with other studies or reviews

The findings from this review are broadly similar to the previous version of this review (Hassiotis 2008). However, the two new studies have provided further evidence in support of the use of behavioural and cognitive-behavioural approaches in improving some of the participant outcomes. However, evidence from one large study suggests that CBT (anger management) does not lead to significant improvements in quality of life or to reduction of costs.

The results are consistent with other systematic reviews and meta-analysis of behavioural and cognitive-behavioural interventions in the management of aggressive behaviour. Nicoll 2013 found large effect sizes for the treatment of anger using CBT, but they included studies that were not randomised and studies that did not include a control group. Didden 2006 found that behavioural interventions were effective in reducing different types of challenging behaviour. However, the included studies were single-case studies. Heyvaert 2010 and Heyvaert 2012 found a positive effect of treatment of any type for problem behaviours. However, the treatments included pharmacological as well as psychological therapies in managing a range of challenging behaviours, and small case studies. Finally, another systematic review of psychological therapies indicates that individual CBT may be effective for treating depression in people with intellectual disabilities (Vereenoghe 2013), whilst interventions aiming at improving interpersonal relationships are least effective.

AUTHORS' CONCLUSIONS

Implications for practice

At present, there is some evidence that cognitive-behavioural treatments are effective in the short-term management of outwardly-directed aggression. Five of the included studies reported significant improvement immediately after treatment was completed, but the effect was imprecise. Unfortunately, we were not able to include behavioural interventions, such as Applied Behavioural Analysis or Positive Behavioural Support, as published studies did not report specific data on aggression. Despite the methodological limitations, there is some indication that mindfulness may be of some help in reducing aggression. Cognitive-behavioural interventions are relatively resource-intensive but it can be argued that they are preferable to the use of psychotropic drugs, which have significant side-effects. Given that behavioural treatments are often used as first-line or adjunctive treatment in clinical practice for problem behaviours, including outwardly-directed aggression, it is important that their efficacy

is further investigated. In addition, no information yet exists on the best way in which they should be implemented, for example, alone or in combination with other approaches. Finally, access to psychological therapies for people with intellectual disabilities is an important issue, and therefore lay therapists delivering such interventions could make psychological therapies more accessible to this population group.

The treatment of problem behaviours is an expensive long-standing problem for community intellectual disability services and many people are placed far from home or in hospitals. In England, there has been a further drive to develop effective community services for people with intellectual disabilities and aggression (DOH 2012). If such services are to be successful in helping patients effectively, it is paramount that evidence-based treatments are available.

Implications for research

Willner 2005, in a critical overview of psychotherapeutic interventions for people with intellectual disabilities, pointed out the dearth of significant clinical trials to underpin anecdotal information about the efficacy of those interventions in practice. Clearer evidence should be provided by larger randomised controlled trials of well-defined interventions over a longer time frame. The trial protocols should indicate clearly how intellectual disabilities and aggressive behaviour are defined and measured, and they should have strategies for dealing with dropouts. Recruitment of people with intellectual disabilities into trials presents a challenge and strategies to ensure participant flow into studies are essential. Randomised controlled trials comparing behavioural and cognitive-behavioural interventions to other interventions, such as psychotropic medication, or other psychological interventions (e.g. parent training), and studies in children or participants with more severe intellectual disabilities, behavioural phenotypes associated with aggression or autism, would add significantly to the evidence base and improve clinical decision making. Furthermore, new studies should introduce mixed-methods designs to identify any process issues that impede or facilitate the delivery of complex interventions in people with intellectual disabilities.

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* Indicates the major publication for the study

CHARACTERISTICS OF STUDIES

Characteristics of included studies [ordered by study ID]

McPhail 1989

Methods	Randomised controlled trial - Setting: study conducted in Scotland; adult training centre - No study dates are given
Participants	12 participants (mean age 34 (35 in intervention group and 33 in control group) with mild-to-severe intellectual disabilities on BPVS (mean mental age in both groups was 7)) Participants who were eligible were judged to be disruptive by instructors and staff at a day centre as reported on a 10-point severity scale of 17 disruptive behaviours. It would appear that the scale was developed for the study
Interventions	Treatment 1: abbreviated progressive relaxation (n = 6) - Intervention was carried out by researchers who were familiar with the intervention - No fidelity checks of the intervention were carried out Treatment 2: no treatment or "story reading" (n = 6)
Outcomes	Behavioural rating scale, 10-item checklist
Notes	- Data in published paper omitted SD and we did not receive a response from contacting the authors - No information on source of funding - No declaration of conflicts of interest statement

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	No information provided. It is not clear how participants were randomised to treatment groups
Allocation concealment (selection bias)	Unclear risk	No information provided
Blinding of participants and personnel (performance bias) All outcomes	High risk	Participants and personnel were not blinded to group allocation

McPhail 1989 (Continued)

Blinding of outcome assessment (detection bias) All outcomes	Low risk	Outcome assessors were blinded to group allocation
Incomplete outcome data (attrition bias) All outcomes	Low risk	All participants completed the intervention but data from 2 participants were removed from analysis; 1 participant from each group was removed from the analysis (1 was unwell for a week and the other showed no aggression at baseline). Quote: "One subject from each group was discarded from the analysis, one because she was ill for a week during treatment and the other because she showed almost no disruptive behaviour at baseline and throughout the study". The reasons provided for the removal of participants appear to be unrelated to the outcome
Selective reporting (reporting bias)	High risk	No data on the follow-up study are presented in the paper, although the authors provide a reason for this. Quote: "The follow-up study consisted of four observation sessions on two different days in two consecutive weeks, three months after the completion of the original study. Because of extensive changes within the centre, only three relaxation and three control group participants could be observed under similar conditions to that at the time of the original study"
Other bias	Low risk	No other sources of bias such as an imbalance of participant characteristics at baseline

Nezu 1991

Methods	Randomised controlled trial - Setting: study conducted in the USA; participants recruited from an outpatient clinic setting - No study dates are given
Participants	- Eligibility criteria: mild ID, concomitant mental health problem and maladaptive behaviour (e.g. anger control, verbal or physical aggression, destructive behaviour). No changes in medication one month prior to participation in the study. Participants were excluded if they had organic brain syndrome, substance misuse, active psychotic symptoms or were receiving psychological therapies 28 adults (mean age 36 years) were included; 18 were men and most were White caucasian but two were Black. 9 were receiving antipsychotic medication. Baseline characteristics according to allocation group were not provided
Interventions	Treatment 1: Problem-solving-assertiveness (n = 9) Treatment 2: Assertiveness-problem-solving (n = 9) Treatment 3: waiting list (n = 10) - The interventions were delivered by psychologists and were based on established treatment manuals. For the purposes of the review, the 2 arms of the intervention were grouped as 1: assertiveness training and problem solving - The control group went into treatment at the end of the intervention - In order to assess adherence to therapy manual, each therapy session was videotaped and independently assessed by 2 research assistants
Outcomes	- Brief Symptom Inventory, Problem-Solving Task, Adaptive Behaviour Scale-Revised (part II), Role-Play Test of Anger Arousing Situations, Subjective Units of Distress - Assessments were carried out mid-treatment, post-treatment, and at three-month follow-up (treatment group only and therefore not included in the analysis)

Nezu 1991 (Continued)

- Notes
- Participants had comorbid mental disorders but data were available on the behavioural problems separately from the mental disorders. The authors used widely-known instruments for measuring behaviour change and diagnosing mental illness
  - No information in source of funding
  - No declaration of conflicts of interest statement

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Randomisation using coin tossing (This information is not reported in the published paper, but communicated via email to reviewers, Nezu 2000 [pers comm]).
Allocation concealment (selection bias)	Unclear risk	Not reported in the paper; authors contacted but did not respond
Blinding of participants and personnel (performance bias) All outcomes	High risk	No blinding of participants and personnel
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Outcome assessors are reported as being unaware of the treatment status of participants
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not reported in paper; authors contacted but did not respond
Selective reporting (reporting bias)	Low risk	We believe that all prespecified outcomes were reported
Other bias	Unclear risk	Effects of co-morbidity and psychotropic medication on treatment response is unclear

Singh 2013

Methods	Randomised controlled trial
	• Setting: study conducted in the USA; participants were living in community settings • No study dates were given
Participants	• Eligibility criteria: 4 or more incidents of aggression in the last 12 weeks, and the incidents had to be severe enough to cause pain or require first aid • 34 participants with mild intellectual disabilities were included (17 in each group) • Aged 17 - 34 years. Mean age of intervention group 23.4 years; mean age of control group 23.1 years • 7 were women (4 in intervention group; 3 in control group)
Interventions	• Experimental group: 12 weeks of baseline (no intervention: phase 1), followed by 12 weeks of mindfulness training (Meditation on the Soles of the Feet: phase 2), followed by follow-up for 12 weeks (phase 3), and then another 12 weeks (phase 4) • Carers and support staff were taught to use mindfulness techniques in their daily lives by an experienced trainer

Singh 2013 (Continued)

- During the 12-week intervention phase, carers and support staff taught individuals with intellectual disabilities to use mindfulness. This involved 15- to 30-minute sessions with the individual everyday, based on a manual. The initial teaching sessions were recorded and fidelity to the manual was checked by a trained therapist. Fidelity ranged from 89% to 100% across all dyads
- Control group: 12 weeks of baseline (no intervention: phase 1) followed by wait-list (12 weeks: phase 2). The control group were then offered the intervention for 12 weeks (phase 3), followed by 12 weeks of follow-up (phase 4)

Outcomes	Primary outcome: • Mean number of incidents of physical aggression and verbal aggression recorded by individuals and staff or home carers each week, during each 12-week phase. This scale was developed for the study • Inter-rater reliability between individuals and staff or home carers was assessed (agreements ranged from 92% to 100%)
Notes	• Relevant data were extrapolated from graphs (bar charts with standard error bars) • No information on source of funding • No declaration of conflicts of interest statement

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	No information provided; authors contacted but did not respond
Allocation concealment (selection bias)	Unclear risk	No information provided; authors contacted but did not respond
Blinding of participants and personnel (performance bias) All outcomes	High risk	No blinding of participants and personnel
Blinding of outcome assessment (detection bias) All outcomes	High risk	Outcome assessments were completed by parents, support staff and individuals with intellectual disabilities, and therefore were not blinded to group allocation
Incomplete outcome data (attrition bias) All outcomes	Low risk	No incomplete data
Selective reporting (reporting bias)	Low risk	All prespecified outcomes were reported
Other bias	Unclear risk	Authors had a strong allegiance to the intervention and their desire for the intervention to succeed could have affected data collection, but the likelihood of this impacting the results is unclear

Taylor 2005

Methods	Randomised controlled trial (computer-generated randomisation further balanced to ensure that participants matched on key variables) • Setting: study conduct in the UK; inpatient forensic service (National Health Service) • No study dates are provided

Taylor 2005 (Continued)

Participants	• Inclusion criteria: male between 18 - 60 years of age; full scale IQ between 55 to 80 (mild-to-borderline intellectual disability); detained on a section under the Mental health Act; self-report score of 90 or more on the Novaco Anger Scale; self-report score of 55 or more on the Provocation Index • Exclusion criteria: presence of an active, uncontrolled axis 1 mental disorder (DSM IV); presence of epilepsy if thought to be related to episodes of aggression; and if patient was likely to be discharged or transferred within 6 months of starting treatment • Demographic profile: 40 men. Mean age in intervention group 29.4; mean age in control group 29.9; mean IQ in treatment group 67.1; mean IQ in control group 70.7 • 25 of the participants had comorbid mental disorders • Most of the participants had reported physical aggression, including sexual assault
Interventions	• Participants were allocated to treatment and control groups, but also received treatment-as-usual. 20 participants in each group • Treatment 1: Manual-based individual cognitive-behavioural treatment for anger management in people with mild intellectual disabilities • Same therapist delivered 18 weekly sessions. Sessions split into a 6-week preparatory phase and then 12 weeks of treatment • Weekly peer supervision sessions for the therapists and random checks of treatment files to check treatment fidelity and therapist confidence • Treatment 2: Routine care (RC) wait-list control
Outcomes	• Assessments were at baseline, immediately pre-treatment, at completion of treatment, and 4 months post-treatment • Outcomes measures included self reports of Novacos Anger Scale and the Anger Expression Scale. Ward staff completed the Ward Anger Rating Scale over same time
Notes	• No information in source of funding • No declaration of conflicts of interest statement

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Randomisation was carried out by independent statistician using computer-generated randomisation codes. The groups were subsequently "balanced" on the following variables: age, IQ, and length of hospital stay
Allocation concealment (selection bias)	Low risk	In an email (Taylor 2007 [pers comm] , 4 September 2007) author reported "This was done by an assistant psychologist who was not involved in delivering treatment, administering study assessments, or in the routine care of the patients involved."
Blinding of participants and personnel (performance bias) All outcomes	High risk	Participants and study personnel were not blinded to the allocation group
Blinding of outcome assessment (detection bias) All outcomes	High risk	Outcome assessors were not blinded to the treatment group
Incomplete outcome data (attrition bias) All outcomes	High risk	Data from 36 out of 40 participants were reported (10% loss). All dropouts were in the treatment group. 2 dropped out for reasons "unrelated to the treatment itself", and the other 2 were discharged from the hospital and lost to follow-up. The researchers did not carry out an intention-to-treat analysis as the data of those four non-completers were excluded from the final analysis

Taylor 2005 (Continued)

Selective reporting (reporting bias)	Low risk	All prespecified outcomes were reported
Other bias	Unclear risk	The effects of comorbidity and psychotropic medication on treatment response is unclear

Willner 2002

Methods	Quasi-randomised controlled trial (randomisation using alternate referrals) - Setting: study conducted in the UK; community (participants recruited from community teams) - Study dates are not provided	
Participants	- Inclusion criteria: presence of intellectual disability and problems with anger control 16 adults with intellectual disabilities were included (2 later dropped out); 8 participants in each group - Mean age in treatment group 31.4; age range 18 - 57; mean age in control group 30.4, age range 19 - 55 - Participants had mild to moderate level of intellectual disabilities (WAIS-III/WAIS-R)	
Interventions	Treatment 1: 9 x 2-hour group sessions - Treatment was provided by psychologists/therapists - Adherence to treatment/fidelity was not assessed Treatment 2: wait-list control	
Outcomes	- Anger ratings by clients and carers at baseline, 3 weeks post-treatment, and at 3 months follow-up (intervention group only and therefore not included in the analysis) - Measures included the Novacos Anger Scale and Provocation Inventory	
Notes	- No information in source of funding - No declaration of conflicts of interest statement	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	High risk	Randomisation was based on alternate referrals
Allocation concealment (selection bias)	High risk	No concealment of allocation as it was not possible
Blinding of participants and personnel (performance bias) All outcomes	High risk	No blinding of participants and personnel
Blinding of outcome assessment (detection bias) All outcomes	High risk	Quote: "it was not possible to arrange for assessments to be carried out independently or blind"
Incomplete outcome data (attrition bias) All outcomes	Low risk	2 participants were not included in the analysis. Quote: "one dropped out of the treatment group after the first session and the other, who was now in the control group, declined the post-group assessment." The reasons for the dropout/missing data do not appear to be related to the outcome

Willner 2002 (Continued)

Selective reporting (re-reporting bias)	Low risk	All prespecified outcomes were reported
Other bias	High risk	No published psychometric data on the instruments used

Willner 2013

Methods	Cluster-randomised controlled trial of 30 centres (15 experimental and 15 control) - Setting: study conducted in the UK; day centres for people with intellectual disability - Study was carried out between December 2009 and January 2012 - Centres were randomised according to "minimisation" with a random component set at 80% - Centres were balanced on 3 key variables (service users' mean self-reported Provocation Inventory score, number of participants, and mean number of hours spent by service user with at least 1 lay therapist outside of sessions)
Participants	Centres were eligible if: - there were anger control problems amongst at least 4 service users - had at least 2 members of staff willing to be "lay therapists" - no current anger management interventions 179 participants with mild or moderate intellectual disabilities were included in study (90 in intervention arm and 89 in control arm) - Participants were excluded if they required urgent psychological treatment for anger or aggression - Intellectual ability assessed using WASI and BPVS * Median full-scale IQ 57 * Median age 38 * 71% men
Interventions	Treatment group: manualised group cognitive-behavioural anger management therapy - Training (3 sessions over the course of 1 day), based on a manual developed for the intervention, was provided to "lay therapists" (e.g. support staff), who delivered the therapy - Lay therapists were supervised by a psychologist (fortnightly supervision) 52 sessions were monitored for adherence to the manual and inter-rater reliability was assessed (83%). Cohen's kappa of 0.65 is reported overall Control group: "treatment-as-usual", waiting list control group
Outcomes	Primary outcomes: - Self-reported Provocation Index (PI) Score Secondary outcomes: - PI completed by staff - Profile of Anger Coping Skills completed by service user, key worker, and home carer - Aberrant Behaviour Checklist, completed by key worker and home carer - Modified Overt Aggression Scale, completed by key worker and home carer - Controllability Beliefs Scales completed by key worker Other secondary measures included quality of life, depression, anxiety, self esteem, and service resource utilisation (using CSRI)
Notes	Relatively large study incorporating a large number of centres

Willner 2013 (Continued)

- Funding by the NIHR Health Technology Assessment (HTA) programme
- Declaration of conflicts of interest: nil

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Randomisation was based in 'minimisation' with a random component set at 80%
Allocation concealment (selection bias)	Low risk	Not an issue as clusters were all randomised at the same time
Blinding of participants and personnel (performance bias) All outcomes	High risk	Participants and study personnel were not blinded to the allocation group. Key worker reports were provided by staff who had not been the 'lay therapist' but this was not possible in all cases (n = 14)
Blinding of outcome assessment (detection bias) All outcomes	Low risk	The assessors were blinded to the allocation group but the authors report "although this may have been compromised by incidental comments from respondents during data collection". However, the authors believe that this risk was small
Incomplete outcome data (attrition bias) All outcomes	Low risk	Number of participants who withdrew from study are reported. At 10 months retention rate was 81% (projected 80%) with same number of dropouts in both arms (17 dropouts). Results were analysed according to intention-to-treat. 80% of key workers retained at 10-month follow-up but only 60% of home carers were retained at follow-up
Selective reporting (reporting bias)	Low risk	All prespecified the outcomes were reported
Other bias	Unclear risk	Authors had a strong allegiance to the intervention and their desire for the intervention to succeed could have affected data collection, but the likelihood of this impacting the results is unclear

BPVS: British Picture Vocabulary Scale.

CSRI: Client Service Receipt Inventory.

IQ: intelligence quotient.

MHA: Mental Health Act.

NHS: National Health Service.

NIHR: National Institute for Health Research.

SD: standard deviation.

WAIS: Wechsler Adult Intelligence Scale.

WAIS-III: Wechsler Adult Intelligence Scale, Third Edition.

WAIS-R: Wechsler Adult Intelligence Scale, Revised.

WASI: Wechsler Abbreviated Scale of Intelligence.

Characteristics of excluded studies [ordered by study ID]

Study	Reason for exclusion
Amerikaner 1982	Participants did not specifically have intellectual disabilities
Bagner 2007	Intervention was based on parent-child interactions (parent training)

Study	Reason for exclusion
Baker 1971	Non-randomised study
Bearss 2013	Not randomised. No control group
Benson 1986	Non-randomised 4-armed study. No 'no-treatment' control group
Bird 2000	Descriptive study. No randomisation or concealment of allocation. Poor design
Bornstein 1980	Non-randomised study. Participants did not specifically have aggressive behaviour
Brightman 1982	Study about parent training
Brookman-Frazee 2012	No control group. It is not clear whether participants had intellectual disabilities
Carr 2006	Participants did not specifically have aggressive behaviour
Clement 1967	Participants did not specifically have intellectual disabilities or aggressive behaviour
Durand 2013	Participants did not specifically have intellectual disabilities. Intervention based on parent training
Edmonson 1983	Aimed at improving prosocial behaviour, rather than aggressive behaviour
Eikeseth 2007	Non-randomised study. Participants did not appear to have intellectual disabilities
Eikeseth 2012	Non-randomised study. Not clear what proportion of participants had intellectual disabilities. Study not specifically about aggressive behaviour
Eldevik 2006	Non-randomised study. Not specifically about aggressive behaviour
Fava 2011	Non-randomised study. Not specifically about aggressive behaviour
Feldman 2002	No control group
Gates 2001	Study about parent training
Gresham 1982	Non-randomised study. No concealment of allocation. No instrument for recording aggressive behaviour
Grey 2007	Non-randomised study
Hagiliassis 2005	Participants were not clearly aggressive although they all had difficulties with anger control and expression of anger. Not all participants had intellectual disabilities
Hall 1973	Descriptive study, not a clinical trial
Hassiotis 2009	Not specifically about aggressive behaviour
Koenig 2010	Participants did not have intellectual disabilities. Study not specifically about aggressive behaviour
Leblanc 1995	Investigates the impact of social skills training on pro-social behaviours in preschoolers with developmental delays. No data available on outward-directed aggression
Lindsay 2004	Non-randomised study

Study	Reason for exclusion
Lovaas 1987	Non-randomised study. No “no treatment control group”. Participants did not specifically have intellectual disabilities or aggressive behaviour
Lowe 1996	Non-randomised study. Not specifically about aggressive behaviour
Mate-Kole 1999	Not all participants had intellectual disabilities. Study not specifically about aggressive behaviour
Murphy 1978	No “no treatment control group”. Study not specifically about aggressive behaviour
Reitzel 2013	Not specifically about aggressive behaviour
Rickards 2009	No "no treatment" control group. Parent- or family-based intervention
Roberts 2006	Study about parent training. Participants were not aggressive
Roeden 2014	Non-randomised study
Rose 2000	Study appears to describe some of the data included in Rose 2005 group treatment for aggressive behaviour. No randomisation. No proper wait-list control
Rose 2005	Study describes 10 groups for aggressive behaviour held over 5 years. Some people on the waiting list were assessed but there was no random allocation and therefore no proper wait-list control
Rose 2009	Non-randomised study
Schnitzer 2007	Non-randomised study. Not specifically about aggressive behaviour
Shechtman 2005	Not specifically about aggressive behaviour
Smith 1997	Study about development of pro-social behaviours rather than ameliorating aggressive behaviour
Strauss 2012	Non-randomised study of parent training
Tavormina 1975	Study about parent training
Taylor 2002	Wait-list controlled study of individual cognitive behavioural therapy for anger. Pilot study, and the data have been included in Taylor 2005
To 2000	Small scale non-randomised trial of efficacy of progressive relaxation in reducing aggressive behaviours, which included self injury and forensic behaviours and as such was not part of this review
Wacker 1998	Study about parent training
Wiggs 1999	Not specifically about aggressive behaviour
Willner 2007	Non-randomised study

Characteristics of studies awaiting assessment *[ordered by study ID]*

[Collada-Castillo 2011](#)

Methods	Randomised controlled trial
	Study conducted in the USA

Collada-Castillo 2011 (Continued)

Participants	36 participants with intellectual disability and aggressive behaviour
Interventions	- Two intervention arms: group based cognitive re-appraisal and group based problem solving; and one control arm - Participants were randomly assigned to one of the three arms
Outcomes	Participants' ability to understand the intentions of others; ability to generate assertive / effective problem solving strategies and to regulate anger
Notes	

DATA AND ANALYSES
Comparison 1. Anger management versus wait-list control group (community sample)

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Aggressive behaviour: Severity of incidents: Aberrant Behaviour Checklist (ABC) - Hyperactivity subscale - key worker report	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
1.1 Post-treatment	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
1.2 Follow-up: 10 months	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
2 Aggressive behaviour: Severity of incidents: ABC - Irritability subscale - key worker report	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
2.1 Post-treatment	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
2.2 Follow-up: 10 months	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
3 Aggressive behaviour: Severity of incidents: ABC - Hyperactivity subscale - home carer report	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
3.1 Post-treatment	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
3.2 Follow-up: 10 months	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
4 Aggressive behaviour: Severity of incidents: ABC - Irritability subscale - home carer report	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
4.1 Post-treatment	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
4.2 Follow-up: 10 months	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
5 Aggressive behaviour: Severity of incidents: MOAS - key worker report	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
5.1 Post-treatment	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
5.2 Follow-up: 10 months	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
6 Aggressive behaviour: Severity of incidents: Modified Overt Aggression Scale (MOAS) - home carer report	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
6.1 Post-treatment	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
6.2 Follow-up: 10 months	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
7 Aggressive behaviour: Severity of incidents: Controllability Beliefs Scale (CBS) - key worker report	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
7.1 Post-treatment	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
7.2 Follow-up: 10 months	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
8 Ability to control anger: Provocation Inventory (PI) - self report	2		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
8.1 Post-treatment	2		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
8.2 Follow-up: 10 months	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
9 Ability to control anger: PI - carer report	2		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
9.1 Post-treatment	2		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
9.2 Follow-up: 10 months	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
10 Ability to control anger: Novaco Anger Scale (NAS) - self report	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
10.1 Post-treatment	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
11 Ability to control anger: NAS - carer report	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
11.1 Post-treatment	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
12 Ability to control anger: Profile of Anger Coping Skills (PACS) - self report	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
12.1 Post-treatment	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
12.2 Follow-up: 10 months	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
13 Ability to control anger: PACS - key worker report	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
13.1 Post-treatment	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
13.2 Follow-up: 10 months	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
14 Ability to control anger: PACS - home carer report	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
14.1 Post-treatment	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
14.2 Follow-up: 10 months	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
15 Mental state: Depression: Glasgow Depression Scale for people with an Intellectual Disability (GDS-ID)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
15.1 Post-treatment	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
15.2 Follow-up: 10 months	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
16 Mental state: Anxiety: Glasgow Anxiety Scale for people with an Intellectual Disability (GAS-ID)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
16.1 Post treatment	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
16.2 Follow-up: 10 months	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
17 Self esteem: Rosenberg Self Esteem Scale (SES)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
17.1 Post-treatment	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
17.2 Follow-up: 10 months	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
18 Quality of Life: Comprehensive Quality of Life Scale: Intellectual Disability (ComQoL-ID)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
18.1 Post-treatment	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
18.2 Follow-up: 10 months	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
19 Costs of service utilisation: Client Service Receipt Inventory (CSRI): Cost per person per	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
week of health and social care resource (in British pounds)				
19.1 Follow-up: 10 months	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]

Analysis 1.1. Comparison 1 Anger management versus wait-list control group (community sample), Outcome 1 Aggressive behaviour: Severity of incidents: Aberrant Behaviour Checklist (ABC) - Hyperactivity subscale - key worker report.

Study or subgroup	Treatment		Control		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	Fixed, 95% CI	Fixed, 95% CI
1.1.1 Post-treatment						
Willner 2013	78	7.9 (7.7)	81	12.7 (10.2)		-4.8[-7.6,-2]
1.1.2 Follow-up: 10 months						
Willner 2013	77	8.2 (8.4)	73	9.4 (9)		-1.2[-3.98,1.58]
					Favours treatment	Favours control

Analysis 1.2. Comparison 1 Anger management versus wait-list control group (community sample), Outcome 2 Aggressive behaviour: Severity of incidents: ABC - Irritability subscale - key worker report.

Study or subgroup	Treatment		Control		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	Fixed, 95% CI	Fixed, 95% CI
1.2.1 Post-treatment						
Willner 2013	77	7.5 (7.8)	81	11 (9.5)		-3.5[-6.21,-0.79]
1.2.2 Follow-up: 10 months						
Willner 2013	77	8.4 (9.8)	73	7.6 (6.8)		0.8[-1.89,3.49]
					Favours treatment	Favours control

Analysis 1.3. Comparison 1 Anger management versus wait-list control group (community sample), Outcome 3 Aggressive behaviour: Severity of incidents: ABC - Hyperactivity subscale - home carer report.

Study or subgroup	Treatment		Control		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	Fixed, 95% CI	Fixed, 95% CI
1.3.1 Post-treatment						
Willner 2013	45	9.3 (9.7)	59	12.3 (12)		-3[-7.17,1.17]
1.3.2 Follow-up: 10 months						
Willner 2013	43	6.7 (7.6)	41	9.1 (13.8)		-2.4[-7.2,2.4]
					Favours treatment	Favours control

Analysis 1.4. Comparison 1 Anger management versus wait-list control group (community sample), Outcome 4 Aggressive behaviour: Severity of incidents: ABC - Irritability subscale - home carer report.

Analysis 1.5. Comparison 1 Anger management versus wait-list control group (community sample), Outcome 5 Aggressive behaviour: Severity of incidents: MOAS - key worker report.

Analysis 1.6. Comparison 1 Anger management versus wait-list control group (community sample), Outcome 6 Aggressive behaviour: Severity of incidents: Modified Overt Aggression Scale (MOAS) - home carer report.

Analysis 1.7. Comparison 1 Anger management versus wait-list control group (community sample), Outcome 7 Aggressive behaviour: Severity of incidents: Controllability Beliefs Scale (CBS) - key worker report.

Analysis 1.8. Comparison 1 Anger management versus wait-list control group (community sample), Outcome 8 Ability to control anger: Provocation Inventory (PI) - self report.

Analysis 1.9. Comparison 1 Anger management versus wait-list control group (community sample), Outcome 9 Ability to control anger: PI - carer report.

Analysis 1.10. Comparison 1 Anger management versus wait-list control group (community sample), Outcome 10 Ability to control anger: Novaco Anger Scale (NAS) - self report.

Analysis 1.11. Comparison 1 Anger management versus wait-list control group (community sample), Outcome 11 Ability to control anger: NAS - carer report.

Analysis 1.12. Comparison 1 Anger management versus wait-list control group (community sample), Outcome 12 Ability to control anger: Profile of Anger Coping Skills (PACS) - self report.

Analysis 1.13. Comparison 1 Anger management versus wait-list control group (community sample), Outcome 13 Ability to control anger: PACS - key worker report.

Analysis 1.14. Comparison 1 Anger management versus wait-list control group (community sample), Outcome 14 Ability to control anger: PACS - home carer report.

Analysis 1.15. Comparison 1 Anger management versus wait-list control group (community sample), Outcome 15 Mental state: Depression: Glasgow Depression Scale for people with an Intellectual Disability (GDS-ID).

Study or subgroup	Treatment		Control		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	Fixed, 95% CI	Fixed, 95% CI
Willner 2013	72	8.3 (8.2)	72	8.1 (6)		0.2[-2.15,2.55]

Analysis 1.16. Comparison 1 Anger management versus wait-list control group (community sample), Outcome 16 Mental state: Anxiety: Glasgow Anxiety Scale for people with an Intellectual Disability (GAS-ID).

Study or subgroup	Treatment		Control		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	Fixed, 95% CI	Fixed, 95% CI
1.16.1 Post treatment						
Willner 2013	75	16 (10.7)	79	18.3 (8.7)		-2.3[-5.39,0.79]
1.16.2 Follow-up: 10 months						
Willner 2013	72	15.6 (9.3)	71	15.2 (8.9)		0.4[-2.59,3.39]

Analysis 1.17. Comparison 1 Anger management versus wait-list control group (community sample), Outcome 17 Self esteem: Rosenberg Self Esteem Scale (SES).

Study or subgroup	Treatment		Control		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	Fixed, 95% CI	Fixed, 95% CI
1.17.1 Post-treatment						
Willner 2013	67	25.3 (3.9)	74	25 (3.9)		0.3[-0.98,1.58]
1.17.2 Follow-up: 10 months						
Willner 2013	64	25.8 (4.8)	70	26.5 (4.1)		-0.7[-2.22,0.82]

Analysis 1.18. Comparison 1 Anger management versus wait-list control group (community sample), Outcome 18 Quality of Life: Comprehensive Quality of Life Scale: Intellectual Disability (ComQoL-ID).

Study or subgroup	Treatment		Control		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	Fixed, 95% CI	Fixed, 95% CI
1.18.1 Post-treatment						
Willner 2013	62	94.3 (40.2)	67	99.9 (31.3)		-5.6[-18.11,6.91]
1.18.2 Follow-up: 10 months						
Willner 2013	70	97.5 (34.1)	70	98.1 (41.9)		-0.6[-13.26,12.06]

Analysis 1.19. Comparison 1 Anger management versus wait-list control group (community sample), Outcome 19 Costs of service utilisation: Client Service Receipt Inventory (CSRI): Cost per person per week of health and social care resource (in British pounds).

Comparison 2. Anger management versus wait-list control group (forensic sample)

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Aggressive behaviour: Severity of incidents: NAS - Total score	1		Mean Difference (IV, Random, 95% CI)	Totals not selected
1.1 Post-treatment	1		Mean Difference (IV, Random, 95% CI)	0.0 [0.0, 0.0]
1.2 Follow-up: 4 months	1		Mean Difference (IV, Random, 95% CI)	0.0 [0.0, 0.0]
2 Aggressive behaviour: Severity of incidents: NAS - Cognitive subscale	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
2.1 Post-treatment	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
2.2 Follow-up: 4 months	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
3 Aggressive behaviour: Severity of incidents: NAS - Arousal subscale	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
3.1 Post-treatment	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
3.2 Follow-up: 4 months	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
4 Aggressive behaviour: Severity of incidents: NAS - Behavioral subscale	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
4.1 Post-treatment	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
4.2 Follow-up: 4 months	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
5 Ability to control anger: PI - Total score	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
5.1 Post-treatment	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
5.2 Follow-up: 4 months	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
6 Ability to control anger: PI - Disrespect subscale	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
6.1 Post-treatment	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
6.2 Follow-up: 4 months	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
7 Ability to control anger: PI - Unfairness subscale	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
7.1 Post-treatment	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
7.2 Follow-up: 4 months	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
8 Ability to control anger: PI - Frustration subscale	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
8.1 Post-treatment	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
8.2 Follow-up: 4 months	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
9 Ability to control anger: PI - Annoying traits subscale	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
9.1 Post-treatment	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
9.2 Follow-up: 4 months	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
10 Ability to control anger: PI - Irritations subscale	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
10.1 Post-treatment	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
10.2 Follow-up: 4 months	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
11 Ability to control anger: Spielberg's State - Trait Anger Expression Inventory - Anger Expression subscale (STAXI - AX)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
11.1 Post-treatment	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
11.2 Follow-up: 4 months	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
12 Ability to control anger: STAXI - Anger control subscale	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
12.1 Post-treatment	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
12.2 Follow-up: 4 months	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
13 Ability to control anger: Ward Anger Rating Scale (WARS)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
13.1 Post-treatment	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
13.2 Follow-up: 4 months	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]

Analysis 2.1. Comparison 2 Anger management versus wait-list control group (forensic sample), Outcome 1 Aggressive behaviour: Severity of incidents: NAS - Total score.

Analysis 2.2. Comparison 2 Anger management versus wait-list control group (forensic sample), Outcome 2 Aggressive behaviour: Severity of incidents: NAS - Cognitive subscale.

Analysis 2.3. Comparison 2 Anger management versus wait-list control group (forensic sample), Outcome 3 Aggressive behaviour: Severity of incidents: NAS - Arousal subscale.

Analysis 2.4. Comparison 2 Anger management versus wait-list control group (forensic sample), Outcome 4 Aggressive behaviour: Severity of incidents: NAS - Behavioral subscale.

Study or subgroup	Treatment		Control		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	Fixed, 95% CI	Fixed, 95% CI
Taylor 2005	16	30.3 (5.7)	20	32.9 (5.3)		-2.64[-6.26,0.98]
					Favours treatment -10 -5 0 5 10 Favours control	

Analysis 2.5. Comparison 2 Anger management versus wait-list control group (forensic sample), Outcome 5 Ability to control anger: PI - Total score.

Study or subgroup	Treatment		Control		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	Fixed, 95% CI	Fixed, 95% CI
2.5.1 Post-treatment						
Taylor 2005	16	62 (15.9)	20	70.7 (16.3)		-8.7[-19.27,1.87]
2.5.2 Follow-up: 4 months						
Taylor 2005	16	64.2 (17.3)	20	69.2 (15.5)		-4.96[-15.82,5.9]
					Favours treatment -20 -10 0 10 20 Favours control	

Analysis 2.6. Comparison 2 Anger management versus wait-list control group (forensic sample), Outcome 6 Ability to control anger: PI - Disrespect subscale.

Study or subgroup	Treatment		Control		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	Fixed, 95% CI	Fixed, 95% CI
2.6.1 Post-treatment						
Taylor 2005	16	13.4 (3)	20	14.6 (3.6)		-1.16[-3.3,0.98]
2.6.2 Follow-up: 4 months						
Taylor 2005	16	13.5 (4)	20	13.8 (3.6)		-0.3[-2.82,2.22]
					Favours treatment -4 -2 0 2 4 Favours control	

Analysis 2.7. Comparison 2 Anger management versus wait-list control group (forensic sample), Outcome 7 Ability to control anger: PI - Unfairness subscale.

Study or subgroup	Treatment		Control		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	Fixed, 95% CI	Fixed, 95% CI
2.7.1 Post-treatment						
Taylor 2005	16	13.8 (3.7)	20	15.9 (3.6)		-2.04[-4.45,0.37]
2.7.2 Follow-up: 4 months						
Taylor 2005	16	14.6 (3.5)	20	14.8 (3.7)		-0.19[-2.53,2.15]
					Favours treatment -5 -2.5 0 2.5 5 Favours control	

Analysis 2.8. Comparison 2 Anger management versus wait-list control group (forensic sample), Outcome 8 Ability to control anger: PI - Frustration subscale.

Analysis 2.9. Comparison 2 Anger management versus wait-list control group (forensic sample), Outcome 9 Ability to control anger: PI - Annoying traits subscale.

Analysis 2.10. Comparison 2 Anger management versus wait-list control group (forensic sample), Outcome 10 Ability to control anger: PI - Irritations subscale.

Analysis 2.11. Comparison 2 Anger management versus wait-list control group (forensic sample), Outcome 11 Ability to control anger: Spielberger's State - Trait Anger Expression Inventory - Anger Expression subscale (STAXI - AX).

Analysis 2.12. Comparison 2 Anger management versus wait-list control group (forensic sample), Outcome 12 Ability to control anger: STAXI - Anger control subscale.

Analysis 2.13. Comparison 2 Anger management versus wait-list control group (forensic sample), Outcome 13 Ability to control anger: Ward Anger Rating Scale (WARS).

Comparison 3. Assertiveness and problem-solving versus no-treatment control group

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Ability to control anger: Problem-Solving Task (PST)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
1.1 Post-treatment	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
2 Ability to control anger: Role Play Test of Anger Arising Situations (RPT)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
2.1 Post-treatment	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
3 Adaptive functioning: Adaptive Behaviour Scale - Revised, Part II (ABS-II)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
3.1 Post-treatment	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
4 Mental state: Psychiatric symptoms: Brief Symptom Inventory (BSI)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
4.1 Post-treatment	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
5 Mental state: Psychological distress: Subjective Units of Distress Scale (SUDS)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
5.1 Post-treatment	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]

Analysis 3.1. Comparison 3 Assertiveness and problem-solving versus no-treatment control group, Outcome 1 Ability to control anger: Problem-Solving Task (PST).

Study or subgroup	Treatment		Control		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	Fixed, 95% CI	Fixed, 95% CI
3.1.1 Post-treatment						
Nezu 1991	18	-65.8 (20.8)	10	-41 (17.9)		-24.84[-39.5,-10.18]
					Favours treatment	Favours control

Analysis 3.2. Comparison 3 Assertiveness and problem-solving versus no-treatment control group, Outcome 2 Ability to control anger: Role Play Test of Anger Arising Situations (RPT).

Study or subgroup	Treatment		Control		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	Fixed, 95% CI	Fixed, 95% CI
3.2.1 Post-treatment						
Nezu 1991	18	-25.4 (5.9)	10	-13.7 (6)		-11.69[-16.32,-7.06]
					Favours treatment	Favours control

Analysis 3.3. Comparison 3 Assertiveness and problem-solving versus no-treatment control group, Outcome 3 Adaptive functioning: Adaptive Behaviour Scale - Revised, Part II (ABS-II).

Study or subgroup	Treatment		Control		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	Fixed, 95% CI	Fixed, 95% CI
3.3.1 Post-treatment						
Nezu 1991	18	53.2 (17.2)	10	74.9 (20)		-21.73[-36.44,-7.02]
					Favours treatment	Favours control

Analysis 3.4. Comparison 3 Assertiveness and problem-solving versus no-treatment control group, Outcome 4 Mental state: Psychiatric symptoms: Brief Symptom Inventory (BSI).

Study or subgroup	CBT (AT & P-S)		NO TREAT- MENT CONTROL		Mean Difference	
	N	Mean(SD)	N	Mean(SD)	Fixed, 95% CI	Fixed, 95% CI
3.4.1 Post-treatment						
Nezu 1991	18	0.7 (0.5)	10	1.2 (0.4)		-0.48[-0.79,-0.17]
Favours treatment					-0.5 -0.25 0 0.25 0.5	Favours control

Analysis 3.5. Comparison 3 Assertiveness and problem-solving versus no-treatment control group, Outcome 5 Mental state: Psychological distress: Subjective Units of Distress Scale (SUDS).

Study or subgroup	Treatment		Control		Mean Difference	
	N	Mean(SD)	N	Mean(SD)	Fixed, 95% CI	Fixed, 95% CI
3.5.1 Post-treatment						
Nezu 1991	18	3 (3.1)	10	7.4 (3.3)		-4.36[-6.85,-1.87]
Favours treatment					-10 -5 0 5 10	Favours control

Comparison 4. Meditation based on mindfulness versus wait-list control group

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Aggressive behaviour: Frequency of incidents: Number of incidents of physical aggression per week during treatment (12 weeks)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
1.1 Post-treatment	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
2 Aggressive behaviour: Frequency of incidents: Number of incidents of verbal aggression per week during treatment (12 weeks)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
2.1 Post-treatment	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]

Analysis 4.1. Comparison 4 Meditation based on mindfulness versus wait-list control group, Outcome 1 Aggressive behaviour: Frequency of incidents: Number of incidents of physical aggression per week during treatment (12 weeks).

Study or subgroup	Treatment		Control		Mean Difference	
	N	Mean(SD)	N	Mean(SD)	Fixed, 95% CI	Fixed, 95% CI
4.1.1 Post-treatment						
Singh 2013	17	3 (2.7)	17	5.8 (1.9)		-2.8[-4.37,-1.23]
Favours treatment					-100 -50 0 50 100	Favours control

Analysis 4.2. Comparison 4 Meditation based on mindfulness versus wait-list control group, Outcome 2 Aggressive behaviour: Frequency of incidents: Number of incidents of verbal aggression per week during treatment (12 weeks).

Study or subgroup	Treatment		Control		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	Fixed, 95% CI	Fixed, 95% CI
4.2.1 Post-treatment						
Singh 2013	17	2.8 (2.7)	17	6.1 (2.5)	+	-3.3[-5.05,-1.55]
					Favours treatment	Favours control

APPENDICES

Appendix 1. Detailed search strategies for updated review

Cochrane Central Register of Controlled Studies (CENTRAL), part of the Cochrane Library

2014, Issue 3, searched 8 April 2014. Limited to publication year 2013 to 2014 [59 records]

2013, Issue 4, searched 24 May 2013 [216 records]

#1MeSH descriptor: [Intellectual Disability] explode all trees
#2MeSH descriptor: [Mentally Disabled Persons] this term only
#3MeSH descriptor: [Developmental Disabilities] this term only
#4MeSH descriptor: [Child Development Disorders, Pervasive] this term only
#5MeSH descriptor: [Autistic Disorder] this term only
#6(intellect* near/5 (deficien* or disab* or handicap* or impair*))
#7(mental* near/5 (deficien* or disab* or handicap* or impair* or retard*))
#8(learning near/5 (difficult* or disab* or disorder* or impair*))
#9autis*
#10(down* near/3 syndrome*)
#11(Fragile next X or Fraxe or Fraxa or Martin next Bell or Marker next X)
#12(prader near/3 willi*)
#13MeSH descriptor: [Tuberous Sclerosis] this term only
#14tuberous sclerosis
#15(williams near/3 syndrome):ti,ab
#16#1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9 or #10 or #11 or #12 or #13 or #14 or #15
#17MeSH descriptor: [Anger] this term only
#18MeSH descriptor: [Aggression] 2 tree(s) exploded
#19(anger or angry)
#20(aggressive or aggression)
#21MeSH descriptor: [Attention Deficit and Disruptive Behavior Disorders] 1 tree(s) exploded
#22MeSH descriptor: [Impulse Control Disorders] this term only
#23(attention deficit* or (hyperactiv* or hyper-activ*))
#24MeSH descriptor: [Behavior] this term only
#25MeSH descriptor: [Behavioral Symptoms] this term only
#26MeSH descriptor: [Child Behavior] 1 tree(s) exploded
#27MeSH descriptor: [Child Behavior Disorders] explode all trees
#28MeSH descriptor: [Dangerous Behavior] 1 tree(s) exploded
#29(behavio*r*)
#30((conduct or disruptive) near/3 disorder*)
#31(impuls* near/3 (conduct* or control* or disorder*))
#32(oppositional or defiant or defiance)
#33MeSH descriptor: [Violence] this term only
#34violen*

(Continued)

#35(violence or violent)
#36#17 or #18 or #19 or #20 or #21 or #22 or #23 or #24 or #25 or #26 or #27 or #28 or #29 or #30 or #31 or #32 or #33 or #34 or #35
#37#16 and #36
#38MeSH descriptor: [Psychotherapy] this term only
#39MeSH descriptor: [Behavior Therapy] this term only
#40MeSH descriptor: [Behavior Control] this term only
#41MeSH descriptor: [Cognitive Therapy] this term only
#42CBT
#43((cognitive or cognition) near/3 (intervention* or method* or technique* or therap* or training or treat*))
#44(behavio*r* near/3 (intervention* or method* or technique* or therap* or training or treat*))
#45(behavio*r* near/3 (control* or modif*))
#46(psychotherap* or psycho next therap* or psycho-therap*)
#47(aversive or aversion or biofeedback or bio-feedback or bio next feedback or desensiti*ation or relaxation or meditat*)
#48(functional next behavio*r* next analys*)
#49(functional next analys* near/10 behavio*r*)
#50(anger near/3 (control* or coping or manage*))
#51MeSH descriptor: [Family Therapy] this term only
#52family next therap*
#53((multi next systemic or multisystemic) near/2 therap*)
#54social next skill* next train*
#55#38 or #39 or #40 or #41 or #42 or #43 or #44 or #45 or #46 or #47 or #48 or #49 or #50 or #51 or #52 or #53 or #54
#56#37 and #55

Ovid MEDLINE

1946 to March week 4 2014, searched 8 April 2014. Limited to ED 20130501 to 20140408 [59 records]

1946 to May week 3 2013, searched 23 May 2013 [934 records]

1 exp Intellectual Disability/
2 Mentally Disabled Persons/
3 Developmental Disabilities/
4 Child Development Disorders, Pervasive/
5 Autistic Disorder/
6 (intellect\$ adj5 (deficien\$ or disab\$ or handicap\$ or impair\$)).tw.
7 (mental\$ adj5 (deficien\$ or disab\$ or handicap\$ or impair\$ or retard\$)).tw.
8 (learning adj5 (difficult\$ or disab\$ or disorder\$ or impair\$)).tw.
9 autis\$.tw.
10 (down\$ adj3 syndrome\$).tw.
11 (Fragile X or Fraxe or Fraxa or Martin Bell or Marker X).tw.
12 (prader adj3 willi).tw.
13 Tuberous Sclerosis/
14 tuberous sclerosis.tw.
15 (williams adj3 syndrome).tw.
16 or/1-15
17 Anger/
18 exp Aggression/
19 (anger or angry).tw.
20 (aggressive or aggression).tw.
21 "attention deficit and disruptive behavior disorders"/
22 attention deficit disorder with hyperactivity/
23 conduct disorder/
24 Impulse Control Disorders/
25 (attention deficit\$ or (hyperactiv\$ or hyper-activ\$)).tw.
26 behavior/
27 behavioral symptoms/
28 exp child behavior/
29 Child Behavior Disorders/
30 Dangerous Behavior/
31 behavio?r\$.tw.
32 Conduct disorder/

(Continued)

33 ((conduct or disruptive) adj3 disorder\$.tw.
34 impulse control disorder/
35 (impuls\$ adj3 (conduct\$ or control\$ or disorder\$)).tw.
36 (oppositional or defiant or defiance).tw.
37 Violence/
38 (violent or violence).tw.
39 violen\$.tw.
40 or/17-39
41 Psychotherapy/
42 Behavior therapy/
43 behavior control/
44 Cognitive therapy/
45 CBT.tw.
46 ((cognitive or cognition) adj3 (intervention\$ or method\$ or technique\$ or therap\$ or training or treat\$)).tw.
47 (behavio?r\$ adj3 (intervention\$ or method\$ or technique\$ or therap\$ or training or treat\$)).tw.
48 (behavio?r\$ adj3 (control\$ or modif\$)).tw.
49 (psychotherap\$ or psycho-therap\$).tw.
50 (aversive or aversion or biofeedback or bio-feedback or desensiti#ation or relaxation or meditat\$).tw.
51 functional behavio?r\$ analys\$.tw.
52 (functional analys\$ adj10 behavio?r\$).tw.
53 (anger adj3 (control\$ or coping or manage\$)).tw.
54 Family therapy/
55 family therap\$.tw.
56 ((multi systemic or multisystemic) adj2 therap\$).tw.
57 social skill\$ train\$.tw.
58 or/41-57
59 randomized controlled trial.pt.
60 controlled clinical trial.pt.
61 randomi#ed.ab.
62 placebo\$.ab.
63 drug therapy.fs.
64 randomly.ab.
65 trial.ab.
66 groups.ab.
67 or/59-66
68 exp animals/ not humans.sh.
69 67 not 68
70 16 and 40 and 58 and 69

Embase (Ovid)

1980 to 2014 week 14, searched 9 April 2014. Limited to EM 201321 to 2014114 [107 records]

1980 to 2013 week 20, searched 23 May 2013 [967 records]

1 exp mental deficiency/
2 intellectual impairment/
3 learning disorder/
4 developmental disorder/
5 autism/
6 (intellect\$ adj5 (deficien\$ or disab\$ or handicap\$ or impair\$)).tw.
7 (mental\$ adj5 (deficien\$ or disab\$ or handicap\$ or impair\$ or retard\$)).tw.
8 (learning adj5 (difficult\$ or disab\$ or disorder\$ or impair\$)).tw.
9 autis\$.tw.
10 (down\$ adj3 syndrome\$).tw.
11 (Fragile X or Fraxe or Fraxa or Martin Bell or Marker X).tw.
12 (prader adj3 willi\$).tw.
13 tuberous sclerosis/
14 tuberous sclerosis.tw.
15 (williams adj3 syndrome).tw.
16 mental patient/

(Continued)

- 17 or/1-16
- 18 exp aggression/
- 19 (anger or angry).tw.
- 20 (aggressive or aggression).tw.
- 21 attention deficit disorder/
- 22 (attention deficit\$ or (hyperactiv\$ or hyper-activ\$)).tw.
- 23 Behavior/
- 24 Behavior disorder/
- 25 conduct disorder/
- 26 ((conduct or disruptive) adj3 disorder\$).tw.
- 27 Impulse Control Disorder/
- 28 (impuls\$ adj3 (conduct\$ or control\$ or disorder\$)).tw.
- 29 oppositional defiant disorder/
- 30 (oppositional or defiant or defiance).tw.
- 31 ((behavior or behaviour) adj5 disorder\$).tw.
- 32 (challenging adj5 (behavior\$ or behaviour\$)).tw.
- 33 violence/
- 34 violen\$.tw.
- 35 or/18-34
- 36 17 and 35
- 37 Psychotherapy/
- 38 behavior therapy/
- 39 cognitive therapy/
- 40 (behavio?r\$ adj3 (intervention\$ or method\$ or technique\$ or therap\$ or training or treat\$)).tw.
- 41 ((cognitive or cognition) adj3 (intervention\$ or method\$ or technique\$ or therap\$ or training or treat\$)).tw.
- 42 CBT.tw.
- 43 (behavio?r\$ adj3 (control\$ or modif\$)).tw.
- 44 (aversive or aversion or biofeedback or bio-feedback or desensiti#ation or relaxation or mediat\$).tw. [Note "mediate\$" corrected to "meditat\$" in line 53]
- 45 functional behavio?r\$ analys\$.tw.
- 46 (functional analys\$ adj10 behavio?r\$).tw.
- 47 (anger adj3 (control\$ or coping or manage\$)).tw.
- 48 family therapy/
- 49 family therap\$.tw.
- 50 (psychotherap\$ or psycho-therap\$).tw.
- 51 ((multi-systemic or multisystemic) adj2 therap\$).tw.
- 52 social skill\$ train\$.tw.
- 53 (aversive or aversion or biofeedback or bio-feedback or desensiti#ation or relaxation or meditat\$).tw.
- 54 or/37-53
- 55 36 and 54
- 56 exp Clinical trial/
- 57 Randomized controlled trial/
- 58 Randomization/
- 59 Single blind procedure/
- 60 Double blind procedure/
- 61 triple blind procedure/
- 62 Crossover procedure/
- 63 Placebo/
- 64 Randomi#ed.tw.
- 65 RCT.tw.
- 66 (random\$ adj3 (allocat\$ or assign\$)).tw.
- 67 randomly.ab.
- 68 groups.ab.
- 69 trial.ab.
- 70 ((singl\$ or doubl\$ or trebl\$ or tripl\$) adj3 (blind\$ or mask\$)).tw.
- 71 Placebo\$.tw.
- 72 Prospective study/
- 73 (crossover or cross-over).tw.
- 74 prospective.tw.
- 75 or/56-74
- 76 exp animals/ or exp invertebrate/ or animal experiment/ or animal model/ or animal tissue/ or animal cell/ or nonhuman/

(Continued)

77 human/ or normal human/ or human cell/
78 76 and 77
79 76 not 78
80 75 not 79
81 55 and 80

CINAHL: Cumulative Index to Nursing and Allied Health Literature (EBSCOhost)

1937 to current, searched 9 April 2014. Limited to EM 20130501 to current [32 records]

1937 to current, searched 28 May 2013 [325 records]

60 S28 AND S43 AND S44 AND S59
S59 S46 OR S47 OR S48 OR S49 OR S50 OR S51 OR S52 OR S53 OR S54 OR S55 OR S56 OR S57 OR S58
S58 TI (evaluat* study or evaluat* research) or AB (evaluat* study or evaluat* research) or TI (effectiv* study or effectiv* research) or
AB (effectiv* study or effectiv* research) OR TI (prospectiv* study or prospectiv* research) or AB(prospectiv* study or prospectiv* re-
search) or TI (follow-up study or follow-up research) or AB (follow-up study or follow-up research)
S57 placebo*
S55 (MH "Crossover Design")
S54 (tripl* N3 mask*) or (tripl* N3 blind*)
S53 (doubl* N3 mask*) or (doubl* N3 blind*)
S52 (singl* N3 mask*) or (singl* N3 blind*)
S51 (clinic* N3 trial*) or (control* N3 trial*)
S50 (random* N3 allocat*) or (random* N3 assign*)
S49 randomis* or randomiz*
S48 (MH "Meta Analysis")
S47 (MH "Clinical Trials+")
S46 MH random assignment
S45 S28 AND S43 AND S44
S44 S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7 OR S8 OR S9 OR S10 OR S11 OR S12 OR S13
S43 S29 OR S30 OR S31 OR S32 OR S33 OR S34 OR S35 OR S36 OR S37 OR S38 OR S39 OR S40 OR S41 OR S42
S42 (MH "Social Skills Training")
S41 TI "social skill* train*" OR AB "social skill* train*"
S40 TI ((multi-systemic or multisystemic) N2 therap*) OR AB ((multi-systemic or multisystemic) N2 therap*)
S39 TI family therap* OR AB family therap*
S38 (MH "Family Therapy")
S37 TI (anger N3 (control* or coping or manage*)) OR AB (anger N3 (control* or coping or manage*))
S36 TI (functional analys* N10 behavio#r*) OR AB (functional analys* N10 behavio#r*)
S35 TI(functional behavio#r* analys*) OR AB (functional behavio#r* analys*)
S34 TI (aversive or aversion or biofeedback or bio-feedback or desensiti*ation or relaxation or meditat*) OR AB (aversive or aversion
or biofeedback or bio-feedback or desensiti*ation or relaxation or meditat*)
S33 TI (psychotherap* or psycho-therap*) OR AB (psychotherap* or psycho-therap*)
S32 TI (behavio#r* N3 (intervention* or method* or technique* or therap* or training or treat*)) OR AB (behavio#r* N3 (intervention*
or method* or technique* or therap* or training or treat*))
S31 TI ((cognitive or cognition) N3 (intervention* or method* or technique*)) OR AB ((cognitive or cognition) N3 (intervention* or
method* or technique* or therap* or training or treat*))
S30 CBT
S29 (MH "Psychotherapy") OR (MH "Behavior Modification") OR (MH "Behavior Therapy") OR (MH "Cognitive Therapy") OR (MH
"Biofeedback") OR (MH "Desensitization, Psychologic") OR (MH "Relaxation Techniques+") OR (MH "Psychotherapy, Brief")
S28 S14 OR S15 OR S16 OR S17 OR S18 OR S19 OR S20 OR S21 OR S22 OR S23 OR S24 OR S25 OR S26 OR S27
S27 TI (violen* and behavio#r*) OR AB (violen* and behavio#r*)
S26 (MH "Violence")
S25 (MH "Behavioral Symptoms") OR (MH "Disruptive Behavior") OR (MH "Social Behavior Disorders")
S24 TI (oppositional or defiant or defiance) OR AB (oppositional or defiant or defiance)
S23 TI (impuls* N3 (conduct* or control* or disorder*)) OR AB (impuls* N3 (conduct* or control* or disorder*))
S22 TI ((conduct or disruptive) N3 disorder*) OR AB ((conduct or disruptive) N3 disorder*)
S21 TI (attention deficit* or (hyperactiv* or hyper-activ*)) OR AB(attention deficit* or (hyperactiv* or hyper-activ*))
S20 (MH "Impulse Control Disorders")
S19 (MH "Child Behavior Disorders")
S18 (MH "Attention Deficit Hyperactivity Disorder")
S17 TI (aggressive or aggression) OR AB(aggressive or aggression)

(Continued)

S16 TI (anger or angry) OR AB(anger or angry)
 S15 (MH "Aggression")
 S14 (MH "Anger")
 S13 TI (down* N3 syndrome*) OR AB (down* N3 syndrome*)
 S12 TI(williams N3 syndrome) or AB (williams N3 syndrome)
 S11 TI(tuberous sclerosis) or AB(tuberous sclerosis)
 S10 (MH "Tuberous Sclerosis")
 S9 TI (prader N3 willi*) or AB(prader N3 willi*)
 S8 TI("Fragile X" or Fraxe or Fraxa or "Martin Bell" or "Marker X") OR AB("Fragile X" or Fraxe or Fraxa or "Martin Bell" or "Marker X")
 S7 TI autism* OR AB autism*
 S6 TI (learning N5 (difficult* or disab* or disorder* or impair*)) OR AB(learning N5 (difficult* or disab* or disorder* or impair*))
 S5 TI (mental* N5 (deficien* or disab* or handicap* or impair* or retard*)) OR AB(mental* N5 (deficien* or disab* or handicap* or impair* or retard*))
 S4 TI (intellect* N5 (deficien* or disab* or handicap* or impair*)) OR AB (intellect* N5 (deficien* or disab* or handicap* or impair*))
 S3 (MH "Developmental Disabilities")
 S2 (MH "Child Development Disorders, Pervasive+")
 S1 (MH "Mental Retardation+") or MH("Mentally disabled persons")

PsycINFO (Ovid)

1967 to April week 1 2014, searched 9 April 2014. Limited to up 20130501 to 20140408 [119 records]

1967 to May week 2, searched 23 May 2013 [1157 records]

1 exp Intellectual Development Disorder/ (36228)
 2 learning disorders/ (2019)
 3 developmental disabilities/ (9586)
 4 pervasive developmental disorders/ (6169)
 5 autism/ (18725)
 6 autism\$.tw. (27283)
 7 fragile x syndrome/ (1035)
 8 (Fragile X or Fraxe or Fraxa or Martin Bell or Marker X).tw. (1563)
 9 (down\$ adj3 syndrome\$).tw. (5738)
 10 prader willi syndrome/ (380)
 11 (prader adj3 willi\$).tw. (559)
 12 mental disorders/ (57504)
 13 tuberous sclerosis.tw. (358)
 14 williams syndrome/ (680)
 15 (williams adj3 syndrome).tw. (892)
 16 (intellect\$ adj5 (deficien\$ or disab\$ or handicap\$ or impair\$)).tw. (9822)
 17 (mental\$ adj5 (deficien\$ or disab\$ or handicap\$ or impair\$ or retard\$)).tw. (40485)
 18 (learning adj5 (difficult\$ or disab\$ or disorder\$ or impair\$)).tw. (31804)
 19 or/1-18 (162931)
 20 exp Anger/ (10033)
 21 aggressive behavior/ (19217)
 22 aggressiveness/ (3215)
 23 (anger or angry).tw. (22971)
 24 (aggressive or aggression).tw. (53438)
 25 exp attention deficit disorder/ (17015)
 26 (attention deficit\$ or (hyperactiv\$ or hyper-activ\$)).tw. (29918)
 27 behavior disorders/ (7641)
 28 behavior?r\$.tw. (637255)
 29 conduct disorder/ (3177)
 30 ((conduct or disruptive) adj3 disorder\$).tw. (7124)
 31 explosive disorder/ (148)
 32 impulse control disorders/ (514)
 33 (impuls\$ adj3 (conduct\$ or control\$ or disorder\$)).tw. (4415)
 34 oppositional defiant disorder/ (1091)
 35 (oppositional or defiant or defiance).tw. (4783)
 36 violence/ (21463)
 37 (violent or violence).tw. (56935)

(Continued)

38 or/20-37 (731398)
39 19 and 38 (49598)
40 psychotherapy/ (38809)
41 exp cognitive techniques/ (13459)
42 behavior modification/ (9808)
43 exp cognitive behavior therapy/ (10124)
44 exp behavior therapy/ (16124)
45 CBT.tw. (6696)
46 ((cognitive or cognition) adj3 (intervention\$ or method\$ or technique\$ or therap\$ or training or treat\$)).tw. (36413)
47 (behavio?r\$ adj3 (intervention\$ or method\$ or technique\$ or therap\$ or training or treat\$)).tw. (65864)
48 (behavio?r\$ adj3 (control\$ or modif\$)).tw. (24341)
49 (aversive or aversion or biofeedback or bio-feedback or desensiti#ation or relaxation or meditat\$).tw. (40222)
50 functional behavio?r\$ analys\$.tw. (50)
51 (functional analys\$ adj10 behavio?r\$).tw. (1043)
52 (anger adj3 (control\$ or coping or manage\$)).tw. (2562)
53 family therapy/ (17833)
54 family therap\$.tw. (15936)
55 (psychotherap\$ or psycho-therap\$).tw. (84389)
56 multisystemic therapy/ (118)
57 ((multi systemic or multisystemic) adj2 therap\$).tw. (353)
58 social skills training/ (3576)
59 social skill\$ train\$.tw. (2751)
60 or/40-59 (244202)
61 39 and 60 (11153)
62 clinical trials/ (6720)
63 (randomis\$ or randomiz\$).tw. (42232)
64 (random\$ adj3 (allocat\$ or assign\$)).tw. (27351)
65 ((clinic\$ or control\$) adj trial\$).tw. (35929)
66 ((singl\$ or doubl\$ or trebl\$ or tripl\$) adj3 (blind\$ or mask\$)).tw. (18456)
67 (crossover\$ or "cross over\$").tw. (6517)
68 random sampling/ (536)
69 Experiment Controls/ (590)
70 Placebo/ (3374)
71 placebo\$.tw. (28745)
72 exp program evaluation/ (15299)
73 treatment effectiveness evaluation/ (14457)
74 ((effectiveness or evaluat\$) adj3 (stud\$ or research\$)).tw. (51773)
75 exp experimental methods/ (11556)
76 or/62-75 (176956)
77 61 and 76 (1157)

ERIC: Education Resources Information Centre (Proquest)

1966 to current, searched 9 April 2014. Limited to publication year 2013 to 2014 [30 records]

1966 to current, searched 24 May 2013 [735 records]

((SU.EXACT("Mild Mental Retardation") OR SU.EXACT("Down Syndrome") OR SU.EXACT("Moderate Mental Retardation") OR SU.EXACT("Mental Retardation") OR SU.EXACT("Severe Mental Retardation") OR SU.EXACT("Pervasive Developmental Disorders") OR SU.EXACT("Autism") OR (intellect* NEAR/5 (deficien* OR disab* OR handicap* OR impair*)) OR (mental* NEAR/5 (deficien* OR disab* OR handicap* OR impair* OR retard*)) OR (learning NEAR/5 (difficult* OR disab* OR disorder* OR impair*)) OR autis* OR (down* NEAR/3 syndrome*) OR ("Fragile X" OR Fraxe OR Fraxa OR "Martin Bell" OR "Marker X" OR "prader near/3 willi*") OR "tuberous scle-rosis" OR "williams near/3 syndrome") AND (SU.EXACT("Psychological Patterns") OR SU.EXACT("Aggression") OR SU.EXACT("Violence") OR SU.EXACT("Hyperactivity") OR SU.EXACT("Child Behavior") OR SU.EXACT("Behavior") OR SU.EXACT("Self Control") OR ((conduct OR disruptive) NEAR/3 disorder*) OR (impuls* NEAR/3 (conduct* OR control* OR disorder*)) OR (oppositional OR defiant OR defiance) OR (anger OR angry OR aggressive OR aggression OR violence OR violent) OR behaviour OR behavior)) AND (SU.EXACT("Behavior Modification") OR SU.EXACT("Cognitive Restructuring") OR SU.EXACT("Desensitization") OR SU.EXACT("Psychotherapy") OR SU.EXACT("Relaxation Training") OR CBT OR ((cognitive OR cognition) NEAR/3 (intervention* OR method* OR technique* OR therap* OR training OR treat*)) OR (behavio?r* NEAR/3 (control* OR modif*)) OR (psychotherap* OR "psycho therap*" OR psycho-therap*) OR (aversive OR aversion OR biofeedback OR bio-feedback OR bio-feedback OR desensiti*ation OR relaxation OR meditat*) OR ("functional analys*" NEAR/10 be-

(Continued)

havior?r*) OR ("functional analys*" NEAR/10 behavior?r*) OR (anger NEAR/3 (control* OR coping OR manage*)) OR ("family therap*") OR ((multi-systemic OR multisystemic) NEAR/2 therap*) OR "social skill* trainin*") AND (SU.EXACT("Longitudinal Studies") OR SU.EXACT("Control Groups") OR SU.EXACT("Program Effectiveness") OR SU.EXACT("Experimental Groups") OR SU.EXACT("Followup Studies") OR SU.EXACT("Comparative Analysis") OR prospective OR "follow up" OR ((evaluat* OR compar* OR blind*) NEAR/5 (study OR studies OR research)) OR ((compar* OR control*) NEAR/5 group*) OR randomi?ation OR (random* NEAR/3 (assign OR allocate*)))

Social Services Abstracts (Proquest)

1979 to current, searched 9 April 2014. Limited to publication year 2013 to 2014 [3 records]
1979 to current, searched 24 May 2013 [81 records]

(SU.EXACT("Mentally Retarded") OR SU.EXACT("Downs Syndrome") OR SU.EXACT("Autism") OR (intellect* NEAR/5 (deficien* OR disab* OR handicap* OR impair*)) OR (mental* NEAR/5 (deficien* OR disab* OR handicap* OR impair* OR retard*)) OR (learning NEAR/5 (difficult* OR disab* OR disorder* OR impair*)) OR autis* OR (down* NEAR/3 syndrome*) OR ("Fragile X" OR Fraxe OR Fraxa OR "Martin Bell" OR "Marker X" OR "prader near/3 willi*") OR "tuberous sclerosis" OR "williams near/3 syndrome") AND (SU.EXACT("Aggression") OR SU.EXACT("Violence") OR SU.EXACT("Behavior") OR SU.EXACT("Behavior Problems") OR SU.EXACT("Attention Deficit Disorder") OR SU.EXACT("Self Control") OR SU.EXACT("Impulsiveness") OR ((conduct OR disruptive) NEAR/3 disorder*) OR (impuls* NEAR/3 (conduct* OR control* OR disorder*)) OR (oppositional OR defiant OR defiance) OR (anger OR angry OR aggressive OR aggression OR violence OR violent) OR behaviour OR behavior) AND (SU.EXACT("Behavior Modification") OR SU.EXACT("Family Therapy") OR SU.EXACT("Psychotherapy") OR ((cognitive OR cognition) NEAR/3 (intervention* OR method* OR technique* OR therap* OR training OR treat*)) OR (behavior?r* NEAR/3 (intervention* OR method* OR technique* OR therap* OR training OR treat*)) OR (behavior?r* NEAR/3 (control* OR modif*)) OR (psychotherap* OR "psycho therap*" OR psycho-therap*) OR (aversive OR aversion OR biofeedback OR bio-feedback OR bio-feedback OR desensiti*ation OR relaxation OR meditat*) OR ("functional analys*" NEAR/10 behavior?r*) OR ("functional analys*" NEAR/10 behavior?r*) OR (anger NEAR/3 (control* OR coping OR manage*)) OR ("family therap*") OR ((multi-systemic OR multisystemic) NEAR/2 therap*) OR "social skill* trainin*")

Cochrane Database of Systematic Reviews (CDSR), part of the Cochrane Library

2014, Issue 4, searched 8 April 2014. Limited to publication year 2013 to 2014 [7 records]
2013, Issue 4, searched 24 May 2013 [19 records]

#1MeSH descriptor: [Intellectual Disability] explode all trees
#2MeSH descriptor: [Mentally Disabled Persons] this term only
#3MeSH descriptor: [Developmental Disabilities] this term only
#4MeSH descriptor: [Child Development Disorders, Pervasive] this term only
#5MeSH descriptor: [Autistic Disorder] this term only
#6(intellect* near/5 (deficien* or disab* or handicap* or impair*)):ti,ab
#7(mental* near/5 (deficien* or disab* or handicap* or impair* or retard*)):ti,ab
#8(learning near/5 (difficult* or disab* or disorder* or impair*)):ti,ab 663
#9autis*:ti,ab
#10(down* near/3 syndrome*):ti,ab
#11(Fragile next X or Fraxe or Fraxa or Martin next Bell or Marker next X):ti,ab
#12(prader near/3 willi*):ti,ab
#13MeSH descriptor: [Tuberous Sclerosis] this term only
#14tuberous sclerosis:ti,ab
#15(williams near/3 syndrome):ti,ab
#16#1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9 or #10 or #11 or #12 or #13 or #14 or #15
#17MeSH descriptor: [Anger] this term only
#18MeSH descriptor: [Aggression] 2 tree(s) exploded
#19(anger or angry):ti,ab
#20(aggressive or aggression):ti,ab
#21MeSH descriptor: [Attention Deficit and Disruptive Behavior Disorders] 1 tree(s) exploded
#22MeSH descriptor: [Impulse Control Disorders] this term only
#23(attention deficit* or (hyperactiv* or hyper-activ*)):ti,ab
#24MeSH descriptor: [Behavior] this term only
#25MeSH descriptor: [Behavioral Symptoms] this term only
#26MeSH descriptor: [Child Behavior] 1 tree(s) exploded
#27MeSH descriptor: [Child Behavior Disorders] explode all trees
#28MeSH descriptor: [Dangerous Behavior] 1 tree(s) exploded

(Continued)

#29(behavio*r*):ti,ab
 #30((conduct or disruptive) near/3 disorder*):ti,ab
 #31(impuls* near/3 (conduct* or control* or disorder*)):ti,ab
 #32(oppositional or defiant or defiance):ti,ab
 #33MeSH descriptor: [Violence] this term only
 #34violen*:ti,ab
 #35(violence or violent):ti,ab
 #36#17 or #18 or #19 or #20 or #21 or #22 or #23 or #24 or #25 or #26 or #27 or #28 or #29 or #30 or #31 or #32 or #33 or #34 or #35
 #37#16 and #36
 #38MeSH descriptor: [Psychotherapy] this term only
 #39MeSH descriptor: [Behavior Therapy] this term only
 #40MeSH descriptor: [Behavior Control] this term only
 #41MeSH descriptor: [Cognitive Therapy] this term only
 #42CBT:ti,ab
 #43((cognitive or cognition) near/3 (intervention* or method* or technique* or therap* or training or treat*)):ti,ab
 #44(behavio*r* near/3 (intervention* or method* or technique* or therap* or training or treat*)):ti,ab
 #45(behavio*r* near/3 (control* or modif*)):ti,ab
 #46(psychotherap* or psycho next therap* or psycho-therap*):ti,ab
 #47(aversive or aversion or biofeedback or bio-feedback or bio next feedback or desensiti*ation or relaxation or meditat*):ti,ab
 #48(functional next behavio*r* next analys*):ti,ab
 #49(functional next analys* near/10 behavio*r*):ti,ab
 #50(anger near/3 (control* or coping or manage*)):ti,ab
 #51MeSH descriptor: [Family Therapy] this term only
 #52family next therap*:ti,ab
 #53((multi next systemic or multisystemic) near/2 therap*):ti,ab
 #54social next skill* next train*:ti,ab
 #55#38 or #39 or #40 or #41 or #42 or #43 or #44 or #45 or #46 or #47 or #48 or #49 or #50 or #51 or #52 or #53 or #54
 #56#37 and #55

Database of Abstracts of Reviews of Effects (DARE), part of the Cochrane Library

2014, Issue 1, searched 8 April 2014. Limited to publication year 2013 to 2014 [3 records]

2013, Issue 2, searched 24 May 2013 [25 records]

#1MeSH descriptor: [Intellectual Disability] explode all trees
 #2MeSH descriptor: [Mentally Disabled Persons] this term only
 #3MeSH descriptor: [Developmental Disabilities] this term only
 #4MeSH descriptor: [Child Development Disorders, Pervasive] this term only
 #5MeSH descriptor: [Autistic Disorder] this term only
 #6(intellect* near/5 (deficien* or disab* or handicap* or impair*)):ti,ab
 #7(mental* near/5 (deficien* or disab* or handicap* or impair* or retard*)):ti,ab
 #8(learning near/5 (difficult* or disab* or disorder* or impair*)):ti,ab 663
 #9autis*:ti,ab
 #10(down* near/3 syndrome*):ti,ab
 #11(Fragile next X or Fraxe or Fraxa or Martin next Bell or Marker next X):ti,ab
 #12(prader near/3 willi*):ti,ab
 #13MeSH descriptor: [Tuberous Sclerosis] this term only
 #14tuberous sclerosis:ti,ab
 #15(williams near/3 syndrome):ti,ab
 #16#1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9 or #10 or #11 or #12 or #13 or #14 or #15
 #17MeSH descriptor: [Anger] this term only
 #18MeSH descriptor: [Aggression] 2 tree(s) exploded
 #19(anger or angry):ti,ab
 #20(aggressive or aggression):ti,ab
 #21MeSH descriptor: [Attention Deficit and Disruptive Behavior Disorders] 1 tree(s) exploded
 #22MeSH descriptor: [Impulse Control Disorders] this term only
 #23(attention deficit* or (hyperactiv* or hyper-activ*)):ti,ab
 #24MeSH descriptor: [Behavior] this term only
 #25MeSH descriptor: [Behavioral Symptoms] this term only
 #26MeSH descriptor: [Child Behavior] 1 tree(s) exploded

(Continued)

#27MeSH descriptor: [Child Behavior Disorders] explode all trees
 #28MeSH descriptor: [Dangerous Behavior] 1 tree(s) exploded
 #29(behavio*r*):ti,ab
 #30((conduct or disruptive) near/3 disorder*):ti,ab
 #31(impuls* near/3 (conduct* or control* or disorder*)):ti,ab
 #32(oppositional or defiant or defiance):ti,ab
 #33MeSH descriptor: [Violence] this term only
 #34violen*:ti,ab
 #35(violence or violent):ti,ab
 #36#17 or #18 or #19 or #20 or #21 or #22 or #23 or #24 or #25 or #26 or #27 or #28 or #29 or #30 or #31 or #32 or #33 or #34 or #35
 #37#16 and #36
 #38MeSH descriptor: [Psychotherapy] this term only
 #39MeSH descriptor: [Behavior Therapy] this term only
 #40MeSH descriptor: [Behavior Control] this term only
 #41MeSH descriptor: [Cognitive Therapy] this term only
 #42CBT:ti,ab
 #43((cognitive or cognition) near/3 (intervention* or method* or technique* or therap* or training or treat*)):ti,ab
 #44(behavio*r* near/3 (intervention* or method* or technique* or therap* or training or treat*)):ti,ab
 #45(behavio*r* near/3 (control* or modif*)):ti,ab
 #46(psychotherap* or psycho next therap* or psycho-therap*):ti,ab
 #47(aversive or aversion or biofeedback or bio-feedback or desensiti*ation or relaxation or meditat*):ti,ab
 #48(functional next behavio*r* next analys*):ti,ab
 #49(functional next analys* near/10 behavio*r*):ti,ab
 #50(anger near/3 (control* or coping or manage*)):ti,ab
 #51MeSH descriptor: [Family Therapy] this term only
 #52family next therap*:ti,ab
 #53((multi next systemic or multisystemic) near/2 therap*):ti,ab
 #54social next skill* next train*:ti,ab
 #55#38 or #39 or #40 or #41 or #42 or #43 or #44 or #45 or #46 or #47 or #48 or #49 or #50 or #51 or #52 or #53 or #54
 #56#37 and #55

WorldCat (worldcat.org/)

Searched 9 April 2014. Limited to publication year 2013 to 2014 [5 records]

Searched 24 May 2013 [19 records]

'kw: (compare* OR random* OR effectiv* OR evaluat* OR intervention* OR treat* or therap*) AND kw:(cognit* OR behav* OR meditat* OR psychotherap* OR relax* or therapy OR therapies) AND kw:(autis* OR disabilit* OR disabl* OR "down* syndrome" OR fragile OR prader OR mental* or intellect*)' and limited to 'Thesis/dissertation'

OpenGrey (opengrey.eu/)

Searched 10 April 2014 [29 new records when compared with records found in May 2013]

Searched 27 May 2013 [31 records]

Searched on (aggression OR anger) AND (psychotherapy OR CBT OR cognitive OR behav*)

ClinicalTrials.gov (clinicaltrials.gov/)

Searched 10 April 2014. Limited to records received between 1 May 2013 and 10 April 2014 [2 records]

Searched 27 May 2013 [25 records]

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aggression AND (disability OR disabled OR intellectual OR retarded) AND (behaviour OR behavior OR cognitive OR CBT OR psychotherapy) and Limited to intervention studies

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International Clinical Trials Registry Platform (ICTRP) (who.int/ictpr/en/)

Searched 7 April 2014. Limited to trials registered between 1 May 2013 and 10 April 2014 [7 records]

Behavioural and cognitive-behavioural interventions for outwardly-directed aggressive behaviour in people with intellectual disabilities (Review)

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Searched 27 May 2013 [36 records]

Recruitment status : ALL

Searched 2007, Issue 1

#1 MeSH descriptor MENTAL RETARDATION
#2 MeSH descriptor LEARNING DISORDERS
#3 MeSH descriptor MENTALLY DISABLED PERSONS
#4 (mental* in All Text near/6 retard* in All Text)
#5 (mental* in All Text near/6 disabl* in All Text)
#6 (intellect* in All Text near/6 disabl* in All Text)
#7 (learning in All Text near/6 disabl* in All Text)
#8 (mental* in All Text near/6 handicap* in All Text)
#9 (mental* in All Text near/6 deficien* in All Text)
#10 (intellect* in All Text near/6 impair* in All Text)
#11 (learn* in All Text near/6 disorder* in All Text)
#12 (learning in All Text near/6 difficult* in All Text)
#13 (((((((((#1 or #2) or #3) or #4) or #5) or #6) or #7) or #8) or #9) or #10) or #11) or #12)
#14 MeSH descriptor BEHAVIOR
#15 behavior* in All Text
#16 behaviour* in All Text
#17 MeSH descriptor IMPULSE CONTROL DISORDERS
#18 MeSH descriptor VIOLENCE
#19 MeSH descriptor CONDUCT DISORDER
#20 (attention in All Text near/6 deficit* in All Text)
#21 conduct in All Text
#22 (disruptive in All Text near/6 disorder* in All Text)
#23 MeSH descriptor CHILD BEHAVIOR DISORDERS
#24 (anger in All Text or angry in All Text)
#25 hyperactiv* in All Text
#26 violen* in All Text
#27 aggressi* in All Text
#28 (challenging in All Text near/6 behaviour* in All Text)
#29 (challenging in All Text near/6 behavior* in All Text)
#30 (behavior* in All Text near/6 disorder* in All Text)
#31 (behaviour* in All Text near/6 disorder* in All Text)
#32 (#14 or #15 or #16 or #17 or #18 or #19 or #20 or #21 or #22 or #23 or #24 or #25 or #26 or #27 or #28 or #29 or #30 or #31)
#33 MeSH descriptor BEHAVIOR THERAPY
#34 (behavior* in All Text near/6 therap* in All Text)
#35 (behaviour* in All Text near/6 therap* in All Text)
#36 (cognitive in All Text near/6 therap* in All Text)
#37 cognitive next behavior* next therap* in All Text
#38 cognitive next behaviour* next therap* in All Text
#39 (behavior in All Text near/6 modif* in All Text)
#40 (behaviour in All Text near/6 modif* in All Text)
#41 functional next behaviour* next analys* in All Text
#42 functional next behavior* next analys* in All Text

(Continued)

- #43 (functional in All Text near/6 analys* in All Text)
- #44 (anger in All Text near/6 manage* in All Text)
- #45 (anger in All Text near/6 coping in All Text)
- #46 (anger in All Text near/6 control* in All Text)
- #47 (#33 or #34 or #35 or #36 or #37 or #38 or #39 or #40 or #41 or #42 or #43 or #44 or #45 or #46)
- #48 (#13 and #32 and #47)

MEDLINE (Ovid)

Searched 1966 to February 2007

- 1 Mental retardation/
- 2 Learning disorders/
- 3 Mentally disabled persons/
- 4 (intellect\$ adj5 disabl\$).tw.
- 5 (mental\$ adj5 retard\$).tw.
- 6 (mental\$ adj5 disabl\$).tw.
- 7 (learning adj5 disabl\$).tw.
- 8 (mental\$ adj5 handicap\$).tw.
- 9 (intellect\$ adj5 impair\$).tw.
- 10 (learn\$ adj5 disorder\$).tw.
- 11 (learning adj5 difficult\$).tw.
- 12 (mental\$ adj5 deficien\$).tw.
- 13 or/1-12
- 14 Behavior/
- 15 behavior.tw.
- 16 behaviour.tw.
- 17 (challenging adj5 (behavior\$ or behaviour\$)).tw.
- 18 Impulse control disorders/
- 19 Violence/
- 20 Conduct disorder/
- 21 (attention adj5 deficit\$).tw.
- 22 conduct.tw.
- 23 (disruptive adj5 disorder\$).tw.
- 24 ((behavior\$ or behaviour\$) adj5 disorder\$).tw.
- 25 Child behavior disorders/
- 26 Anger/
- 27 (anger or angry).tw.
- 28 hyperactiv\$.tw.
- 29 violen\$.tw.
- 30 Aggression/
- 31 aggressi\$.tw.
- 32 or/14-31
- 33 Behavior therapy/ or Cognitive therapy/
- 34 ((behavior or behaviour) adj5 therap\$).tw.
- 35 (cognitive adj5 therap\$).tw.
- 36 cognitive behavior therap\$.tw.
- 37 cognitive behaviour therap\$.tw.
- 38 ((behavior or behaviour) adj5 modif\$).tw.
- 39 functional behavior analys\$.tw.
- 40 functional behaviour analys\$.tw.
- 41 (functional adj5 analys\$).tw.
- 42 (anger adj5 manage\$).tw.
- 43 (anger adj5 coping).tw.
- 44 or/33-43
- 45 randomized controlled trial.pt.
- 46 controlled clinical trial.pt.
- 47 randomized controlled trials.sh.
- 48 random allocation.sh.
- 49 double blind method.sh.
- 50 single blind method.sh.

(Continued)

51 or/45-50
52 (animals not humans).sh.
53 51 not 52
54 clinical trial.pt.
55 exp Clinical Trials/
56 (clin\$ adj25 trial\$).ti,ab.
57 ((singl\$ or doubl\$ or trebl\$ or tripl\$) adj25 (blind\$ or mask\$)).ti,ab.
58 placebos.sh.
59 placebo\$.ti,ab.
60 random\$.ti,ab.
61 research design.sh.
62 or/54-61
63 62 not 52
64 63 not 53
65 comparative study.sh.
66 exp Evaluation Studies/
67 follow up studies.sh.
68 prospective studies.sh.
69 (control\$ or prospectiv\$ or volunteer\$).ti,ab.
70 or/65-69
71 70 not 52
72 71 not (53 or 64)
73 53 or 64 or 72
74 13 and 32 and 44 and 73
75 from 74 keep 1-332
76 (anger adj5 control\$).tw.
77 44 or 76
78 13 and 32 and 77 and 73

Embase (Ovid)

Searched 1980 to 2007 week 9

1 clin\$.tw.
2 trial\$.tw.
3 (clin\$ adj3 trial\$).tw.
4 singl\$.tw.
5 doubl\$.tw.
6 trebl\$.tw.
7 tripl\$.tw.
8 blind\$.tw.
9 mask\$.tw.
10 ((singl\$ or doubl\$ or trebl\$ or tripl\$) adj3 (blind\$ or mask\$)).tw.
11 randomi\$.tw.
12 random\$.tw.
13 allocat\$.tw.
14 assign\$.tw.
15 (random\$ adj3 (allocat\$ or assign\$)).tw.
16 crossover.tw.
17 16 or 15 or 11 or 10 or 3
18 exp Randomized Controlled Trial/
19 exp Double Blind Procedure/
20 exp Crossover Procedure/
21 exp Single Blind Procedure/
22 exp RANDOMIZATION/
23 18 or 19 or 20 or 21 or 22 or 17
24 Mental Deficiency/
25 Learning Disorder/
26 Mental Patient/
27 (mental\$ adj5 retard\$).tw.
28 (mental\$ adj5 disabl\$).tw.

(Continued)

- 29 (intellect\$ adj5 disabl\$).tw.
- 30 (learning adj5 disabl\$).tw.
- 31 (mental\$ adj5 handicap\$).tw.
- 32 (mental\$ adj5 deficien\$).tw.
- 33 (Intellect\$ adj5 impair\$).tw.
- 34 (learn\$ adj5 disorder\$).tw.
- 35 (learning adj5 difficult\$).tw.
- 36 or/24-35
- 37 BEHAVIOR/
- 38 behavior\$.tw.
- 39 behaviour\$.tw.
- 40 (challenging adj5 (behavior\$ or behaviour\$)).tw.
- 41 Impulse Control Disorder/
- 42 VIOLENCE/
- 43 Conduct Disorder/
- 44 (attention adj5 deficit\$).tw.
- 45 conduct.tw.
- 46 (disruptive adj5 disorder\$).tw.
- 47 ((behavior or behaviour) adj5 disorder\$).tw.
- 48 Behavior Disorder/
- 49 (anger or angry).tw.
- 50 hyperactiv\$.tw.
- 51 violen\$.tw.
- 52 aggressi\$.tw.
- 53 or/37-52
- 54 Behavior Therapy/
- 55 ((behavior or behaviour) adj5 therap\$).tw.
- 56 (cognitive adj5 therap\$).tw.
- 57 cognitive behaviour therap\$.tw.
- 58 cognitive behavior therap\$.tw.
- 59 ((behavior or behaviour) adj5 modif\$).tw.
- 60 functional behavior analys\$.tw.
- 61 functional behaviour analys\$.tw.
- 62 (functional adj5 analys\$).tw.
- 63 (anger adj5 manage\$).tw.
- 64 (anger adj5 coping).tw.
- 65 (anger adj5 control\$).tw.
- 66 or/54-65
- 67 23 and 36 and 53 and 66

PsycINFO (SilverPlatter)

Searched 1872 to 2007 February week 2

((mentally adj disabled adj person*) or (explode "Learning-Disorders" in MJ,MN) or (explode "Mental-Retardation" in MJ,MN) or (learn near difficult*) or (mental* near deficien*) or (learn* near disorder*) or (mental* near handicap*) or (intellect* near impair*) or (learning near disabl*) or (intellect* near disabl*) or (mental* near disabl*) or (mental* near retard*)) and (((aggressi*) or (violen*) or (hyperactiv*) or (anger or angry) or (anger near manage*)or(anger near control*)or(anger near coping) or "Anger-Control" in MJ,MN or (child behavior?r disorder*) or (disruptive near disorder*) or ("Conduct-Disorder" in MJ,MN) or (conduct) or ("Violence-" in MJ,MN) or (attention near deficit*) or (explode "Impulse-Control-Disorders" in MJ,MN) or (behaviour) or (behavior) or ("Behavior-" in MJ,MN)) and ((cognitive near therap*) or ("Behavior-Therapy" in MJ,MN) or (behavior?r near therap*) or ("Cognitive-Behavior-Therapy" in MJ,MN) or ((functional near analys*) or ((functional behavior?r analys*)) or ((behavior?r near modif*)) or ((cognitive behavior?r therap*)) and (((control* or clinic* or prospectiv*) near5 (trial* or study or studies)) in AB)or(((control* or clinic* or prospectiv*) near5 (trial* or study or studies)) in TI)) or (((random*) in AB)or((random*) in TI)) or (((random* near (trial* or study or studies)) in AB)or((random* near (trial* or study or studies)) in TI)) or (((random* near (allocat* or assign* or divid*)) in AB)or((random* near (allocat* or assign* or divid*)) in TI)) or (((compar* near5 (trial* or study or studies)) in AB)and(compar* near5 (trial* or study or studies))) or (placebo*) or (((cross?over) in AB)and((cross?over) in TI)) or ((((singl* or doubl*) near (blind* or mask*)) in AB)and(((singl* or doubl*) near (blind* or mask*)) in TI)) or ((((allocat* or assign* or divid*) near5 (condition* or experiment* or treatment* or control* or group*)) in AB)and(((allocat* or assign* or divid*) near5 (condition* or experiment* or treatment* or control* or group*)) in TI))

Appendix 3. Additional methods

Please see our original protocol ([Hassiotis 2001](#)).

Analysis	Method
Measures of treatment effect	Dichotomous data For binary outcomes, for example, 'problem behaviour present' or 'not present', we will calculate a standard estimation of the odds ratio (OR) with 95% confidence intervals (CI). If ORs are not given or cannot be calculated based on 2 x 2 tables, we will include studies reporting risk ratios (RR), but ORs and RRs will not be combined in a meta-analysis Continuous data When different measures are used to assess the same outcome, we will combine the data using the standardised mean difference (SMD) and calculated 95% CIs. However, we will only include normally distributed data in the meta-analysis. To assess the distribution of the data, we will calculate the observed mean minus the lowest possible value (or the highest possible value minus the observed mean) divided by the standard deviation; a value less than two is evidence of skew. If the data are skewed, we will contact the authors to request individual participant data or data summaries so that we may transform the data using a log scale. If we are unable to retrieve this information, we will present a narrative description of the results.
Unit of analysis	If clustering is not taken into account, we will perform approximately correct analyses according to the methods described in the <i>Cochrane Handbook for Systematic Reviews of Interventions</i> (Higgins 2011), providing we can obtain or estimate the intraclass correlation coefficient (ICC)
Dealing with missing data	First, we will try to contact the authors to request any missing data (e.g. missing participants, summary data). Failing that, we will follow the recommendations in the <i>Cochrane Handbook for Systematic Reviews of Interventions</i> (Higgins 2011) We will manage missing data by performing an intention-to-treat analysis. When dichotomous data is missing, we will assume that participants who dropped out had a less favourable outcome (e.g. problem behaviour present) and impute the data accordingly. For continuous missing data, we will use 'the last observation carried forward (LOCF)'. We will assess the impact of these decisions on the robustness of the results by conducting sensitivity analyses. Thus, for dichotomous data, we will conduct a sensitivity analysis by imputing data assuming that those missing experienced the more favourable outcome (e.g. problem behaviour not present) (Gamble 2005). For continuous missing data, we will conduct a sensitivity analysis comparing outcomes based on observed data and the LOCF data. When possible, we will obtain any missing summary data (e.g. missing standard deviations) using the methods described in the <i>Cochrane Handbook for Systematic Reviews of Interventions</i> (Higgins 2011). We will describe the methods used to impute the data in the 'Characteristics of included studies' tables. If we are unable to impute the data (e.g. we have insufficient information as regards the numbers missing from each group), we will analyse the available data only and explain in the main text the reasons why we were not able to impute the missing data. When we are unable to impute the results, we will present a narrative description of the results of these studies.
Assessment of heterogeneity	We will assess statistical heterogeneity by visual inspection of the forest plots, to examine the extent to which confidence intervals overlap around the estimate for each included study on the forest plots. If confidence intervals have generally limited overlap, this could indicate the presence of statistical heterogeneity. We will use the Chi² test to formally test for heterogeneity, with a low P value (i.e. less than 0.10) indicating possible heterogeneity (Higgins 2011). We will also use the I² to determine the proportion

(Continued)

of variation in point estimates that is due to heterogeneity rather than sampling error or chance (Higgins 2003). We will consider I^2 values in the range of 50% to 90% to represent substantial statistical heterogeneity.

Due to the potential unreliability of the χ^2 test, we will also present the magnitude of the heterogeneity and compare it with the distribution suggested by Turner 2012 to confirm whether there is substantial heterogeneity in the included studies in the meta-analysis.

We will discuss in full any unexpected variability that may arise.

Subgroup analysis and investigation of heterogeneity	We will conduct subgroup analyses for studies that include data on adults with intellectual disabilities and those that include children and for studies of participants with different severity of intellectual disabilities (e.g. mild and moderate versus severe intellectual disabilities)
Data synthesis	Given the considerable variability between studies due to the different interventions and populations taking part, we will undertake a meta-analysis using a random-effects model as it allows for between-study variability
Assessment of reporting bias	If we have a sufficient number of included studies (10), we will draw funnel plots to identify asymmetry due to publication bias and other small-study effects. We will apply Egger's regression intercept (Egger 1997) and Begg's rank correlation (Begg 1994) to assess funnel plot asymmetry. However, both tests may be subject to low power to detect bias if there are only a small number of included studies
Sensitivity analysis	If a meta-analysis is performed, we will conduct a sensitivity analysis excluding studies of low quality (e.g. studies where there was a bias in the randomisation process or where there was no concealment of group allocation or other bias)

Appendix 4. Glossary

List of measures used in this review	
Abbreviation	Full name of measure
ABC-R-II	Aberrant Behaviour Checklist - Revised - Part II
ABS-II	Adaptive Behaviour Scale - Part II
BSI	Brief Symptom Inventory
CBS	Controllability Beliefs Scale
COMQoL-ID	Comprehensive Quality of Life Scale - Intellectual Disability
CSRI	Client Service Receipt Inventory
GDS-ID	Glasgow Depression Scale - Intellectual Disability
GAS-ID	Glasgow Anxiety Scale - Intellectual Disability
NAS	Novacos Anger Scale
MOAS	Modified Overt Aggression Scale

(Continued)

PI	Provocation Inventory
PACS	Profile of Anger Coping Skills
PST	Problem-Solving Task
RPT	Role Play Test of Anger Arising Situations
SES	Rosenberg Self Esteem Scale
SUDS	Subjective Units of Distress Scale
STAXI	Spielberger State - Trait Anger Expression Inventory
WARS	Ward Anger Rating Scale

WHAT'S NEW

Date	Event	Description
12 February 2015	New citation required but conclusions have not changed	Two new studies included in the review
8 April 2014	New search has been performed	The review was updated following a new search in May 2013 and a 'top up search' in April 2014

HISTORY

Protocol first published: Issue 4, 2001

Review first published: Issue 4, 2004

Date	Event	Description
14 August 2008	Amended	Minor amendments made; new reference added
14 May 2008	Amended	Converted to new review format.
29 February 2008	New citation required and minor changes	Substantive amendment
29 February 2008	New citation required but conclusions have not changed	Review rewritten to incorporate new data
7 March 2007	New search has been performed	New searches; one new study found

CONTRIBUTIONS OF AUTHORS

AA - along with JB, reviewed the abstracts and full texts of relevant papers, and contributed to the write-up of this updated version of the review.

IH - in collaboration with AH contributed to the drafts of the original review and to the write-up of this updated version of the review.

Behavioural and cognitive-behavioural interventions for outwardly-directed aggressive behaviour in people with intellectual disabilities (Review)

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JB - along with AA, reviewed the abstracts and full texts of relevant papers, and contributed to the write-up of this updated version of the review.

AH - in collaboration with contributed to the drafts of the original review and to the write-up of this updated version of the review.

DECLARATIONS OF INTEREST

Dr Afia Ali - none known.

Dr Ian Hall - is employed as a consultant psychiatrist in the United Kingdom's (UK) National Health Service (NHS), and receives fees for giving expert testimony in civil cases in the English Courts. He receives expense payments in relation to study leave and activities connected with his employment. Dr Hall does unremunerated work for the Royal College of Psychiatrists leading and supporting psychiatrists, and setting standards in psychiatry.

Jessica Blickwedel - none known.

Professor Angela Hassiotis - is the author of an academic publication [Hassiotis 2009](#) that was excluded from this review. Although she was not directly involved in the decision making regarding the paper, she has an overview of the work completed for this document. She declares that at no point has she attempted to influence her co-authors' decisions about this paper.

Professor Hassiotis's institution has grants pending with the National Institute for Health Research (NIHR) for Research for Patient Benefit and Health Technology Assessment (HTA) programmes, and the Bailey Thomas Charitable Foundation. Professor Hassiotis occasionally receives payment for lecture honoraria by academic institutions as an invited speaker/workshop leader and author of commissioned articles.

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Internal sources

- University College London, UK.

Salary

- East London Foundation Trust, UK.

Salary

External sources

- No sources of support supplied

DIFFERENCES BETWEEN PROTOCOL AND REVIEW

There are three main differences between the protocol ([Hassiotis 2001](#)) and this update.

- In the title, we replaced 'learning disabilities' with 'intellectual disabilities' as this is the term that is now used in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-V) and internationally.
- We added new search terms to include behavioural phenotypes that are associated with aggression as potentially new studies may have been identified in these conditions.
- We have revised and updated sections of our methods. As these revisions were not applicable to this update, they have been archived for future updates (for more details, see [Appendix 3](#)). The changes are as follows.
  - We clarified how we will identify and resolve skew in the data. We did not have this information in our original protocol.
  - In our protocol we said that we will "exclude studies that had a dropout rate of more than 50% as this was likely to bias the findings of the study". However, we recognise that this will result in a significant loss of data, which will threaten the validity of the review. Thus, we removed this sentence and revised the methods that we will use to 'deal with missing data' according to the recommendations in the handbook ([Higgins 2011](#)).
  - We specified that we will present the magnitude of heterogeneity and compare it with that reported in [Turner 2012](#). This information was not in our original protocol.
  - We specified the number of studies needed before we will draw funnel plots, and the tests that we will use to assess funnel plot asymmetry as this information was not included in our original protocol.

INDEX TERMS

Medical Subject Headings (MeSH)

*Aggression; Anger; Assertiveness; Behavior Therapy [*methods]; Cognitive Behavioral Therapy; Learning Disabilities [*psychology]; Mindfulness; Problem Solving; Psychotherapy, Group; Randomized Controlled Trials as Topic; Social Behavior Disorders [*therapy]; Violence

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MeSH check words

Adult; Humans