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Reducing Aggression in Adolescence: Identifying Effective Behaviour Change Techniques

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Abstract

Peer aggression among adolescents is a problem in many countries. It has negative short- and long-term consequences for both perpetrators and victims. Many interventions to reduce aggression have been designed and evaluated. However, which components make interventions more effective are still unknown. This thesis aims to identify the most effective behaviour change techniques (BCTs) to reduce aggression among adolescents in order to optimise interventions.

First, a multi-level meta-analysis of 101 trials was conducted to identify the most effective BCTs for (a) interventions targeted to adolescents at higher risk of being aggressive and (b) (universal) interventions addressed to all adolescents. *Action planning* was identified as the most effective BCT for targeted interventions and *problem solving* and *behavioural practice* were the most effective BCTs in universal interventions. It was difficult to extract the independent effect of these BCTs as most of the interventions included in the meta-analysis were composed of several BCTs. Therefore, two randomised controlled trials were conducted to examine the effect of (a) *action planning* with at-risk adolescents and (b) *problem solving* with a general sample of adolescents. First, 100 referred adolescents were randomised to complete a volitional help sheet for anger management or to an active control group. No effect on aggression was found for the full sample, but the intervention was effective for adolescents with high callous-unemotional traits. Second, 908 adolescents were randomised to a brief online problem-solving intervention or a passive control group. This intervention was effective in reducing verbal aggression, but not other types of aggression.

The research in this thesis identified the most effective BCTs to reduce aggression among adolescents and showed that brief interventions using only those BCTs are effective in some circumstances. However, future research should investigate which combinations of techniques are the most effective in reducing overall aggression.

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Declaration

I, the author, confirm that the Thesis is my own work. I am aware of the University's Guidance on the Use of Unfair Means (www.sheffield.ac.uk/ssid/unfair-means). This work has not been previously been presented for an award at this, or any other, university.

Publications arising from this thesis

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Chapter 1. Introduction

Aggression among adolescents is a problem in many countries. Craig et al. (2009) found that bullying is a common problem in 40 countries of Europe and America. In the United States, Lynne-Landsman et al. (2011) found significant increases in aggression through middle school with 51% of the sample (out of 2,931 urban youth) presenting high levels of aggressive behaviour at the end of middle school. In addition, Wang et al. (2009), in their study using a big US-representative sample (n = 7132) of grades 6 to 10, found that 35.2% of the sample had bullied someone verbally, 24% socially and 13.3% physically. The statistics in the UK are similar. In the year 2018/2019, the most common reason (26%) for arrests of people between 10 and 17 years old in England was violence against another person (Home Office, 2019). Besides, in the UK Annual Bullying Survey of 2019 (Ditch the Label, 2019), 22% of participants (of a sample of 7347 young people aged between 12 and 20 years old) reported that they had been bullied in the past year.

Violence and aggression are an important public health problem (Slutkin, 2017). One of the targets of the Sustainable Development Goals adopted by the United Nations (2017) for the period 2016-2030 is to "significantly reduce all forms of violence and related death rates everywhere." (p. 556). This thesis works towards this target by investigating the most effective components of interventions to reduce aggression among adolescents. With that knowledge, effective interventions can be developed to reduce the prevalence of aggression in adolescence. This thesis combines knowledge from decades of intervention evaluations in youth violence with the increasing interest in active ingredients and intervention optimisation in health psychology.

In this chapter, the concepts of aggression and violence will be defined, as well as their differences and components. Second, an overview of the state of intervention research will be presented. After that, the Behaviour Change Technique (BCT) Taxonomy version 1

(Michie et al., 2013), which is used along the thesis to identify effective components, will be described and finally, the thesis aims will be stated.

1.1 Conceptualisation of aggression

Aggression is a heterogeneous construct that includes a variety of behaviours, forms and functions. It is often used interchangeably with the term violence and it is a component of other constructs such as conduct disorder or antisocial behaviour.

1.1.1 Aggression as a component of other constructs

Aggression is identified in the literature as a form of child behavioural problems (Achenbach & Rescorla, 2001; Lynne-Landsman et al., 2011), as a type of externalising behaviour (Liu, 2004; K. E. Walton et al., 2011), as a dimension of antisocial behaviour (Burt, 2012; Vitaro et al., 2015), and as symptoms of Conduct Disorder (American Psychiatric Association, 2013). The main difference between these concepts is the scope. Behavioural problems and externalising behaviour include hyperactivity and therefore have a broader scope than antisocial behaviour and conduct disorder. However, all of them have in common the inclusion of aggression as one of the main components.

Conduct disorder is defined as "a repetitive pattern of behaviour in which the basic rights of others or major age-appropriate societal norms or rules are violated" (p. 472; American Psychiatric Association, 2013). The symptoms of this disorder are classified into four categories in the DSM5 (American Psychiatric Association, 2013): (1) Aggression toward people and animals, (2) Destruction of property, (3) Deceitfulness or theft and (4) Serious violations of rules. The specific aggressive behaviours that are counted as symptoms for conduct disorder and compose the category Aggression toward people and animals are (1) often bullies, threatens or intimidates others, (2) often initiates physical fights, (3) has used a weapon that can cause serious physical harm to others (e.g., a bat, brick, broken bottle, knife,

gun), (4) has been physically cruel to people, (5) has been physically cruel to animals, (6) has stolen while confronting a victim (e.g. mugging, purse snatching, extortion, armed robbery) and (7) has forced someone into sexual activity. These symptoms include physical aggression, both threatened (e.g., stealing with confrontation) and actual (e.g., fighting).

In addition, DSM5 includes two characteristics to designate youth with more sinister forms of psychopathology, including higher levels of aggression: limited prosocial emotions and childhood-onset type (American Psychiatric Association, 2013). Limited prosocial emotions consist of lack of remorse, lack of empathy, unconcerned about performance and shallow affect, which in the literature are found as callous-unemotional traits. These traits are part of the psychopathy construct and seem to designate a higher risk group of youth that presents a more stable and serious aggressive pattern of behaviour (Frick & White, 2008; Rowe et al., 2010). Childhood-onset type, or life-course-persistent in Moffit's (1993) model, designates a group of youth that develops severe conduct problems including aggression during childhood – defined by the DSM5 as before the age of 10 - and maintain this severe pattern of behaviour during adolescence and adulthood. Moffit (1993) argued that there were two types of antisocial behaviour according to the age of onset: life-course persistent and adolescent-limited, being the first one the most severe and leading to worse outcomes. Some researchers have claimed that youth with limited prosocial emotions and with childhood-onset overlap (Frick, 2012; Urben et al., 2017). In other words, youth high in callous-unemotional traits often have an earlier onset. However, Hyde, Burt, Shaw, Donnellan, and Forbes (2015) found no relationship between high callous-unemotional traits and early onset.

These characteristics added in the DSM5 to identify more severe forms of conduct disorder are part of a wider body of research attempting to classify types of antisocial behaviour. Antisocial behaviour has a similar definition to conduct disorder, encompassing behaviours that violate the right of others and societal norms (Burt, 2012; Liu, 2004). It is a

heterogeneous construct and researchers have been interested in finding subtypes for many years in order to identify forms that particularly require treatment. Some researchers have argued that different types of antisocial behaviour can be found according to the type of behaviours displayed. To test that theory, Frick et al. (1993) analysed symptoms of both conduct disorder and oppositional defiant disorder together and the results suggested that they fall into two dimensions. The first dimension is covert-overt behaviour, which follows previous results from Loeber and Schmaling (1985). The second one is a destructive-non-destructive behaviour dimension. According to the four quadrants extracted using these two dimensions, the symptoms were classified in four categories of behaviours: oppositional (overt and nondestructive; e.g. argues, angry), aggression (overt and destructive; e.g., assault, cruel), property violations (covert and destructive; e.g. steals, vandalism) and status violations (covert and nondestructive, e.g. truancy, runaway). Analyses of conduct disorder symptoms looking for patterns of symptoms support this classification. Breslau et al. (2012) and Nock et al. (2006) found three mild classes of Conduct Disorder: rule violations, deceit/theft and aggressive. These mild classes accounted for 91% of the participants with conduct disorder (Breslau et al., 2012). They also found a severe class that included participants with symptoms from all the mild classes. Therefore, the literature on the behavioural subtypes of antisocial behaviour has consistently found a covert or rule-breaking type of and an overt or aggressive type. Several studies have compared this behavioural approach to Moffit's (1993) model and have found that the behavioural approach, as opposed to the age of onset approach, is a better predictor of later outcomes (Burt et al., 2011; Hyde et al., 2015).

Rule-breaking antisocial behaviour and aggressive antisocial behaviour are strongly correlated. Burt et al. (2015) found correlations from r = .38 to .73 in a study of 27,861 parent-adolescent dyads across 25 countries, varying according to the informant of the

behaviour, sex and country of the participant and definition of aggressive behaviour. Similarly, Lynne-Landsman et al. (2011) found correlations from r = .66 to .71 in a large sample of American adolescents. This strong correlation has triggered doubts about whether they are two different constructs. However, there is substantial evidence for differences in patterns of development, genetic and environmental risk factors and correlates. Burt (2012) conducted an extensive review of the literature and concluded than aggressive behaviours have an earlier age of onset and have a stronger genetic influence than rule-breaking behaviours. Besides, aggressive behaviours are especially related to anger and negative emotions while rule-breaking behaviours are specifically linked to impulsivity. These differences have been supported by later findings (Burt, 2013; Hyde et al., 2015; Vitaro et al., 2015).

Therefore, in this thesis we follow the behavioural approach, focusing on the aggressive subtype of antisocial behaviour. To sum up this section, aggression is an overt behaviour, that violates the right of others and societal norms. It is highly related to other antisocial behaviours, but it has been consistently found as an independent construct with a different pattern of development and different correlates.

1.1.2 Aggression and violence

The terms aggression and violence are often used interchangeably. However, there are subtle differences between the constructs. Loeber and Stouthamer-Loeber (1998) argued that violence is developed through a pathway that includes previously minor and moderate forms of aggression. Therefore, violence would include only the most serious forms of aggression, which appear after using other forms of aggression. Liu et al. (2013) defined aggression as those acts that inflict bodily or mental harm on others and includes physical (e.g., fighting), verbal (e.g., insulting) and relational behaviours (e.g., spreading rumours). In contrast, violence was defined as a subtype of aggression that includes any form of physical

aggression. Following this, interpersonal violence has been defined as behaviours intended to hurt others using threats or physical force (Eisner et al., 2016).

All these definitions have in common the consideration of violence as a serious subtype of aggression, including mainly physical aggression. In this thesis, the general term aggression will be used, including both minor, moderate and serious forms of aggression. Furthermore, preventing and reducing aggression before it escalates to serious forms of violence would allow us to achieve the target of the Sustainable Development Goals (United Nations, 2017) discussed at the beginning of this chapter.

1.1.3 Types of aggression

Liu et al.'s (2013) definition of aggression, mentioned in Section 1.1.2, shows the research interest for subtyping aggression. The internal structure of aggression has been explored in several studies (e.g., Little et al., 2003; Raine et al., 2006). Two ways of structuring the construct dominate the research. One refers to its function and the second one to its form.

According to its function, two types of aggression are distinguished: proactive and reactive (Little et al., 2003; Liu, 2004; Raine et al., 2006). Proactive aggression is used as a mean to obtain a goal and reactive aggression is displayed in response to a threat or a provocation and is usually motivated by anger (Little et al., 2003). An overall moderate correlation ($r = .64$) was found between both functions in a meta-analysis of fifty-one studies (Polman et al., 2007), which indicates that few aggressive behaviours are purely proactive or reactive, although one of the functions is usually predominant (Liu, 2004). However, each function shows distinct relations with social and psychological adjustment (Fite et al., 2010; Hubbard et al., 2010; Raine et al., 2006; Vitaro & Brendgen, 2005), which supports their distinction. For example, Raine et al. (2006) found that proactive aggression was more

strongly related to psychopathic personality, blunted affect and serious violent offending whereas reactive aggression was related to impulsivity, hostility, trait anxiety, lack of close friends, unusual perceptual experiences and odd speech.

According to its form, there are two main types of aggression: direct, also known as overt aggression, and relational, also known as indirect or covert aggression (Card et al., 2008; Little et al., 2003). Direct forms of aggression refer to verbal behaviours such as name-calling or threatening and physical behaviours such as hitting and pushing that are intended to harm others. Therefore, direct aggression can be further divided into two subtypes: verbal and physical aggression. Relational forms of aggression aim to damage the social relationships of the target, including behaviours such as spreading rumours or excluding from activities (Little et al., 2003). A meta-analysis of 148 studies found that direct and relational aggression are strongly correlated ($r = .76$; Card et al., 2008), which might indicate that they are the same construct. However, many studies have supported their distinction (Card et al., 2008; Kaukiainen et al., 1999; Little et al., 2003; Prinstein et al., 2001; Seo, 2011). In their meta-analysis, Card et al. (2008) found that each form of aggression had different relationships with other constructs: direct aggression was associated with emotional dysregulation, conduct problems, low peer acceptance, peer rejection and low prosocial behaviour, whereas relational aggression was associated with internalizing behaviours and high prosocial behaviour. The use of each form by gender is also different. Boys use more direct aggression than girls, especially physical aggression. However, the relationship between gender and relational aggression is not clear. Some studies have found that both genders were equally relationally aggressive and others have reported small gender differences with inconsistent direction of effect (Little et al., 2003; Seo, 2011; Wang et al., 2009).

Functions and forms of aggression are complementary (Little et al., 2003; Ostrov et al., 2013). This means that each form of aggression can serve reactive or proactive purposes.

For example, someone can punch another person (direct aggression) to show dominance (proactive aggression) or because they are angry at them after being insulted (reactive aggression). This can happen similarly with relational aggression.

1.1.4 Aggression in adolescence; its consequences and costs

Displaying aggressive behaviours during adolescence, especially physical aggression, is associated with negative immediate and long-term outcomes for both victims and perpetrators. Cross-sectional studies have found that displaying aggression in adolescence is associated with psychosomatic symptoms, poor academic achievement, substance use (including legal and illegal substances), delinquency and being arrested (Lynne-Landsman et al., 2011; Piko et al., 2006). In addition, a longitudinal study found that juvenile referrals increased the likelihood of being arrested as an adult (Rhoades et al., 2016). Furthermore, adolescents that present aggressive behaviours were less likely to gain academic qualifications and more likely to present depressive and Antisocial Personality Disorder symptoms and drug problems in young adulthood (Cook et al., 2015; Hyde et al., 2015).

Victims of both direct and relational aggression during adolescence were more likely to suffer from internalizing disorders such as depression (Prinstein et al., 2001). Besides, victims of bullying had more mental health problems during adulthood than those who had not been bullied (Arsenault, 2017) and adolescents that attended high schools with a high prevalence of peer aggression were more likely to drop out (Cornell et al., 2013).

Costs are not only high for victims and perpetrators, but also for the institutions. In the US alone, the annual cost of serious aggression among adolescents is over $21 billion (National Center for Injury Prevention and Control (U.S.): Division of Violence Prevention, 2019). That figure takes into account only medical costs and productivity loss. The cost is likely to be much higher when other costs such as mental health services for perpetrators and

victims and the criminal justice system are added. The high prevalence, the negative outcomes for both victims and perpetrators and the high cost highlight the importance of developing effective interventions to reduce aggressive behaviour throughout the community.

1.2 Current interventions for aggressive behaviour in adolescents

Previous meta-analyses have shown that psychosocial interventions to prevent or reduce aggressive and related behaviours usually have a small to moderate effect size. Table 1.1 shows a summary of their findings. For instance, Mytton et al. (2006) found an overall effect size of 0.41 on aggressive behaviours and Ttofi and Farrington (2011) found an overall effect size of 0.17 on bullying. In contrast, some meta-analyses found no effect (e.g., Özabacı, 2011; Park-Higgerson et al., 2008). The difference in overall effect size between meta-analyses and the high level of heterogeneity between studies within each meta-analysis indicate that there may be characteristics that moderate intervention effectiveness. Previous meta-analyses (summarised in Table 1.1) and systematic reviews (summarised in Table 1.2) have suggested some potential moderators of intervention effectiveness that are summarised in this section.

1.2.1 Universal and targeted interventions

When an intervention is designed, it is often considered to which population it is targeted as the needs of the population may be different. Depending on the level of risk, preventive interventions can be universal, selective or indicated (National Center for Injury Prevention and Control (U.S.): Division of Violence Prevention, 2019). Universal interventions are those aimed at the general adolescent population, such as the program, My friends, a school-based social and emotional program (Kozina, 2018). Selective interventions are those aimed at adolescents with one or two risk factors that, therefore, are more likely to behave aggressively. Example risk factors are poor parental supervision and large family size

Table 1.1

Overview of Previous Meta-Analyses

Reference	Main focus	Mean ES	Years	Age	Moderators found	Effective components
Beelmann and Lösel (2006)	Social Skills Training	0.39	1971-2000	4-18	Level of risk^{+}, age^{+}, intensity of intervention^{+}	Cognitive Behavioural Training
Fossum et al. (2016)	Targeted psychosocial and psychopharmacological interventions	0.64	1980-2010	2-17	Individual interventions^{+}	Cognitive Behavioural Training
Fossum et al. (2008)	Indicated interventions	0.62	1987-2008	Under 18	Age^{-}	Behavioural training
Gaffney et al. (2019)	Universal school-based interventions	1.32 (OR)	2009-2016	4-18		
Grove et al. (2008)	Studies with at least 6 months follow up	0.17	1980-2007	Under 19		
Harwood et al. (2017)	Martial arts	0.65	1980-2015	Up to 18		
McCart et al. (2006)	Parent Training and Cognitive Behavioural Training	0.4	Up to 2005	Under 18	Age (CBT is more effective in older children)	Behavioural parent training
Melendez-Torres et al. (2016)	Positive youth development interventions	0.021	1985-2014	11-18		
Merrel et al. (2008)	School-based interventions	0.04	1980-2004	4-19		
Montgomery and Maunders (2015)	Creative bibliotherapy	0.68	1983-2014	5-15		
Mytton et al. (2006)	Targeted school-based interventions	0.41	Up to 2003	2-19	Age^{+}	Social Skills Training
Özabacı (2011)	Targeted Cognitive Behavioural Therapy	0.094	1997-2009	6-18		
Park-Higgerson et al. (2008)	School-based interventions	0.09	1970-2004	5-17	Level of risk^{+}, age^{+}, facilitator (delivered by specialist were more effective than delivered by a teacher)	
Robinson et al. (1999)	Targeted school-based cognitive behaviour modification	0.64	1971-1993	2-19		

Sawyer et al. (2015)	Targeted interventions with at least one-year follow-up	0.31	Up to 2010	Under 18	Level of risk^{+}, gender (f), informant (observation showed the largest effect and parent report the smallest), facilitator (delivered by the researcher were more effective than delivered by professionals)	
Silva et al. (2018)	School-based social skills training	-0.1	2003-2014	8-16		
Smeets et al. (2015)	Targeted Cognitive Behaviour Therapy	0.5	2000-2013	Up to 23		
Spruit et al. (2016)	Sports participation	0.32	Up to 2015	10-21		
Stoltz et al. (2012)	Individual targeted school-based interventions	0.3	1975-2011	2-12	Age^{-}	
Ttofi and Farrington (2011)	Universal school-based interventions	0.17	1983-2009	3-16	Age^{+}, duration of intervention^{+}, intensity of intervention^{+}, teacher's training^{+}	Parent training, disciplinary methods, playground supervision, classroom management, classroom rules, whole-school policy, school conferences, information for parents, cooperative group work.
Wilson and Lipsey (2007)	School-based interventions	0.17	1950-2007	2-19	Level of risk^{+}, socioeconomic status^{-}, age^{-}, duration of intervention^{+}, intensity of intervention^{+}, individual interventions	Behavioural strategies
Wilson et al. (2001)	School-based interventions	0.25	Up to 2000	2-19	Level of risk^{+}	Interventions focused on the environment, Cognitive Behavioural Training and Behavioural Training

Note. ES = Effect size; OR = Odds Ratio; gender (m/f) = interventions were more effective for males/females.

$^{+}$ Interventions were more effective with a higher level of these moderators. $^{-}$ Interventions were more effective with lower levels of these moderators

(Farrington et al., 2017). An example of selective intervention is the one evaluated by Betzalel and Shechtman (2017), who used bibliotherapy in small groups with adolescents affected by parental absence. Indicated interventions are those targeted to adolescents that present many risk factors or have already behaved aggressively. For example, Uzunoglu and Baysan Arabaci (2017) delivered the Anger Management Education Program to a small group of adolescents diagnosed with Conduct Disorder. Many reviews focused solely on one of the types. For example, Gaffney et al. (2019) focused only on universal school-based interventions, while Stoltz et al. (2012) focused only on indicated individual interventions.

It is often difficult to draw the line between selective and indicated interventions, as many researchers use previous aggressive behaviour to identify participants for interventions that they describe as selective. For example, Singh (2017) selected adolescents with high scores on self-reported aggression and Abdulmalik et al. (2016) selected students with high aggression reported by teachers. Besides, studies that used other risk factors to select the participants often find that participants have already behaved aggressively at baseline (for example, see Betzalel & Shechtman, 2017; Gottfredson, Cross, Wilson, Rorie, et al., 2010). Therefore, for this thesis selective and indicated interventions have been grouped as targeted interventions, as they target a specific group of adolescents with greater risk of being aggressive.

Several reviews have found that interventions are more effective when the level of risk of the participants at baseline is higher (e.g., Gavine et al., 2016; Limbos et al., 2007). In addition, Wilson and Lipsey (2007) compared universal and selective interventions in a meta-analysis and found that selective interventions were more effective with an average effect size of 0.21 for universal interventions and 0.29 for selective interventions. This is supported by the higher overall ES consistently found in meta-analyses focusing on targeted

interventions compared to those focusing on universal interventions. For example, Fossum et al. (2016) found an average effect size of 0.64 in their meta-analyses of targeted interventions, while Melendez-Torres et al. (2016) found an average effect size of 0.021 in their meta-analyses of universal interventions. Therefore, it can be concluded that targeted interventions are more effective than universal interventions. Although this might reflect that participants in targeted interventions have higher levels of aggression at baseline and, therefore, more scope for change, it is important to pay attention to this difference as the mechanisms underlying effectiveness in universal and targeted interventions may be also different.

1.2.2 Moderators of effectiveness

Previous reviews and meta-analyses have studied many moderators of effectiveness. These moderators refer to different aspects of the intervention and delivery that have an impact on the effect of the interventions. Examples of moderators of effectiveness are the age of the participants, duration of the intervention or the setting where the intervention is delivered. Some of these aspects have been consistently found to moderate the effect of interventions. An example of this is the target level, as discussed in Section 1.2.1. However, results are inconsistent for other potential moderators. A summary of the moderators found in each previous review and meta-analysis with the direction of effect can be seen in Table 1.1 and Table 1.2.

For participants' characteristics, previous reviews have investigated the moderate effect of gender, age and ethnicity. Gender was in most reviews a non-significant moderator (Fossum et al., 2008; Grove et al., 2008; Mytton et al., 2006; Robinson et al., 1999; Smeets et al., 2015; Spruit et al., 2016; S. J. Wilson & Lipsey, 2007). However, Cid (2017) found that after-school targeted interventions were less effective for girls and Sawyer et al. (2015) found that targeted interventions were less effective in groups with a higher percentage of boys.

Table 1.2

Overview of Previous Systematic Reviews

Reference	Main focus	Years	Age	Moderators found	Effective components
Atienzo et al. (2017)	Interventions in Latin America	Up to 2015	10-24		
Brännström et al. (2016)	Aggression Replacement Training	1987-2004	Above 12		
Cassidy et al. (2016)	Media campaigns	1995-2008	10-29		
Cid (2017)	Targeted after-school programs in Latin America	2012-2016	6-20	Level of risk^{+}, parent commitment^{+}, gender (m)	
Cooper et al. (2000)	Violence prevention programs	1980-1999	7-14		Classroom teaching, peer mediation
Cox et al. (2016)	Interventions in Australia	Up to 2013	12-18		Interactive
Fagan and Catalano (2013)	Intervention programs	1992-2012	0-18	Duration of intervention^{-}, intensity of intervention^{+}	
Gavine et al. (2016)	Universal school-based interventions	2002-2014	11-18	Level of risk^{+}	
Hahn et al. (2007)	Universal school-based interventions	Up to 2004	2-19	Age (more effective in kindergarten and high school)	
Howard et al. (1999)	School-based interventions	1993-1997	2-19		
Kelly (2017)	School-based interventions that include mentoring in the United States	1999-2015	12-17		
Limbos et al. (2007)	Interventions in the United States	1990-2006	12-17	Level of risk^{+}, duration of intervention^{+}	
Molina et al. (2005)	Targeted school-based interventions in the United States	1990-2004	6-12		Cognitive Behavioural Training and Social Skills Training
Neville et al. (2014)	Individual brief interventions targeted to male	Up to 2013	Above 10		Motivational interviewing, social norms
Scheckner et al. (2002)	Universal school-based interventions	1990-1999	2-19	Age (most effective in elementary school), more than one setting, training^{+}	
Smedler et al. (2015)	Intervention programs with at least 6 months follow up	1990-2013	2-19	Level of risk^{-}, family internal stress^{+}	Good Behaviour Game, Parental Management Training

Note. Gender (m/f) = interventions were more effective for males/females.

$^{+}$ Interventions were more effective with a higher level of these moderators. $^{-}$ Interventions were more effective with lower levels of these moderators

Many reviews found age moderation effects (Fossum et al., 2008, 2016; Hahn et al., 2007; McCart et al., 2006; Mytton et al., 2006; Park-Higgerson et al., 2008; Scheckner et al., 2002; Stoltz et al., 2012; Ttofi & Farrington, 2011; S. J. Wilson & Lipsey, 2007). However, all of the reviews that found age moderation effects included both interventions targeted to children and interventions targeted to adolescents. As all meta-analysis used subgroup analysis comparing children and adolescent or linear meta-regression to assess this moderation effect, it is difficult to establish if there is a better moment during adolescence to intervene. Some reviews found that interventions with older participants were more effective (Fossum et al., 2016; McCart et al., 2006; Mytton et al., 2006; Park-Higgerson et al., 2008; Ttofi & Farrington, 2011), indicating that intervening with adolescents was more effective than intervening with children. Hahn et al.'s (2007) review is the only review that found an effect within adolescence. In their review of school-based universal interventions, they found that interventions in high school were more effective than in middle school. Therefore, the moderator effect of gender and age still needs to be investigated to clarify the inconsistent results of previous reviews. The few reviews that have explored the role of ethnicity on intervention effectiveness have not found any significant results (McCart et al., 2006; Spruit et al., 2016).

For intervention characteristics, the moderating effects of duration and intensity have been investigated by previous reviews, as well as the effect of individual versus group interventions. Most reviews did not find a significant effect of duration (McCart et al., 2006; Molina et al., 2005; Sawyer et al., 2015; Scheckner et al., 2002; Smeets et al., 2015; Spruit et al., 2016; S. J. Wilson & Lipsey, 2007) despite the very different durations of the interventions reviewed –for example, in Gavine et al. (2016), interventions lasted from 4 weeks to 4 years - and the ones that found an effect were inconsistent. In their systematic reviews, Limbos et al. (2007) found that targeted interventions that had a duration of more

than 12 months were more likely to be effective while Fagan and Catalano (2013) concluded that some short programs were more effective than long term interventions. Finally, in their meta-analysis, Ttofi and Farrington (2011) found that universal school-based interventions were more effective when they lasted 270 days or more. Some reviews indicated that more intense interventions were more effective (Beelmann & Lösel, 2006; Fagan & Catalano, 2013; Ttofi & Farrington, 2011), although other reviews did not identify intensity as a significant moderator (Fossum et al., 2016; Sawyer et al., 2015; Spruit et al., 2016; S. J. Wilson & Lipsey, 2007). Several reviews agreed that targeted interventions were more effective when they were individually delivered than when they were delivered to groups of participants (Cox et al., 2016; Fossum et al., 2016; Smedler et al., 2015; S. J. Wilson & Lipsey, 2007). However, two meta-analyses focusing on targeted interventions did not find a significant moderator effect (Sawyer et al., 2015; Smeets et al., 2015). In summary, all interventions seemed to be more effective when they were more intense and targeted interventions benefitted from being delivered on an individual basis instead of a group. However, the moderator effect of duration is still not clear and needs to be further investigated.

Finally, for delivery and design characteristics, previous reviews have investigated the moderator effects of who delivers the intervention, where it is delivered and how the outcome is assessed. In targeted interventions, Sawyer et al. (2015) concluded that interventions delivered by a member of the research team were more effective, followed by those delivered by a professional of a mental-health-related area; the least effective interventions where those delivered by someone with no specific mental-health training such as teachers. That conclusion is supported by Park-Higgerson et al. (2008), who also found that interventions were more effective when delivered by an intervention specialist than when delivered by a teacher. Finally, some reviews did not find any significant moderator effects on this respect

(Beelmann & Lösel, 2006; Spruit et al., 2016). Only one meta-analysis investigated the effect of the setting where the intervention was delivered (Smeets et al., 2015). Interventions delivered at a clinic, at school, and home were compared showing no significant differences. The size of the effect also varied in some reviews depending on how the outcome was assessed. Grove et al. (2008) and Wilson and Lipsey (2007) found that the largest effects were associated with official records and self-report, while Sawyer et al. (2015) found that the weakest effects were associated with teacher and parent reports. However, in other reviews, this effect was not significant (Fossum et al., 2008; McCart et al., 2006; Smeets et al., 2015; Spruit et al., 2016). In summary, previous reviews have consistently found that interventions are more effective when delivered by a specialist (being the researcher or a mental health professional) than when delivered by a teacher and that official records and self-reports show the biggest effects.

To sum up, previous reviews consistently found that targeted interventions are more effective than universal interventions, especially when they are delivered individually instead than to a group, that all type of interventions benefits from being more intensive and from being delivered by a specialist and that official records and self-reports show bigger effects than other outcome measures. However, some moderators still need to be investigated to clarify their effect, as previous literature is inconsistent. These moderators are the age and gender of the participants and the duration of the intervention. Finally, the ethnicity of the participants and the setting where the intervention is delivered do not seem to influence effectiveness as results of previous reviews have not been significant.

1.2.3 Effective components

Several reviews have tried to identify which elements are the key active ingredients to intervention effectiveness. However, the approaches taken to answer this question varied. Some reviews focused on the number of components, others on which types of interventions

were more effective, and others on which techniques were the most effective. Table 1.1 and Table 1.2 show which components were found as more effective in each meta-analysis and review.

Some reviews concluded that multicomponent interventions (i.e., interventions with more than one component such as parent training and social skills training) show promise in reducing perpetration of aggressive behaviour. For example, Ttofi and Farrington (2011) concluded that school-based interventions were more effective when they included more than eleven components. However, most reviews found no difference between the effectiveness of multicomponent and single-component interventions (Fagan & Catalano, 2013; S. J. Wilson & Lipsey, 2007) or found that single-component interventions were more effective (Mytton et al., 2006; Park-Higgerson et al., 2008).

When comparing different types of interventions, results are varied and inconsistent. McCart et al. (2006) concluded that parent training was generally more effective than cognitive behavioural therapy. Smedler et al.'s (2015) results supported this, concluding that parent training was the most effective type of intervention for targeted interventions. However, Fossum et al. (2008), in their meta-analysis of targeted interventions, concluded that behavioural therapy was more effective than parent training. Furthermore, cognitive behavioural training was found as one of the most effective interventions in most reviews (Beelmann & Lösel, 2006; Fossum et al., 2016; Molina et al., 2005; Robinson et al., 1999; Smeets et al., 2015; S. J. Wilson & Lipsey, 2007).

Due to these heterogeneous results, some reviews have focused on identifying which specific elements make interventions effective. Wilson and Lipsey (2007) did not identify any particularly effective strategy for universal interventions, but they identified that behavioural strategies such as giving rewards and incentives were the most effective

strategies in targeted intervention. Özabacı (2011) found that behavioural training was the most effective strategy for targeted interventions, which they defined as learning and practising behavioural responses. This is supported by other reviews which found social skills training as one of the most effective targeted interventions (Molina et al., 2005; Mytton et al., 2006). However, social skills training was not effective for universal interventions (Silva et al., 2018), which suggests that effective components might be different for universal and targeted interventions. In addition, Cox et al. (2016) emphasised the interactive nature of the most effective interventions that they identified.

In conclusion, it is still not clear which elements an intervention needs to include to be effective. Single-component interventions seem to work as well as multi-component interventions, although there are some inconsistent findings. Cognitive behavioural training has been consistently found by several reviews as the most effective type of intervention. Finally, behavioural elements seem to work for targeted interventions, but the lack of common definitions makes it difficult to identify which concrete elements are the most effective.

1.3 The Behaviour Change Technique Taxonomy

Identifying effective components is important as evidence of which aspects of the interventions lead to improved behaviour. This is valuable in guiding future intervention optimisation. However, as seen in the previous section, the previous reviews suffered from a lack of common definitions. This limitation could be overcome using a framework that provides specific definitions for each component.

The Behaviour Change Technique (BCT) Taxonomy version 1 (Michie et al., 2013) was an attempt to synthesise all the previous classifications of intervention components to provide a common language that could be used to report and evaluate interventions by

researchers and practitioners. Fifty-four international experts from different disciplines participated in its development and a consensus was sought on the names of the identified BCTs as well as their definitions and classifications. This taxonomy allows better communication and understanding between different disciplines and between research and practice.

A BCT is defined as an "observable, replicable, and irreducible component of an intervention designed to alter or redirect causal processes that regulate behaviour" (p. 82; Michie et al., 2013). The BCT taxonomy version 1 contains a list of 93 BCTs grouped in 16 categories. Examples of BCTs are *goal setting, social support* and *self-reward*. Each BCT is carefully defined including its relationship with other BCTs. The taxonomy also provides examples on how each BCT could be applied. For instance, "Watch hand washing behaviours among health care staff and make notes on context, frequency and technique used" (p. 262; Michie et al., 2014) is the example provided for *monitoring of behaviour by others without feedback* and "Present the likelihood of contracting a sexually transmitted infection following unprotected sexual behaviour" (p. 266; Michie et al., 2014) is one of the examples provided for information about health consequences. Both clear definitions and examples are provided to help practitioners and researchers in the identification and application of BCTs. In addition, free online training is provided for those interested in applying the taxonomy. In the online training, advice is given on how to use (and not to use) the BCT Taxonomy and trainees can practice the identification of BCTs with extracts from published interventions and receive feedback.

The BCT taxonomy has been widely used to analyse interventions addressing many health behaviours such as diabetes care (Presseau et al., 2015) and physical activity (Cradock et al., 2017) and to find the most effective BCTs in those areas. For example, Cradock et al. (2017) found that the presence of *instruction on how to perform behaviour, behavioural*

practice/rehearsal, *action planning* and *demonstration of the behaviour* in diet and physical activity interventions were associated with clinically significant reductions of diabetes symptoms. However, it has never been used to identify the effective components in interventions to reduce aggression.

In this thesis, the BCT taxonomy will be used to analyse components of interventions to reduce aggression. Using a specific taxonomy of intervention components that uses clear definitions is expected to help overcome the lack of common definitions that previous reviews suffered.

1.4 Research questions and thesis outline

The main aim of this project is to identify the most effective BCTs to reduce aggression amongst adolescents. To achieve this, there are several objectives:

1. To identify the most effective BCTs for universal and targeted interventions, and whether they are different.
2. To investigate the most effective BCTs for different types of aggression, and whether they are different.
3. To evaluate the efficacy and effectiveness of the identified BCTs when used on their own.

In order to answer the research questions, Chapter 2 reports a multi-level meta-analysis of randomised controlled trials of interventions addressed to adolescents and with at least one measure of aggression. The moderator effect of type of aggression and target level (i.e. universal and targeted) will be tested as well as the effect size associated with each BCT. Subsequent chapters report two randomised controlled trials to test the efficacy of the BCTs identified as the most effective in the meta-analysis. Chapter 4 reports a randomised controlled trial of the BCT *action planning* – the most effective BCT for targeted

interventions- on a targeted group using the materials developed in Chapter 3. Chapter 5 reports an online randomised controlled trial of the BCT *problem solving* –one of the most effective BCT for universal interventions- addressed to a general population of late adolescents. In each trial, the effects are measured for different types of aggression. Chapter 6 provides a general discussion of the findings and their implications.

Chapter 2. What are the most effective BCTs to reduce aggression in adolescents? A multi-level meta-analysis

2.1 Introduction

Chapter 1 synthesized the findings of previous meta-analyses and systematic reviews on interventions to reduce aggression in young people. As it has been discussed in Section 1.2.3, it is still not clear which intervention components are the most effective to reduce aggression among adolescents. Previous meta-analyses have either mixed studies of children and adolescents or have used combinations of elements in ways that are not comparable due to lack of common definitions.

To overcome these limitations, this chapter presents a meta-analysis focusing on adolescents. In addition, the BCT Taxonomy version 1 (Michie et al., 2013) described in Section 1.3 is used to identify which BCTs are more effective to reduce aggression among adolescents. As argued in Section 1.2.1, effective components are expected to vary between universal and targeted interventions. Therefore, BCTs effects are analysed separately for each of these types of intervention. Besides, one of the thesis objectives is to identify if the most effective BCTs vary for different types of aggression. Finding this information could be useful to design interventions aimed to change specific types of behaviour. Therefore, the most effective BCTS will be explored for physical, verbal, relational, reactive and proactive aggression.

Section 1.2.2 concluded that some moderators of effectiveness still need to be investigated as previous literature is inconsistent. In this meta-analysis, the role of the age and gender of the participants and the duration of the intervention on the effectiveness of the intervention will be explored to clarify those inconsistencies. Previous meta-analyses have found gender effects on both directions when looking only at targeted interventions (Cid, 2017; Sawyer et al., 2015) and age effects when looking only at universal interventions,

finding that interventions in high schools were more effective than in middle school (Hahn et al., 2007). Therefore, the effect of age and gender will be explored for all interventions together and for targeted and universal interventions separately. These moderators might also have a different effect for different types of aggression and therefore, that will also be explored.

An important limitation of previous meta-analyses is the type of analysis used. Previous studies have used traditional meta-analysis, where the assumption of independence of effect sizes prevents more than one effect size from each study from being included. This study applies a multi-level meta-analysis, which relaxes that assumption. Multi-level meta-analysis allows all effect sizes from studies that report multiple comparisons to be included as the modelling accounts for the dependence of effect sizes nested within studies (Assink & Wibbelink, 2016). Thus, information is maximized, and analysis power improved.

2.1.1 The present study

Therefore, in the present study, a multi-level meta-analysis is used to assess the effectiveness of psychosocial interventions in reducing aggression during adolescence. The role of age, gender, duration of intervention and outcome as moderators of intervention effectiveness is examined. Besides, the BCT Taxonomy is used to classify the ingredients of the interventions to test which components are most effective for universal and targeted interventions and for different types of aggression.

2.2 Method

Initially, the present meta-analysis included only physical aggression. This included measures of general, physical, reactive, and proactive aggression -but only when the measures did not also include relational aggression-, traditional bullying, weapon carrying, fighting and anger out -a subscale of STAXI-II (Spielberger, 2010) that measures the

frequency in which anger is expressed negatively towards people and objects. The systematic review protocol for that meta-analysis was registered with PROSPERO (number CRD42018088811) and the results have been published (Castillo-Eito et al., 2020). This chapter presents an extension of that meta-analysis to include relational aggression, verbal aggression and cyberbullying.

2.2.1 Search Strategy

A database search was undertaken in January 2019 to identify all randomised controlled trials published up to the end of 2018. Only randomised controlled trials were included as they provide the best design to assess intervention effectiveness (Higgins & Green, 2011). Searches were conducted on Web of Science (encompassing the databases Web of Science Core Collection, BIOSIS Citation Index, BIOSIS Preview, Current Contents Connect, Data Citation Index, Derwent Innovations Index, Journal and Highly Cited Data, KCI-Korean Journal Database, MEDLINE, Russian Science Citation Index, SciELO, and Zoological Record), as well as in the Scopus and PsycINFO databases. Titles, abstracts and author keywords were searched for four key concepts: (a) adolescents (youth, adolescent, teenager, juvenile, young, minor), (b) intervention (behaviour change, intervention, prevention, experiment, program, reduction, evaluation, strategy, effect, trial), (c) randomised controlled trial (RCT, Cluster RCT, Group RCT, randomised controlled trial); and (d) aggression (bullying, violence, aggression, physical assault, fighting). The search was limited to articles in English and Spanish, as they were the languages in which the researcher was fluent. The specific search was amended as necessary for each database to account for different search functionalities. To account for publication bias, efforts were made to locate grey literature. With that purpose, similar searches were carried out in Open Grey and Proquest Dissertations and Theses.

To ensure all relevant studies were identified, reference lists of the systematic reviews and meta-analyses in Table 1.1 and Table 1.2 were also searched. In addition, once the relevant studies from both database searches and previous reviews were identified, reference lists –i.e., backward search- and citations –i.e., forward search- were searched for each article retrieved. Forward searches were undertaken with Google Scholar to retrieve unpublished studies and studies that were not listed in the previously mentioned databases. The flow diagram for study selection shown in Figure 2.1, which follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses' (PRISMA; Moher et al., 2009) recommendations, shows the number of articles retrieved from both databases and additional resources and the number of records after duplicates were removed.

2.2.2 Study Selection

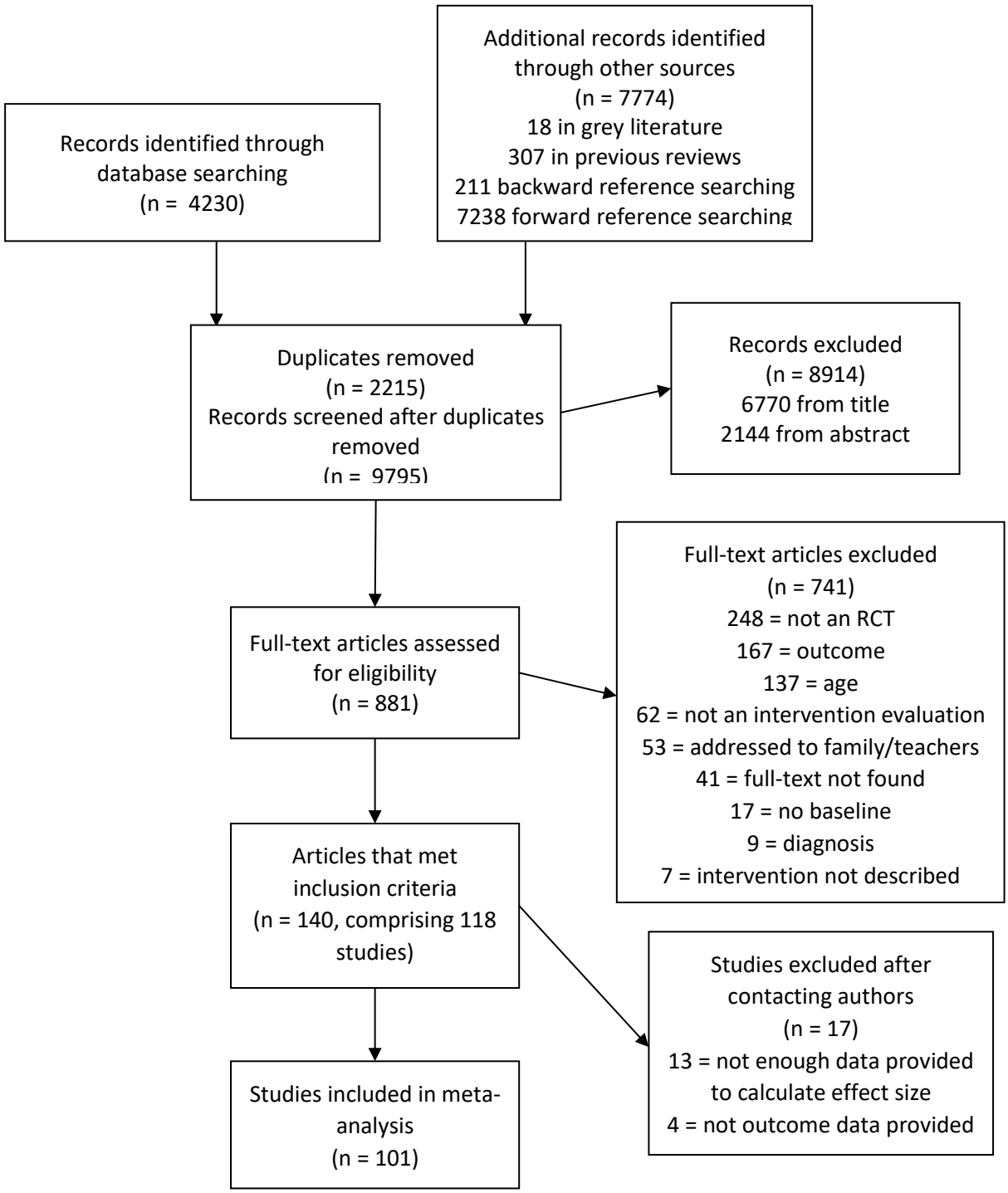
Studies were included if they met the following five inclusion criteria: (a) the study design was a randomised controlled trial or a cluster randomised controlled trial; (b) the mean age of the participants at baseline was between 10 and 17.99 years old or, if the mean was not reported, the range of ages fell within those limits. The mean was selected as the main criteria to follow as it was the most commonly reported descriptive statistic for age. (c) The intervention was mainly addressed to the adolescent rather than to the parent or another agent; (d) there was at least one comparison group that was a non-treatment, waiting list, treatment as usual or attention control group. An attention control group is a group doing an activity unrelated to the intervention in order to blind the participants to group allocation. An example would be a study skills group. The last inclusion criteria was (e) one of the reported outcomes was a behavioural measure of aggression against peers, such as fighting, bullying, relational aggression or verbal aggression.

Studies were excluded if participants were selected due to a specific diagnosis such as autistic spectrum disorder or attention deficit hyperactivity disorder. However, if the

participants were selected due to a diagnosis of conduct disorder or oppositional defiant disorder, the study was still included, as aggressive behaviour is an inherent part of those

Figure 2.1

PRISMA Flow Diagram



Note. RCT = Randomised Controlled Trial

disorders. Studies were also excluded if the intervention included psychopharmacology and if the comparison group received a competing intervention as opposed to treatment as usual. Finally, studies were excluded if they did not measure the relevant outcomes before the intervention (i.e. baseline) and if the intervention was not described.

First, titles and abstracts of all the records found in the databases, grey literature and previous reviews (n = 3826) were screened for inclusion. Full texts were obtained when possible and screened for all the records that appeared to meet the inclusion criteria (n = 380). If the full text could not be found, manuscripts were requested from authors. A second reviewer screened a randomly selected sample of 10% of the articles (n = 38). There was good interrater agreement on article inclusion (Cohen's Kappa = 0.79) with disagreements (n = 3) resolved through discussion. The results of some studies were reported throughout more than one article as can be seen in Appendix A. In those cases, all the articles were screened combinedly to identify the inclusion and the exclusion criteria. If the study met the inclusion criteria, all of the articles for the same study were included representing one study. Sixty-six studies identified from the initial searches were included. Reference lists and citations of those 66 studies were searched to identify further relevant studies and the records identified were screened (n = 5969). The flow diagram in Figure 2.1 shows the number of records included and excluded with reasons for exclusion after the backward and forward reference searches were conducted.

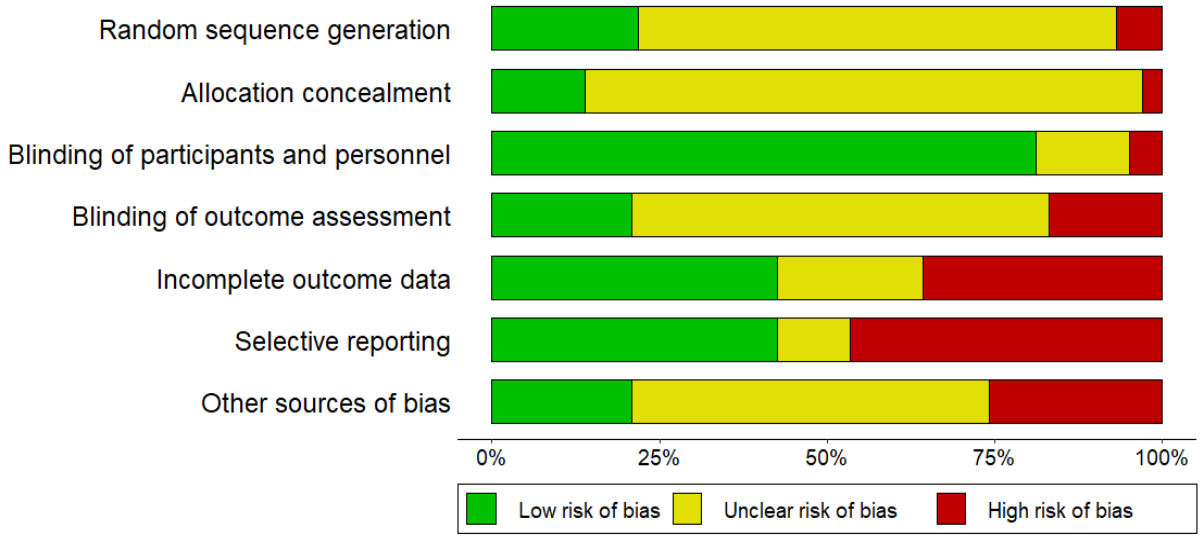
2.2.3 Appraisal of Study Quality

The Cochrane Risk of Bias Tool (Higgins & Green, 2011) was used to assess study quality. The tool grades studies as high risk, low risk or unclear across the following domains: selection bias (random sequence generation and allocation concealment), performance bias, detection bias, attrition bias, reporting bias and other bias.

The author assessed the quality of all included studies (n = 101). The second reviewer assessed a random sample of 10% of the studies (n = 10). The interrater agreement was initially poor (Cohen's Kappa = 0.50). After discussion, it was noticed that the poor agreement was due to different criteria used by the reviewers for attrition bias and reporting bias. After the criteria were discussed and agreed, all the disagreements were resolved. A summary of the risk of bias judgements can be found in Figure 2.2.

Figure 2.2

Summary of Risk of Bias



2.2.4 Data Extraction

Data to calculate Cohen's *d* was extracted from each study. The effect size as quoted in the original publications was used where available (42% of included effect sizes). If a measure of effect size different to Cohen's *d* was reported, such as *r*, it was converted using Decoster's (2012) calculator (24% of effect sizes). For studies with continuous outcomes that did not report effect sizes, means and standard deviations (SD) -or standard errors if SD were not reported- from baseline and follow-up were extracted and Morris' (2008) formula was used to calculate Cohen's *d* (44% of effect sizes). For binary outcomes, percentages or

number of events were extracted for baseline and follow-up, odds ratios were calculated using Higgins and Green's (2011) formula and then transformed to Cohen´s *d* (5% of effect sizes). Authors were contacted when neither effect size nor descriptive statistics were reported (*n* = 30). For the studies whose authors did not reply (*n* = 15) or replied but did not send the data requested (*n* = 10), effect sizes were calculated from inferential statistics if enough data was available using Wilson's (2001) calculator (9% of effect sizes). The remaining studies were excluded from the analysis (*n* = 17). The data extracted from 10% of the studies was checked by the second reviewer, with 100% agreement. Multiple effect sizes were obtained from the same study in papers where (a) several outcomes meeting the inclusion criteria were reported, (b) there was more than one intervention group, (c) analyses for different subsamples were reported or (d) there was more than one follow-up.

Study characteristics (e.g., country), design (e.g., randomised controlled trial or cluster randomised controlled trial), participants' characteristics (e.g., age), intervention characteristics (e.g., BCTs) and outcomes (e.g., used measurement) were extracted from all the included studies (*n* = 101). BCTs were coded using version 1 of Michie et al.'s (2014) taxonomy and extracted from the description of the intervention in each paper. Before doing this, the author undertook the BCT Taxonomy Online Training (www.bct-taxonomy.com). Other papers reporting the same study or using the same intervention were searched to complete information about the intervention when required. If the description was unclear or a manual was cited but could not be retrieved, further information was requested from authors. If treatment as usual or attention control groups were used, BCTs were extracted from each group when possible. The BCTs that were applied in both the intervention group and the control group were not used in the analysis as they could not contribute to variance between the groups. A second reviewer coded the BCTs from a random sample of 15% of the studies. Out of the 47 BCTs that were coded in total for those studies, there were

disagreements on the coding of 18 BCTs. Disagreements were discussed and when an agreement could not be reached, a third reviewer was consulted. The rest of the studies were coded following the principles developed during the interrater discussion.

Included studies used different methods and scales to assess aggression outcomes. Therefore, a big list of outcomes was extracted as listed at the beginning of Section 2.2. As we were interested in whether interventions are differently effective for different types of aggression, outcomes were grouped to match the functions and forms of aggression. Anger out was grouped with reactive aggression; physical aggression, fighting, and weapon carrying were grouped into the category of physical aggression; and measures of threatening were grouped with verbal aggression. Measures of proactive aggression and relational aggression represented two different categories and were not grouped with any other outcome. General aggression, bullying and cyberbullying were left out of the groupings as they can follow different forms and functions of aggression.

2.2.5 Analysis

To account for the likely correlation between effect sizes extracted from the same study, a three-level random-effects meta-analysis was performed using the metafor package (Viechtbauer, 2010) for the R environment (R Core Team, 2019) following Assink and Wibbelink's (2016) guidelines. A three-level model accounts for: sampling variance (level 1), variance between effect sizes from the same study (level 2) and variance between studies (level 3). Following Weisz et al. (2017), analyses with categorical moderators were only conducted if each category contained at least five cases as parameters are poorly estimated when there is limited data.

Sensitivity analyses were used to examine the effect of outliers and risk of bias. Therefore, analyses including and excluding outliers 3 standard deviations from the overall

effect size and analysis excluding and including studies with a high risk of bias were conducted.

Sampling variance was calculated using Meta-essentials (Suurmond et al., 2017). To adjust the cluster randomised controlled trial sample sizes, the design effect was calculated using the intra-cluster correlation reported in the study as described by Higgins and Green (2011). If the intra-cluster correlation was not reported, it was taken from another study that used similar clusters (school vs. classrooms) and outcomes (e.g., self-report, parent-report). Then, the sample size was adjusted using the design effect. In studies with several intervention groups but only one control group, the sample size of the control group was divided by the number of intervention groups. If there were several types of control groups, the non-treatment control group was given preference.

2.3 Results

2.3.1 Characteristics of included studies

One hundred and eighteen studies met the inclusion criteria of which 101 provided enough data to calculate effect sizes allowing inclusion in the analysis. These studies were all reported in English between 1979 and 2018. Eighty-nine per cent were published (86% in academic journals and 3% in books), while the rest were unpublished (10% were dissertations and one record was an institutional report). All included studies comprised 114,917 young people (55,082 in control groups and 59,835 in intervention groups) with a mean age of 13.36 years and 60% male on average. Fifty-two per cent of the studies were cluster randomised controlled trials. The trials were conducted in 21 different countries across all continents with the United States as the most common (54%). The interventions varied in duration from 20 minutes to 3 years, 79% of them were delivered in schools and 85% were group interventions. Fifty-six per cent of the interventions were delivered to young people with aggressive behaviours or with risk factors for aggression (targeted interventions) and 44%

were delivered to the whole population regardless of risk (universal interventions). A summary of the characteristics of each study is reported in Appendix A.

Overall study quality was judged as low. Eighty-one per cent of the studies had at least one domain that was assessed as high risk of bias and 98% of the studies did not report enough information to assess all the domains. The summary of the risk of bias assessment can be found in Figure 2.2.

2.3.2 Impact of interventions on aggressive behaviour

The 101 included studies produced 350 effect sizes from 122 intervention groups. The overall mean effect size was $d = 0.31$, 95% Confidence Interval (CI) [0.19, 0.43], indicating that psychosocial interventions reduced aggression compared to a control group, with a small-to-medium effect size overall, according to Cohen's (1992) conventions.

There was significant heterogeneity between effect sizes within studies ($\chi 2$ (1) = 602,425.02, $p < .001$) and between studies ($\chi 2$ (1) = 242.63, $p < .001$). Thus, 0.002% of total variance can be attributed to the sampling variance, 5.59% to variance within studies and 94.40% to variance between studies.

A sensitivity analysis was conducted excluding effect sizes that were three SD over or below the mean effect size ($k = 7$). This analysis included 343 effect sizes from 100 studies. The overall effect size was still small but significant ($d = 0.25$, 95% CI [0.16, 0.34]) and heterogeneity was still significant both within ($\chi 2$ (1) = 602,424.07, $p < .001$) and between studies ($\chi 2$ (1) =170.96 $p < .001$). The outliers accounted for some variance between studies as, after removing the outliers, the percentage of variance attributed to variance between studies was reduced: 0.003% of the variance was attributed to sampling variance, 9.68% to variance within studies and 90.31% to variance between studies. Inspection of the outliers showed that they were effect sizes from relatively small studies ($n < 40$) of group-based

targeted interventions. These characteristics are shared with other effect sizes in the normal range. They did not share any other characteristics. Therefore, outliers were preserved in the main analyses, although all the analyses were also conducted excluding the outliers to control for influential cases (see Appendix B for results without outliers), as suggested by Viechtbauer and Cheung (2010). When these analyses produced different results, they are reported in the text.

In addition, a sensitivity analysis was conducted excluding studies with a high risk of bias in three or more domains (n = 14). This analysis included 291 effect sizes from 87 studies. The overall effect size was marginally larger than including all the studies (d = 0.34, 95% CI [0.20, 0.47]). As there was not a substantial difference and including high-risk studies resulted in a more conservative effect size, the studies with a high risk of bias were kept for the rest of the analyses.

2.3.3 Moderator analyses

Moderator analyses were conducted to identify whether age, gender, duration of intervention and outcome were moderators of effectiveness. Besides, the moderator effect of target level (i.e., universal vs targeted interventions) was explored, as the analyses of BCTs separately for each category was only appropriate if target was a significant moderator of effectiveness. Moderator analyses are presented in Table 2.1.

As expected, targeted interventions had a significantly larger effect size (d = 0.43) than universal interventions (d = 0.18). Duration of the intervention was also a significant moderator indicating that the shorter the intervention is, the more effective it is (β = -0.01). Age and gender were not significant moderators of effectiveness. Reactive aggression was compared to proactive aggression, and physical aggression was compared to verbal and

Table 2.1

Results of Moderator Analyses Based on 350 Effect Sizes from 101 Studies Containing 122 Intervention Groups

Moderator variable	#studies	#ES	*d*[a] (95% CI)	Omnibus test	p-value	Variance level 2[b]	Variance level 3[c]
Target				F(1,348) = 11.45	< .001*	0.019	0.294
Universal	46	190	0.18 (0.05, 0.32)*				
Targeted	57	159	0.43 (0.30, 0.57)*				
Age (mean, in years)	98	339	0.00 (-0.04, 0.04)	F(1,337) = 0.00	.993	0.020	0.340
Universal	46	191	-0.01 (-0.04, 0.03)	F(1,189) = 0.18	.671	0.021	0.059
Targeted	54	148	0.01 (-0.11, 0.14)	F(1,146) = 0.04	.843	0.014	0.779
Gender (proportion male)	94	332	-0.06 (-0.14, 0.03)	F(1,330) = 1.61	.205	0.019	0.257
Universal	43	179	-0.08 (-0.17, 0.01)	F(1,177) = 2.99	.085	0.020	0.049
Targeted	53	153	0.26 (-0.07, 0.58)	F(1,151) = 2.35	.128	0.012	0.507
Duration (in weeks)	100	348	-0.006 (-0.011, -0.001)*	F(1,346) = 5.83	.016*	0.020	0.303
Functions of aggression				F(1,27) = 0.75	.395	0.000	0.501
Reactive	11	19	0.50 (0.05, 0.95)*				
Proactive	5	10	0.42 (-0.05, 0.89)				
Forms of aggression				F(2,179) = 0.13	.878	0.031	0.128
Physical	49	133	0.18 (0.07, 0.29)*				
Verbal	12	25	0.18 (0.03, 0.34)*				
Relational	12	24	0.21 (0.05, 0.37)*				

Note. # studies = number of independent studies; # ES = number of effect sizes; *d* = mean effect size; CI = confidence interval

[a]For categorical predictors, effect size is Cohen's *d* for each category. For continuous predictors, effect size is β for that specific predictor.

[b]Variance between the effect sizes from the same study. [c]Variance between studies.

*$p < 0.05$

relational aggression. None of these analyses was significant, which indicates that interventions are similarly effective reducing all types of aggression.

2.3.4 Behaviour Change Techniques by level of intervention

After accounting for the BCTs present in control groups, interventions included between 0 and 22 BCTs (*M* = 7.39). Sixty-nine different BCTs were present. The BCTs coded for each specific intervention can be found in Appendix A. The most common BCTs were *behavioural practice*, *problem solving* and *information about social and environmental consequences*, present in 96 (79%), 62 (51%) and 62 (51%) intervention groups respectively.

BCT effectiveness was analysed separately for targeted and universal interventions. Meta-regression and subgroup analyses were conducted for all the BCTs that were included in at least five intervention groups.

2.3.4.1 Universal interventions

Forty-six studies reported universal interventions, providing 191 effect sizes from 53 intervention groups. Fifty-three different BCTs were identified and only 29 were included in 5 or more intervention groups; between 1 and 22 BCTs (*M* = 7.46) were used in each intervention. The most common BCTs were *behavioural practice* (*k* = 39), *information about social and emotional consequences* (*k* = 28), *problem solving* (*k* =25) and *instruction on how to perform the behaviour* (*k* =25).

Number of BCTs included was not a significant moderator of intervention effectiveness (F (1,189) = 0.33, p = .565). A meta-regression including the BCTs that were reported in 5 or more intervention groups as predictors -dichotomised as present or absent- was conducted. The model was not significant (F (29,161) = 0.89, p = .637). Subgroup analyses were conducted for each of these 29 BCTs comparing interventions where the BCT was present with interventions where the BCT was absent. Complete results are in Table 2.2.

Table 2.2

Behaviour Change Techniques Subgroup Analyses for Universal Interventions Based on 191 Effect Sizes from 53 Intervention Groups

BCT No.	Behaviour Change Technique	#IG present	#ES present	ES present (95% CI)	ES absent (95% CI)	t-value	p-value	Difference
1.1	Goal setting (behaviour)	6	11	0.17 (-0.06, 0.40)	0.11 (0.03, 0.19)*	0.49	.627	-0.06
1.2	Problem solving	25	82	0.19 (0.08, 0.30)*	0.04 (-0.07, 0.15)	1.90	.060	0.15
1.3	Goal setting (outcome)	5	29	0.07 (-0.19, 0.34)	0.12 (0.03, 0.20)*	0.33	.746	-0.05
1.4	Action planning	6	12	0.23 (-0.05, 0.52)	0.11 (0.02, 0.19)*	0.84	.401	0.13
1.8	Behavioural contract	5	6	0.12 (-0.11, 0.35)	0.11 (0.03, 0.20)*	0.06	.955	0.01
1.9	Commitment	6	20	0.03 (-0.18, 0.23)	0.13 (0.04, 0.22)*	0.91	.363	-0.10
2.2	Feedback on behaviour	5	27	0.05 (-0.19, 0.28)	0.12 (0.04, 0.21)*	0.60	.547	-0.08
3.1	Social support (unspecified)	13	27	0.14 (0.00, 0.27)*	0.11 (0.02, 0.20)*	0.40	.693	0.03
4.1	Instruction on how to perform a behaviour	25	84	0.15 (0.06, 0.25)*	0.08 (-0.02, 0.17)	1.38	.171	0.08
4.2	Information about antecedents	10	56	0.05 (-0.09, 0.18)	0.14 (0.05, 0.22)*	1.21	.227	-0.08
4.3	Re-attribution	5	14	0.22 (-0.06, 0.49)	0.11 (0.02, 0.19)*	0.76	.451	0.11
5.1	Information about health consequences	6	33	0.14 (-0.09, 0.37)	0.11 (0.03, 0.20)*	0.27	.786	0.03
5.3	Information about social and environmental consequences	28	94	0.14 (0.04, 0.24)*	0.09 (-0.02, 0.19)	0.79	.431	0.05
6.1	Demonstration of the behaviour	14	38	0.13 (-0.02, 0.29)	0.11 (0.01, 0.20)*	0.26	.796	0.02
6.2	Social comparison	9	37	0.13 (-0.07, 0.33)	0.11 (0.02, 0.20)*	0.15	.884	0.02
6.3	Information about others' approval	6	17	0.04 (-0.19, 0.26)	0.13 (0.04, 0.21)*	0.72	.474	-0.09
8.1	Behavioural practice/rehearsal	39	121	0.15 (0.07, 0.24)*	-0.02 (-0.15, 0.11)	2.51	.013	0.18*
8.2	Behaviour substitution	19	83	0.09 (-0.04, 0.21)	0.14 (0.03, 0.24)*	0.60	.547	-0.05
8.6	Generalisation of target behaviour	6	36	0.16 (-0.07, 0.40)	0.11 (0.02, 0.19)*	0.43	.666	0.06
9.1	Credible source	7	14	0.15 (-0.10, 0.40)	0.11 (0.03, 0.20)*	0.29	.771	0.04
10.3	Non-specific reward	6	19	0.15 (-0.09, 0.39)	0.11 (0.03, 0.20)*	0.29	.772	0.04
10.4	Social reward	7	20	0.08 (-0.10, 0.26)	0.12 (0.04, 0.20)*	0.41	.682	-0.04
10.11	Future punishment	6	27	0.06 (-0.19, 0.31)	0.12 (0.04, 0.21)*	0.44	.663	-0.06
11.2	Reduce negative emotions	19	43	0.19 (0.06, 0.32)*	0.07 (-0.03, 0.17)	1.53	.127	0.13
12.2	Restructuring the social environment	6	13	0.12 (-0.04, 0.27)	0.11 (0.03, 0.20)*	0.01	.994	0.001
12.3	Avoidance/reducing exposure to cues of behaviour	7	33	0.05 (-0.16, 0.25)	0.13 (0.04, 0.21)*	0.71	.479	-0.08
13.1	Identification of self as role model	7	36	0.09 (-0.13, 0.31)	0.12 (0.03, 0.21)*	0.26	.794	-0.03
13.2	Framing/reframing	22	65	0.11 (-0.01, 0.23)	0.12 (0.01, 0.23)*	0.10	.920	-0.01
15.4	Self-talk	6	19	0.13 (-0.09, 0.36)	0.11 (0.03, 0.20)*	0.15	.883	0.02

Note. # IG = number of intervention groups; # ES = number of effect sizes; CI = confidence interval

*$p < 0.05$

The results indicated that only interventions that included *problem solving* (*d* = 0.19), *instruction on how to perform the behaviour* (*d* = 0.15), *information about social and environmental consequences* (*d* = 0.14), *behavioural practice* (*d* = 0.15) or *reduce negative emotions* (*d* = 0.19) were significantly effective while the interventions that did not include those BCTs were not. However, the subgroup analysis was significant only for *behavioural practice* (*t* = 2.51, *p* = .013), which means that the studies including behavioural practice had a significantly larger effect (d = 0.15) than the studied that did not include that BCT (d = -0.02).

The sensitivity analysis presented in Appendix B found three outliers whose removal influenced the results. After removing those influential cases, the subgroup analysis for *behavioural practice* was no longer significant. Besides, only interventions including *problem solving* (*d* = 0.14) or *behavioural practice* (*d* = 0.14) were still significantly effective while the interventions where those BCTs were absent were not. A meta-regression including only those two BCTs showed that the model was significant (*F* (2,188) = 3.88, *p* = .022) with only the presence of *behavioural practice* being a significant predictor of effect size (β = 0.15, *t* = 2.00, *p* = .047).

2.3.4.2 Targeted interventions

There were 71 targeted interventions within 57 studies. They reported a total of 159 effect sizes. The 71 targeted intervention groups reported a total of 65 different BCTs. Each intervention reported between 0 and 22 BCTs (*M* = 8.35). The most common BCTs were *behavioural practice* (*k* = 53), *problem solving* (*k* = 35) and *instruction on how to perform the behaviour* (*k* = 34).

The number of BCTs included did not predict how effective the intervention was (*F* (1,157) = 0.41, *p* =.521). A meta-regression was conducted including the 30 BCTs which

were reported in 5 or more intervention groups as predictors -dichotomised as present or absent-. The moderator effect was not significant (F (30,128) = 0.88, p = .648). Subgroup analyses conducted for each BCT showed that, for all BCTs, interventions were significantly effective when the BCT was absent and, for 21 of them, interventions were also significantly effective when the BCT was present. Full results are presented in Table 2.3. The subgroup analysis was only significant for *action planning:* Interventions including *action planning* were significantly more effective (d = 1.09) than interventions that did not include it (d = 0.42; t = 2.00, p = .047).

2.3.5 Behaviour Change Techniques and moderators by type of aggression

Moderator analyses were also conducted for type of aggression – reactive, proactive, physical, verbal and relational- when there were five or more studies in each category. None of the moderators -i.e., gender, age, target level, duration and BCTs- had a significant effect on the effect size of the functions of aggression (i.e., reactive and proactive aggression). Significant moderators for the effect size of the forms of aggression are detailed in the following paragraphs. Full results are presented in Appendix C (refer to Appendix B for results without outliers).

Duration was a significant moderator in the effect on physical aggression (β = -0.01; F (1,129) = 15.94, p < .001), which indicates that shorter interventions were more effective in reducing physical aggression. However, this moderator was not significant after two outlier effect sizes were removed from the analysis (β = -0.003, F (1,127) = 2.19, p = .142). In addition, the analyses conducted after removing those outliers showed that interventions including the BCT *goal setting (behaviour)* were more effective in reducing physical aggression (d = 0.45) than the interventions that did not include it (d = 0.12; t = 2.18, p = .031)

Table 2.3

Behaviour Change Technique Subgroup Analyses for Targeted Interventions Based on 159 Effect Sizes from 71 Intervention Groups

BCT No.	Behaviour Change Techniques	#IG present	#ES present	ES present (95% CI)	ES absent (95% CI)	t-value	p-value	Difference
1.1	Goal setting (behaviour)	10	29	0.66 (0.11, 1.22)*	0.47 (0.21, 0.73)*	0.62	.538	0.19
1.2	Problem solving	35	70	0.51 (0.24, 0.77)*	0.51 (0.23, 0.79)*	0.02	.985	-0.00
1.3	Goal setting (outcome)	15	43	0.18 (-0.24, 0.61)	0.62 (0.36, 0.88)*	1.79	.076	-0.44
1.4	Action planning	9	15	1.09 (0.47, 1.71)*	0.42 (0.18, 0.67)*	2.00	.047	0.67*
1.9	Commitment	5	14	0.07 (-0.77, 0.91)	0.54 (0.30, 0.79)*	1.07	.285	-0.47
2.2	Feedback on behaviour	21	37	0.64 (0.25, 1.02)*	0.45 (0.18, 0.73)*	0.82	.412	0.18
2.3	Self-monitoring of behaviour	16	34	0.32 (-0.10, 0.73)	0.58 (0.31, 0.84)*	1.08	.281	-0.26
2.4	Self-monitoring of outcome(s) of behaviour	5	6	0.59 (-0.21, 1.39)	0.50 (0.25, 0.75)*	0.22	.830	0.09
2.7	Feedback on outcome(s) of behaviour	7	10	0.71 (0.20, 1.22)*	0.48 (0.24, 0.72)*	0.90	.371	0.23
3.1	Social support (unspecified)	15	31	0.56 (0.30, 0.83)*	0.49 (0.25, 0.72)*	0.93	.353	0.08
4.1	Instruction on how to perform a behaviour	34	61	0.52 (0.25, 0.78)*	0.50 (0.23, 0.76)*	0.15	.882	0.02
4.2	Information about antecedents	32	70	0.54 (0.28, 0.80)*	0.47 (0.21, 0.73)*	0.56	.577	0.07
4.3	Re-attribution	12	29	0.49 (-0.01, 1.00)	0.51 (0.25, 0.78)*	0.07	.944	-0.02
5.3	Information about social and environmental consequences	29	59	0.46 (0.20, 0.72)*	0.54 (0.29, 0.79)*	0.69	.490	-0.07
5.6	Information about emotional consequences	6	16	0.52 (0.17, 0.87)*	0.50 (0.27, 0.74)*	0.11	.912	0.02
6.1	Demonstration of the behaviour	18	29	0.73 (0.35, 1.10)*	0.44 (0.19, 0.69)*	1.48	.140	0.29
6.2	Social comparison	19	36	0.49 (0.05, 0.93)*	0.51 (0.25, 0.78)*	0.10	.924	-0.02
6.3	Information about others' approval	5	9	0.07 (-0.68, 0.83)	0.55 (0.31, 0.80)*	1.20	.234	-0.48
8.1	Behavioural practice/rehearsal	53	99	0.53 (0.29, 0.77)*	0.43 (0.12, 0.73)*	0.83	.406	0.10
8.2	Behaviour substitution	29	63	0.44 (0.16, 0.72)*	0.56 (0.30, 0.81)*	0.85	.398	-0.12
8.6	Generalisation of target behaviour	17	36	0.58 (0.21, 0.94)*	0.49 (0.23, 0.74)*	0.49	.628	0.09
9.2	Pros and cons	8	22	0.45 (-0.07, 0.98)	0.51 (0.27, 0.76)*	0.22	.825	-0.06
10.2	Material reward (behaviour)	16	29	0.43 (0.01, 0.85)*	0.53 (0.23, 0.79)*	0.46	.647	-0.11
10.3	Non-specific reward	10	15	0.43 (-0.13, 1.00)	0.52 (0.27, 0.76)*	0.28	.782	-0.08
10.4	Social reward	9	22	0.57 (0.25, 0.89)*	0.50 (0.26, 0.73)*	0.60	.553	0.08
10.9	Self-reward	6	8	0.64 (0.07, 1.21)*	0.50 (0.25, 0.74)*	0.50	.620	0.14
11.2	Reduce negative emotions	20	40	0.58 (0.23, 0.94)*	0.47 (0.20, 0.74)*	0.56	.578	0.20
13.2	Framing/reframing	20	46	0.43 (0.06, 0.79)*	0.54 (0.28, 0.81)*	0.56	.579	-0.11
15.2	Mental rehearsal of successful performance	7	9	0.68 (-0.04, 1.41)	0.49 (0.24, 0.74)*	0.51	.613	0.19
15.4	Self-talk	18	29	0.54 (0.18, 0.91)*	0.49 (0.24, 0.75)*	0.26	.798	0.05

Note. # IG = number of intervention groups; # ES = number of effect sizes; CI = confidence interval

*$p < 0.05$

Age and target level were significant moderators on the effect of interventions on verbal aggression. Interventions were more effective when adolescents were older (β = 0.26, F (1,22) = 7.95, p = .010) and targeted interventions (d = 0.59) were more effective than universal interventions (d = 0.18) in reducing verbal aggression (F (1,23) = 11.21, p = .003). The analyses conducted after removing one outlier showed that interventions including the BCT *behaviour substitution* were significantly less effective in reducing verbal aggression (d = 0.06) than the interventions that did not include it (d = 0.38; t = 2.34, p = .029).

Gender was a significant moderator for the effect on relational aggression. Interventions delivered to higher proportion of male adolescents were more effective in reducing relational aggression (β = 0.45, F (1,22) = 5.35, p = .030). However, gender was no longer a significant moderator after removing one outlier effect size from the analysis (d = 0.39, F (1,21) = 4.25, p = .052). Target level was also a significant moderator of the effect on relational aggression. Targeted interventions (d = 0.61) were more effective than universal interventions (d = 0.04; F (1,22) = 28.04, p < .001). In addition, interventions including *social support (unspecified)* were more effective in reducing relational aggression (d = 0.35) than the interventions that did not include it (d = 0.04; t = 2.90, p = .009) as shown by the analysis done after removing one outlying effect size.

2.4 Discussion

The present multilevel meta-analysis assessed whether psychosocial interventions were effective in reducing aggression among adolescents, attempted to identify the most effective BCTs for universal and targeted interventions and for different types of aggression and aimed to clarify whether age, gender, duration of the intervention and type of aggression were moderators of effectiveness. Across all psychosocial interventions included in the review, a statistically significant small-to-medium overall effect size of 0.31 was found. This corresponds to a 12% decrease in aggressive behaviour in contrast with a control group (Coe,

2002). This effect size is consistent with previous meta-analyses addressing aggression across children and adolescents as can be seen in Table 1.1. Effect sizes found in previous meta-analyses ranged from -0.1 for school-based social skills training (Silva et al., 2018) to 0.68 for creative bibliotherapy (Montgomery & Maunders, 2015). The interventions reviewed had similar effects reducing all subtypes of aggression.

2.4.1 Moderators of effectiveness

We found that level of risk at baseline was a significant moderator confirming, with quantitative analysis, the findings from previous systematic reviews (Gavine et al., 2016; Limbos et al., 2007). Interventions were more effective when they were targeted to adolescents with a higher risk of being aggressive than when they were administered to a general adolescent population. One possible explanation for this result is that aggressive behaviour is relatively rare in the general population. Many participants in universal interventions may show limited aggressive behaviours and, therefore, have little potential to change. However, the fact that this moderator effect was also found for relational and verbal aggression -the most common forms of aggression-, but not for physical aggression -the least common form of aggression- might indicate that this difference in effectiveness is due to other causes. It is possible that physical aggression is rare even in targeted populations or that it is more difficult to change than relational and verbal aggression.

In the present study, shorter interventions were found to be more effective than longer interventions. This finding is consistent with Fagan and Catalano's (2013) systematic review. However, Limbos et al.'s (2007) systematic review concluded that targeted interventions that were longer than a year were more effective than those that were shorter. Limbos et al. (2007) compared interventions shorter and longer than a year based on whether they reported effectiveness, instead of calculating effect sizes. One of the strengths of the present study is the use of multi-level meta-analysis in order to use all reported effect sizes in each study,

rather than an overall conclusion, which makes our findings more robust. Future research should investigate the minimum duration for an intervention to be effective in order to guide intervention development.

Age was a significant moderator for verbal aggression. Interventions aimed at older participants were more effective in reducing verbal aggression than interventions aimed at younger participants. There was no evidence of this effect for overall aggression or other subtypes of aggression. Besides, no evidence was found to support the influence of gender on the effectiveness of the intervention. Although null findings are not equivalent to the absence of effect in the population, given the large number of studies included in this moderator analysis, it is unlikely that they reflect a lack of statistical power. If future studies confirm that age and gender do indeed have little or no effect, it would mean that interventions are effective regardless of gender and throughout all adolescence.

2.4.2 Most effective BCTs

To identify which BCTs were more effective in reducing aggression, we employed the widely used BCT taxonomy version 1 (Michie et al., 2013). Individual techniques in interventions reports were identified. We found that both universal and targeted interventions used similar BCTs, namely: *behavioural practice, problem solving, instruction on how to perform the behaviour* and *information about social and emotional consequences*. The number of included BCTs was not a significant moderator of effectiveness, which suggests that including more BCTs does not make an intervention more effective. However, from our results, it is difficult to determine what is the minimum number of BCTs needed for an intervention to be effective. Future studies are needed to determine that, as this information could guide the design of future interventions and help save resources.

A regression model including *behavioural practice* and *problem solving* predicted the effectiveness of universal interventions with the inclusion of *behavioural practice* being the best predictor. This finding has important implications, as this is the first review to identify specific effective techniques in universal interventions. Previous reviews (Scheckner et al., 2002; S. J. Wilson & Lipsey, 2007) did not find any particular strategy to be more effective in universal interventions. Thus, the current review indicated that effective universal interventions "prompt practice or rehearsal of the performance of the behaviour" (Michie et al., 2014, p. 270). It is important to note, however, that all the studies included in this meta-analysis which used *behavioural practice* included it in combination with at least three other BCTs. Furthermore, 92% of the universal interventions that included *problem solving* also included *behavioural practice*, which might explain the lack of individual predictive power of *problem solving*. Therefore, more research is needed to assess their specific effects both on their own and in combination.

Action planning was the most effective BCT in reducing aggression in targeted interventions. Targeted interventions that included this BCT were more effective than those which did not include it. Previous reviews that had found specific intervention components that are effective for targeted interventions did not find one of them to be *action planning* (Fossum et al., 2008; Özabacı, 2011; S. J. Wilson & Lipsey, 2007). A possible explanation is that the component analysis in previous reviews was different due to the lack of a taxonomy. Previous reviews extracted components that were comprised of a combination of techniques instead of individual BCTs. For example, Wilson and Lipsey (2007) found that the most effective component was behavioural strategies, which they defined as "Techniques, such as rewards, token economies, contingency contracts, and the like to modify or reduce inappropriate behaviour" (p. 18). This highlights the importance of using a taxonomy to identify individual effective components. However, more research is needed to confirm the

individual effect of *action planning*, as all the targeted interventions that included *action planning* included it in combination with other BCTs.

In addition to these findings, some evidence was found that the different subtypes of aggression were affected differently by other BCTs. The inclusion of *goal setting (behaviour)* increased the effect of interventions on physical aggression and the inclusion of *social support (unspecified)* had a similar effect for relational aggression. For verbal aggression, however, it is the absence of the BCT *behavioural substitution* that increased the effect of the interventions. This might be explained because most of the interventions reviewed focused on reducing more serious forms of aggression such as physical aggression, and when *behavioural substitution* was encouraged, the participants may have substituted physical aggression for verbal aggression.

2.4.3 Limitations and further research

One of the main limitations of the present review was the difficulty of extracting BCTs, as the reporting of techniques used in the interventions was rather poor. A similar issue was mentioned before in Cradock et al.'s (2017) meta-analysis of interventions addressing diet and physical activity. Despite the efforts made to retrieve complete intervention descriptions from manuals and authors, it is likely that not all the BCTs used in the interventions were coded. This issue makes it difficult to analyse the effect of each BCT separately. If we want to identify which techniques are more effective, it is important that in the future, the interventions are reported in detail. The BCT taxonomy used in this meta-analysis (Michie et al., 2014) provides a helpful common language to report intervention content. More primary intervention studies are also necessary to identify effective techniques. This should include the design of interventions that use only one technique or comparing similar interventions that differ only in one technique. Some of the studies included in this

meta-analysis have already attempted this. For example, Etscheidt (1984) delivered the same intervention with and without contingent reinforcement and did not find any differences.

Another limitation of the included studies, which is related to the poor reporting of BCTs, is the poor reporting of different aspects of the design. This was an issue during the assessment of risk of bias, as most of the reviewed studies did not report enough information to classify them as low or high risk of bias. Therefore, it was concluded that the quality of the studies was generally low. Future studies should report more detailed accounts of the design and procedure, making sure that they clearly report how they are avoiding the different types of bias.

2.4.4 Conclusion

This is the first multilevel meta-analysis on interventions to reduce aggressive behaviour in adolescents and the first to examine the role of individual BCTs. We found that psychosocial interventions are effective in reducing aggression among adolescents, especially when they are targeted to young people at greater risk of being aggressive. We also found that shorter interventions were more effective than longer interventions. Universal interventions were especially effective if they included *behavioural practice* and *problem solving* and targeted interventions were more effective if they included *action planning.*

Future studies need to determine the minimum duration and number of BCTs that are effective to change aggressive behaviour. To explore this, Chapters 4 and 5 of this thesis will report the effect of brief one-session interventions including only one BCT. Chapter 4 reports a randomised controlled trial of an *action planning* targeted intervention and Chapter 5 presents a randomised controlled trial of a *problem solving* universal intervention. In that way, the individual effects of the BCTs *action planning* and *problem solving* will be tested. Chapter 3 reports the development of the materials used for the *action planning* intervention.

Chapter 3. Development of a Volitional Help Sheet for Anger Management

3.1 Introduction

The meta-analysis reported in Chapter 2 found that *action planning* was the most effective BCT to reduce aggression in interventions for adolescents at risk of being aggressive. However, it is not clear if *action planning* is effective as a standalone BCT, as all the targeted interventions reviewed that included *action planning* also contained other BCTs such as *goal setting*, *problem solving* or *self-monitoring of behaviour* (the BCTs included in each of the interventions reviewed in Chapter 2 can be found in Appendix A). Therefore, another study is needed to determine whether *action planning* is effective on its own to reduce aggressive behaviour among adolescents. This will also help determine the minimum number of BCTs needed for an intervention to be effective.

Action planning is defined in the BCT Taxonomy version 1 as "prompt detailed planning of performance of the behaviour (must include at least one of context, frequency, duration and intensity. Context may be environmental (physical or social) or internal (physical, emotional or cognitive) (includes 'Implementation Intentions')" (Michie et al., 2014, p. 260). Following that definition, most of the interventions reviewed in Chapter 2 that used *action planning* prompted participants to perform anger management strategies (i.e., the behaviour) in anger-provoking situations (i.e., the context; e.g., Etscheidt, 1984; Goldstein et al., 2007; Yorgun, 2007; Zimmerman, 1987).

The use of anger triggers and anger management strategies on interventions to reduce aggression is theoretically based, as anger and aggression are strongly correlated; a medium to strong positive and significant correlation between these two constructs has been consistently found in different studies (e.g., Agbaria et al., 2016; Keatley et al., 2017; Kolla et al., 2017). Anger is especially related to reactive aggression as explained in Section 1.1.3, and

it has been shown to predict physical aggression (Fives et al., 2011; Kolla et al., 2017; Sukhodolsky & Ruchkin, 2004). Especially, lack of anger regulation skills has been identified as a strong predictor of physical and verbal aggression (Roberton et al., 2012; T. N. Sullivan et al., 2010). This thesis will follow the same approach as previous interventions. Therefore, the use of anger management strategies in anger provoking situations will be prompted to test the effect of *action planning* on aggression.

In choosing how to implement *action planning* as a standalone intervention, we followed Michie et al.'s (2014) definition, which highlights that *action planning* includes implementation intentions. Implementation intentions consist of making plans linking a situation that triggers an unwanted behaviour with an alternative wanted behaviour using the structure "IF <trigger> THEN <alternative behaviour>". Implementation intentions have been successfully used to change behaviour such as smoking (Armitage, 2016) and risky driving (Brewster et al., 2016). Different methods to implement this strategy have been tested, both being the participant who creates the plans for themselves (Conner et al., 2013) and the researcher who provides or facilitates plan formation (Epton & Armitage, 2017). A Volitional Help Sheet (VHS) is a researcher-provided method that has been shown to be successful at changing behaviours such as alcohol consumption (Armitage, 2015) and suicidal ideation and behaviour (Armitage et al., 2016). To date, however, implementations intentions or a VHS have not been examined as an independent method to reduce aggression against others.

A VHS consists of a list of triggers and a list of alternative behaviours that participants are instructed to link to make their own plans (e.g., Armitage et al., 2016). In this thesis, the VHS will be formed with a list of anger triggers and a list of anger management strategies, which offer alternative responses to the triggers rather than aggressive behaviours. Participants will link the triggers to anger management behaviours to specify their planned

actions when they encounter the triggers. The first step in the process is to develop these lists of commonly occurring triggers and potential anger management strategies that are appropriate for adolescents with high risk of displaying aggression.

3.1.1 The present study

The study presented in this chapter aims to identify (a) the most relevant anger triggers for adolescents at risk of being aggressive and (b) the anger management strategies that are perceived to be the most effective by that population. To optimise the intervention, it is also important to learn whether the same VHS can be used for all adolescents or whether different VHS are needed for young and late adolescents or males and females. Therefore, whether the relevance of both triggers and strategies differs across age and gender will be investigated. This information will be used to develop a VHS to improve anger management and reduce aggressive behaviour, which will be trialled in Chapter 4.

3.2 Method

3.2.1 Participants

Ethical approval for this study was provided by the Ethics Committee of the Department of Psychology of the University of Sheffield. Participants were recruited from two centres in Sheffield that provide services for children with behavioural problems. These two centres were: (1) a local authority school for children and adolescents that have been excluded from mainstream schools; and (2) a service offered by the city council for children with behavioural problems or anger control issues as identified by referral from their school, parents or local authorities. The young people in these centres were considered adolescents at risk of being aggressive. This sample was selected with the intention that the anger triggers and anger management strategies finally included in the VHS were relevant for adolescents at risk.

An information sheet explaining the study was sent to each eligible participant's home with an opt-out form, carers who did not wish their children to participate were asked to send the form back. None of the parents opted out. Youth workers and learning mentors explained the study to potential participants, who were asked to give verbal assent if they agreed to participate. None declined participation.

Thirty adolescents (6 from the city council, 24 from the school; 63.3% male) between 10 and 16 years old (M = 13.87; SD = 1.28) participated in the study. The majority reported their ethnic origin as white (66.7%), 10% considered themselves Asian, 6.7% black and 10% mixed. This represents a lower proportion of white ethnicity and a higher proportion of other ethnicities than the general population of England and Wales where 86% identified as white, 7.5% Asian, 3.5% black, and 2.2% belonged to other ethnic groups (Office for National Statistics, 2012). The majority of the participants reported living with a single carer (67.9%), which represents a higher percentage than across the UK, where only 22.31% of families with dependent children had a single carer (Office for National Statistics, 2017). The average household size, including the participant, was 4, ranging from 2 to 8 members. Socioeconomic status was generally low: 66.3% of the participants were below the third decile of the Index of Multiple Deprivation (Ministry of Housing, Communities & Local Government, 2015), meaning their households were within the 30% most deprived in England.

3.2.2 Design and procedure

This study used a cross-sectional survey-based design to identify the most frequent anger triggers and the anger management strategies considered more useful among adolescents with a tendency to use aggressive strategies. Previously designed lists of triggers and strategies -explained in detail in Section 3.2.3- were presented to participants with the objective of shortlisting the ten most frequent triggers and the ten most useful anger strategies

among this population. Surveys were completed during one-to-one sessions to avoid distractions. Learning mentors or youth workers run the sessions and were present all the time to answer questions.

Gender and age differences in both triggers and anger managements strategies were also explored. This exploration was conducted to identify whether the differences were large enough to grant the use of different triggers and strategies in the VHS.

3.2.3 Measures

Sociodemographic questionnaire. Participants were asked their gender, age, primary language, ethnic group and household composition. In addition, the three first digits of their postcode were requested. The postcode was used to calculate the Index of Multiple Deprivation (Ministry of Housing, Communities & Local Government, 2015).

Anger triggers list. A list of possible anger triggers was generated using the Provocation Inventory (PI; Novaco, 2003) and the anger-eliciting situations scale of the Multidimensional Anger Inventory (MAI; Siegel, 1986). The PI is a 25-item self-report questionnaire that divides anger-eliciting situations into five areas: (1) disrespectful treatment (e.g., "someone makes fun of the clothes you are wearing"), (2) unfairness (e.g., "someone else gets credit for work that you did"), (3) frustration (e.g., "someone keeps making noise when you are trying to concentrate", (4) annoying traits of others (e.g., "people who act like they know it all") and (5) irritations (e.g., "being slowed down by another person's mistake"). The PI has been standardized with young people aged 9 to 18 years old with a Cronbach's alpha of .93 and test-retest reliability of .82 (Novaco, 2003). The MAI measures anger-eliciting situations such as "someone lets me down" and "people are unfair" with a 9-item scale. The MAI was developed with adults. However, it has been used with adolescents in

several studies showing good internal consistency with Cronbach's alpha ranging from .84 to .88 and test-retest reliability of .75 (Lee et al., 2009; Quinn et al., 2014; Shoval et al., 2011).

There was no overlap between the critical situations extracted from both measures. Therefore, combining the MAI and PI scales resulted in a list of 34 potential triggers (the list and materials presented to the participants can be seen in Appendix D). Some of the items were re-worded for the following four reasons: (1) to conform with Chapman et al.'s (2009) recommendations around the structure of implementation intentions (e.g., "being criticized in front of other people for something that you have done" was re-worded as "I get angry if I am criticized in front of other people for something that I have done"); (2) to simplify the vocabulary (e.g., "I get angry when I have to work with incompetent people" was re-worded as "I get angry if I have to work with people who don't have the required skills"); (3) to turn American expressions into British expressions (e.g., "someone cuts in front of you when you are in line to get something" was re-worded as "I get angry if someone pushes in front of me when I am queuing to get something"); and (4) to omit details to cover a wider range of situations with each item (e.g., "You see someone bully another person who is smaller or less powerful" was re-worded as "I get angry if I see someone bully another person").

Participants were asked to rate how often they encountered each trigger on 3-point scales; 0 (never), 1 (sometimes), and 2 (often). They could also mark whether they did not understand the meaning of the item. Besides, participants were asked to list any other critical situation that they considered relevant but was not included in the list.

Anger management strategies list. Appropriate responses to anger-provoking situations were generated from the Anger Regulation subscale of the Novaco Anger Scale (NAS; Novaco, 2003) and the anger management strategies endorsed by the American Psychological Association (2011). The NAS includes a 12-item Anger Regulation scale

designed to measure three skills for controlling anger in response to specific triggers: (1) cognitive coping (e.g., “If someone says something nasty, I can swallow my pride and let it go”), (2) arousal calming (e.g., “if I feel myself getting angry, I can calm myself down”) and (3) behavioural control (e.g., “if I disagree with someone, I try to say something constructive”). The NAS has been standardised with young people from 9 to 18 years old and the Anger Regulation scale has shown an internal consistency of .78 and test-retest reliability of .72 (Novaco, 2003). The American Psychological Association (2011) endorses 14 strategies for controlling anger, three of which overlap with the items from the NAS.

The NAS items and American Psychological Association’s anger management strategies were combined to produce a list of 23 anger management strategies, which were re-worded for the following reasons: (1) omitting triggers and focusing on strategies that can be generalised (e.g., “when something makes me angry, I put it out of my mind and think of something else” was re-worded as “think of something else”) and (2) simplifying the vocabulary (e.g., the strategy “try non-strenuous, slow exercises. Yoga and similar activities can relax your muscles and calm you down” was re-worded as “calm myself by relaxing my muscles”).

The final list and materials presented to the participants can be found in Appendix E. Participants were asked to rate how useful they thought that each strategy would be on a 3-point scale; 0 (not at all useful), 1 (a little useful), and 2 (very useful). As in the triggers, they could also mark if they did not understand the item. In addition, participants were asked to list any other anger management strategy that they considered relevant but was not included in the list.

3.2.4 Analysis

To test whether the council and school samples could be combined for analysis, participants from both centres were compared on sociodemographic characteristics and total scores. T-tests were employed where dependent variables met parametric assumptions and Mann Whitney U tests were used when they did not. For categorical variables, Fisher's exact test was used. The total score for both lists was calculated as an average of the responses in each item.

Means were calculated for each item in the anger triggers list and the anger management strategies list for the whole sample. The ten items for each list with the highest means were selected to be part of the final VHS. Frequencies of responses are also reported for comparison purposes.

Comparisons by age and gender were conducted on each item. The scale for each item was considered ordinal and, therefore, Mann-Whitney tests were used to compare items scores between males and females and Spearman's rho were used to explore the relationship of each item with age. Bonferroni correction was used to control for multiple comparisons within each set of comparisons.

3.3 Results

3.3.1 Comparison between centres

Table 3.1 shows that participants from the council and the school did not differ significantly on any of the available measures and therefore were combined for analysis.

3.3.2 Anger triggers

Table 3.2 shows the mean score for each item in the anger triggers list (listed in descending order). The mean summary score was 1.32 (*SD* = 0.36, range: 0.42 - 1.77). Means for each item ranged from 0.81 to 1.83. Table 3.2 also reports the percentage of participants

Table 3.1

Participant Characteristics

	Council	School	statistic	*p*
Age [a]	13.67 (1.86)	13.86 (1.17)	70 [b]	.918
IMD (Me)	3	3	61.5 [b]	.586
Household size [a]	4 (1.41)	3.95 (1.94)	60 [b]	.748
Gender (% male)	100%	54%	--	.061[d]
Ethnicity (% white)	66.7%	66.7%	--	1[d]
Single carer	83.3%	63.6%	--	.629[d]
Anger triggers [a]	0.99 (0.58)	1.38 (0.27)	1.46 [c]	.212
AM Strategies [a]	0.57 (0.33)	0.71 (0.38)	0.74 [c]	.468

Note. IMD = Index of Multiple Deprivation; Me = Median; AM = Anger management.

[a] Mean (Standard Deviation) reported. [b] Mann Whitney U test. [c] t-test. [d] Fisher's exact test.

who cited the trigger as occurring "often". More than 80% of the sample reported that they get angry often if "I am accused of something that I didn't do" and if "I am told off, while someone else doing the same thing is not".

The ten items with the highest means were selected to form part of the VHS. All the selected items occurred 'often' for more than 50% of the sample.

3.3.3 Anger management strategies

Table 3.3 shows the mean score for each item in the anger management strategies list (listed in descending order). The mean summary score was 0.68 (*SD* = 0.37, range: 0 - 1.43). Means for each item ranged from 0.43 to 1.21. Table 3.3 also reports the percentage of participants who reported that the strategy would be "very useful". Only three strategies were endorsed by more than 30% of the sample as being very useful; namely, "calm myself down", "make sure that I have some 'quiet time'" and "take deep breaths". The ten items with the highest mean were selected for the VHS.

Table 3.2

Summary Statistics for Each Item of the Anger Triggers List

Item	Mean	SD	Often (%)
I am accused of something that I didn't do[b]*	1.83	0.38	82.8
I am told off, while someone else doing the same thing is not[b]*	1.82	0.39	82.1
I see someone bully another person[b]*	1.69	0.54	72.4
I am criticised in front of other people for something that I have done[a]*	1.66	0.61	72.4
people act like they know it all[d]*	1.60	0.62	66.7
someone looks through my things without my permission[a]*	1.57	0.69	67.9
someone pushes in front of me when I am queuing to get something[a]*	1.55	0.57	58.6
someone starts giving me a hard time[e]*	1.52	0.69	62.1
people think that they are better than I am[d]*	1.50	0.64	57.1
people think that they are always right[d]*	1.48	0.58	51.9
someone is always disagreeing with me[d]	1.47	0.68	56.7
people are unfair[f]	1.45	0.63	51.7
I am watching a TV programme and someone comes along and changes the channel[c]	1.41	0.68	51.7
someone keeps making noise when I am trying to concentrate[c]	1.41	0.68	51.7
someone embarrasses me[f]	1.36	0.87	60.7
people don't listen to me when I talk to them[d]	1.34	0.72	48.3
something stops me doing what I planned to do[f]	1.33	0.62	40.7
someone else gets credit for work that I did[b]	1.27	0.78	46.7
I have to work with people who don't have the required skills[f]	1.26	0.69	39.1
I am slowed down by another person's mistakes[e]	1.22	0.75	40.7
I have to take orders from someone who isn't as able as me[f]	1.21	0.73	37.9
I lend something to someone and they fail to return it[c]	1.17	0.87	46.7
I am not given credit for something I have done[f]	1.11	0.79	35.7
I am overcharged by someone[b]	1.10	0.86	44.8
I do something stupid[f]	1.10	0.77	41.4
I get cold food that is supposed to be hot[e]	1.10	0.86	41.4
someone lets me down[f]	1.10	0.90	34.5
I am hungry and tired and someone plays a practical joke on me[e]	1.07	0.64	23.3
I make plans to do something with a person who backs out at the last minute[c]	1.00	0.80	31
someone looks over my shoulder while I am working[a]	.96	0.88	35.7
I am carrying a drink and someone bumps into me[e]	.93	0.78	26.7
I need to get somewhere in a hurry but I get stuck in traffic[c]	.90	0.77	24.1
someone makes fun of the clothes I am wearing[a]	.90	0.72	20.7
I am delayed[f]	.81	0.88	29.6

Note. Item scores ranged from 0 to 2. Items are from: [a] Disrespectful treatment (PI); [b] Unfairness (PI); [c] Frustration (PI); [d] Annoying traits of others (PI); [e] Irritations (PI); [f] MAI

* Included items in the VHS

Table 3.3

Summary Statistics for Each Item of the Anger Management Strategies List

Item	Mean	SD	Very useful (%)
calm myself down[b]*	1.21	0.79	42.9
make sure that I give myself some 'quiet time'[d]*	1.11	0.74	32.1
take deep breaths[bd]*	1.04	0.79	32.1
stay cool[b]*	1.00	0.80	22.2
avoid putting myself in that situation again in the future[d]*	1.00	0.68	30.8
walk away[c]*	.93	0.73	22.2
suggest discussing the problem another time[d]*	.81	0.62	11.1
think of something else[a]*	.79	0.69	14.3
speak about the problem to the person I have the conflict with[c]*	.79	0.83	25
say something constructive[c]*	.75	0.65	10.7
imagine something calm and relaxing[bd]	.71	0.76	17.9
swallow my pride and let it go[a]	.64	0.68	10.7
think in a logical and realistic way about the situation[d]	.60	0.65	8
stop taking myself too seriously[d]	.59	0.50	0
identify the problem and making a plan to solve it[d]	.54	0.65	7.1
calm myself by relaxing my muscles[d]	.54	0.64	7.7
express what I want in terms of desires: "I would like…" instead of demands: "I must have…"[d]	.52	0.59	4
repeat a calming word or phrase, such as "relax" or "take it easy"[d]	.52	0.70	7.4
listen to the other person and thinking carefully about what I want to say[d]	.52	0.64	11.1
try to understand why someone is bothering me[a]	.50	0.51	0
avoid using extreme words like 'never' and 'always' to describe people and situations[d]	.48	0.70	0
try to find a solution for the problem[cd]	.48	0.51	11.1
try to see positive things in other people[a]	.43	0.63	7.1

Note. Item scores ranged from 0 to 2. Items are from: [a] Cognitive coping (NAS); [b] Arousal calming (NAS); [c] Behavioural control (NAS); [d] American Psychological Association's anger management strategies

*Included items in the VHS

3.3.4 Gender differences

Mann-Whitney tests were conducted to compare males and females on each item score. These analyses showed that responses from females were significantly higher for two of the anger triggers and three of the anger management strategies (see Table 3.4); although these differences became non-significant after applying Bonferroni corrections.

Table 3.4

Gender Differences on Anger Triggers and Anger Management Items

	Mean rank			
Item	Male	Female	U	p
I am carrying a drink and someone bumps into me [a]	12.82	20.14	53.5	.015
People act like they know it all [a]	13.34	19.23	63.5	.042
Calm myself down [b]	11.91	18.50	49.5	.027
Take deep breaths [b]	11.85	18.59	48.5	.025
Imagine something calm and relaxing [b]	11.94	18.45	50	.027

[a] Anger triggers; [b] Anger management strategies

3.3.5 Relationships with age

To analyse the relationship between age and item scores, Spearman's rho was used. Three anger triggers had a significant negative medium correlation with age: "I need to get somewhere in a hurry but I get stuck in traffic" (*rho* = -.48, *p* = .008), "I lend something to someone and they fail to return it" (*rho* = -.50, *p* = .008) and "I do something stupid" (*rho* = -.43, *p* = .021). In addition, four anger management strategies had a significant positive medium correlation with age, such that increasing age was associated with higher scores on the items "stay cool" (*rho* = .44, *p* = .026), "say something constructive" (*rho* = .56, *p* = .002), "identify the problem and making a plan to solve it" (*rho* = .42, *p* = .033) and "stop taking myself too seriously" (*rho* = .44, *p* = .02).

3.4 Discussion

The main objective of this study was to develop the materials needed for an intervention using the BCT *action planning*. With that aim, a VHS to improve anger management was developed. The final VHS includes the most relevant anger triggers and anger management strategies for adolescents displaying or at risk of displaying aggressive behaviour, which is the target population of the intervention. The final VHS can be found in Section F1.

3.4.1 Items composing the VHS

All ten final critical situations were items from the PI (Novaco, 2003). The items included were taken from the subscales disrespectful treatment, unfairness, annoying traits of others and irritations. Previous qualitative studies have identified the pursuit of status and respect as one of the most important reason for violence given by adolescents, which is related to disrespectful treatment (Hansen et al., 2014; Resko et al., 2016; Yonas, O'Campo, Burke, Peak, & Gielen, 2005). In Ness (2004) the main reason given is "not liking the way a person looks at you", which could be considered disrespectful treatment but also related to annoying traits of others.

The final list of ten anger management strategies in the VHS is formed by seven items from NAS (Novaco, 2003) and four from the APA (2011) list -one of the strategies appeared in both sources-. Of the items chosen from the NAS, three belong to the arousal calming subscale, three to the behavioural control subscale and one to cognitive coping. Arousal calming and behavioural control strategies are considered simpler to understand and implement than cognitive coping (Zimmerman, 1987). Therefore, it was expected that youth with few anger management skills would choose easier strategies as more useful for them.

3.4.2 Age and gender differences

The secondary objective of the study was to test differences in item scores by gender and age in order to decide whether it is necessary to construct different VHS for different subpopulations. No differences were found between males and females in anger triggers or anger management strategies. Regarding age, younger participants were more likely to get angry when they needed to get somewhere in a hurry but got stuck in traffic, when someone failed to give them back something that they had borrowed and when they did something stupid. Two of those items belong to the frustration subscale in the NAS (Novaco, 2003), which is compatible with the possibility that younger adolescents are less able to deal with frustration than older adolescents. Previous studies have also found that frustration tolerance increases with age through adolescence (Rauchfleisch, 1981). However, none of those items is part of the ten items selected to form the VHS, indicating that the list of triggers can be used widely. Regarding anger management strategies, older participants were more likely to find useful staying cool, saying something constructive, identifying the problem and making a plan to solve it and not taking themselves too seriously. Two of those items belong to the behavioural control subscale of NAS (Novaco, 2003). This could indicate that older adolescents consider behavioural control strategies more useful than younger adolescents. Two of those items had been selected to form part of the VHS. However, as participants completing the VHS will only need to select some of the strategies, differences in only two out of ten items were considered small, indicating that the same list of anger management strategies can be used for all ages.

3.4.3 Limitations and future directions

The generalisation of these conclusions must be done carefully as the sample size is small. In addition, it could be argued that the opinion from adolescents with anger management issues about which anger management strategies are more useful is not reliable.

It is in fact possible that asking adolescents without anger or aggression issues would have brought different results. However, it is important to notice that interventions to improve anger management are often directed to young people from low socioeconomic status and with identified behavioural problems, like the participants in this study, and accessing the views of this hard-to-reach population is crucial to ensure that interventions developed to reduce aggression in this population are relevant to them.

This study has shown some trends in age changes in the ways the population responds to anger-provoking situations and manage anger. However, further research with a bigger sample is needed to determine whether these trends are replicable. If those trends are found in further research, it remains to be explored whether tailoring an anger management intervention to the age of the client improves its effectiveness.

3.4.4 Conclusion

A VHS for anger management has been developed informed by adolescents at high risk of displaying aggression. No evidence was found that the same VHS could not be applied to all adolescents regardless of their age and gender. This VHS will allow testing whether the BCT *action planning* as a standalone intervention is effective in reducing aggression on a targeted sample, as indicated by the results of Chapter 2. The VHS prompts participants to plan which anger management strategy to use when they encounter a specific anger trigger, following Michie et al.'s (2014) definition of *action planning.*

Chapter 4. Does action planning reduce aggression in at-risk adolescents? A randomised controlled trial

4.1 Introduction

In this chapter, the efficacy and effectiveness of the VHS developed in Chapter 3 is tested in a randomised controlled trial. In this way, the effect of the BCT *action planning* will be evaluated as a standalone intervention. The meta-analysis reported in Chapter 2 indicated that *action planning* was the most effective BCT to reduce aggression in adolescents at higher risk of behaving aggressively. As seen in Chapter 3, the VHS is an effective researcher-provided method of delivering an implementation intentions-based intervention (Armitage, 2015). To form implementations intentions, participants link a specific situation with a wanted response through the formation of "IF <situation> THEN <wanted response>" statements. Thus, the performance of a specific behaviour (i.e., wanted response) is prompted in a specific context (i.e., situation), following Michie et al.'s (2014) definition of *action planning*.

Gollwitzer and Sheeran (2006) argued that both the situation and the response need to be clearly and precisely specified so that the situation cues the action. This may pose a challenge when implementation intentions are used to avoid unwanted behaviours, such as aggression, because many different situations might cue the behaviour but only a few can be specified in an implementation intentions exercise. However, Brewster et al. (2016) found that implementation intentions do not need to be completely specific to be effective. In their study, participants created implementations intentions for situations that were identical, similar or different to the situations that were then presented in a driving simulator. Both participants who created implementation intentions for identical and similar situations reduced their speeding behaviour. They concluded that implementation intentions were generalised to other situations beyond those specified in the IF statements if contextual

similarities are maintained. Furthermore, Epton and Armitage (2017) found that a VHS with a generic situation was as effective in increasing physical activity as a standard VHS with ten specific situations. A similar approach to Epton and Armitage (2017) is used in the present study to test whether using a generic anger trigger is as effective as using specific triggers.

4.1.1 Anger as a mediator

The VHS developed in Chapter 3 prompts individuals to make plans to use anger management strategies in anger-provoking situations. As a result, it is expected to increase anger management skills and thus reduce aggression. Lack of anger management skills is a good predictor of aggression (Roberton et al., 2012; T. N. Sullivan et al., 2010) as explained in Section 3.1. Therefore, a reduction in anger is expected to mediate the effect of the VHS on aggression, particularly regarding reactive aggression, which is usually motivated by anger (Little et al., 2003).

4.1.2 Intentions, negative urgency and callous-unemotional traits as moderators

It has been argued that, for implementations intentions to be effective, the person making the plan needs to have a strong intention to change their behaviour (Gollwitzer & Sheeran, 2006). For example, Sheeran et al. (2005) found that implementation intentions was effective only for participants with strong intentions to achieve the goal. Therefore, intentions to use nonviolent strategies will be measured as a moderator of the effectiveness of the VHS.

Gollwitzer and Sheeran (2006) also found that implementation intentions have larger effects on people with self-control problems, which indicates that it might be effective for reactive aggression, which is related to impulsivity (Raine et al., 2006). However, Scott et al. (2015) found that reactive aggression is not related to general impulsivity, but specifically to negative urgency, which is the tendency to act impulsively when having strong negative emotions, such as anger. It has been reported that an implementation intentions intervention

was not effective for individuals with high urgency who were emotionally activated (Burkard et al., 2013). Therefore, negative urgency may moderate the effect of implementation intentions on aggression such that implementation intentions will be less effective in reducing reactive aggression for participants with higher negative urgency.

Callous-unemotional traits may also moderate the effectiveness of the VHS given that it has been found that youth presenting high levels of these traits are less responsive to treatment (Frick & White, 2008). In particular, young people with high callous-unemotional traits have worse outcomes after parent and family interventions than their peers who are lower in callous-unemotional traits (D. J. Hawes et al., 2014). However, results for interventions that include direct work with young people show mixed results (Wilkinson et al., 2016). Wilkinson et al.'s (2016) review identified some studies in which young people with high callous-unemotional traits were less responsive to treatment. However, the review also covered other studies that did not find differences in the outcome between young people with high and low callous-unemotional traits. One of the criticisms in this review was that many of the studies reviewed had design limitations and the conclusion called for more randomised controlled trials, so the present study will contribute to that body of literature.

4.1.3 The present study

The present study aims to assess whether the VHS developed in Chapter 3 (see Appendix F) is effective in reducing anger and aggression among adolescents with anger issues or behavioural problems one month and six months after the intervention. A randomised controlled trial with three groups - one control group and two intervention groups - will be conducted to evaluate the effect of the VHS. The difference between the intervention conditions is the anger triggers provided in the VHS. One group will receive the list of ten specific triggers developed in Chapter 3 whereas the other group will receive only a generic trigger. These two groups will be compared to test whether they are differentially effective.

Having a generic situation might help with tailoring, as the situations that trigger anger might be different for different people. For example, in Chapter 3 it was found that anger triggers are encountered in different frequencies by adolescents of different ages. In addition, the present study will test whether a reduction in anger mediates the effect of the intervention on reducing aggression. It is expected that a reduction in anger will mediate any reductions in aggressive behaviour, especially on reactive aggression, as a result of the VHS. Finally, the moderation effects of negative urgency, callous-unemotional traits, and intention to avoid aggressive behaviour on intervention effectiveness will also be examined. It is expected that the VHS will be less effective for participants with higher negative urgency or higher callous-unemotional traits and more effective for participants with stronger intentions to avoid aggressive behaviour.

4.2 Method

4.2.1 Participants

Ethical approval for this study was provided by the Ethics Committee of the Department of Psychology of the University of Sheffield. The protocol for this randomised controlled trial was registered at ClinicalTrials.gov with identifier NCT03693209.

A power analysis was conducted using the effect size for *action planning* on targeted interventions found in Chapter 2, which was $d = 1.09$. This power analysis indicated that, to test for a two-tailed hypothesis, a total sample size of 46 participants - 16 in each group - was needed to reach a power of 0.80 with an alpha of 0.05. As high attrition was expected due to the characteristics of the sample and the medium-term follow-up of 6 months, a sample of 100 participants at baseline was targeted.

Mainstream secondary schools and schools for children with social, emotional and mental health difficulties in Yorkshire (England) were contacted and invited to participate in

the study by letter and email. If the school expressed an interest in participating, a meeting was held with a member of the management team to explain the study in detail. After this process, nine schools (5 mainstream and 4 schools for children with social, emotional and mental health difficulties) confirmed their interest to participate in the study. Schools were asked to select the students between 10 and 17 years old that had shown behavioural problems in the past such as aggression or anger dysregulation.

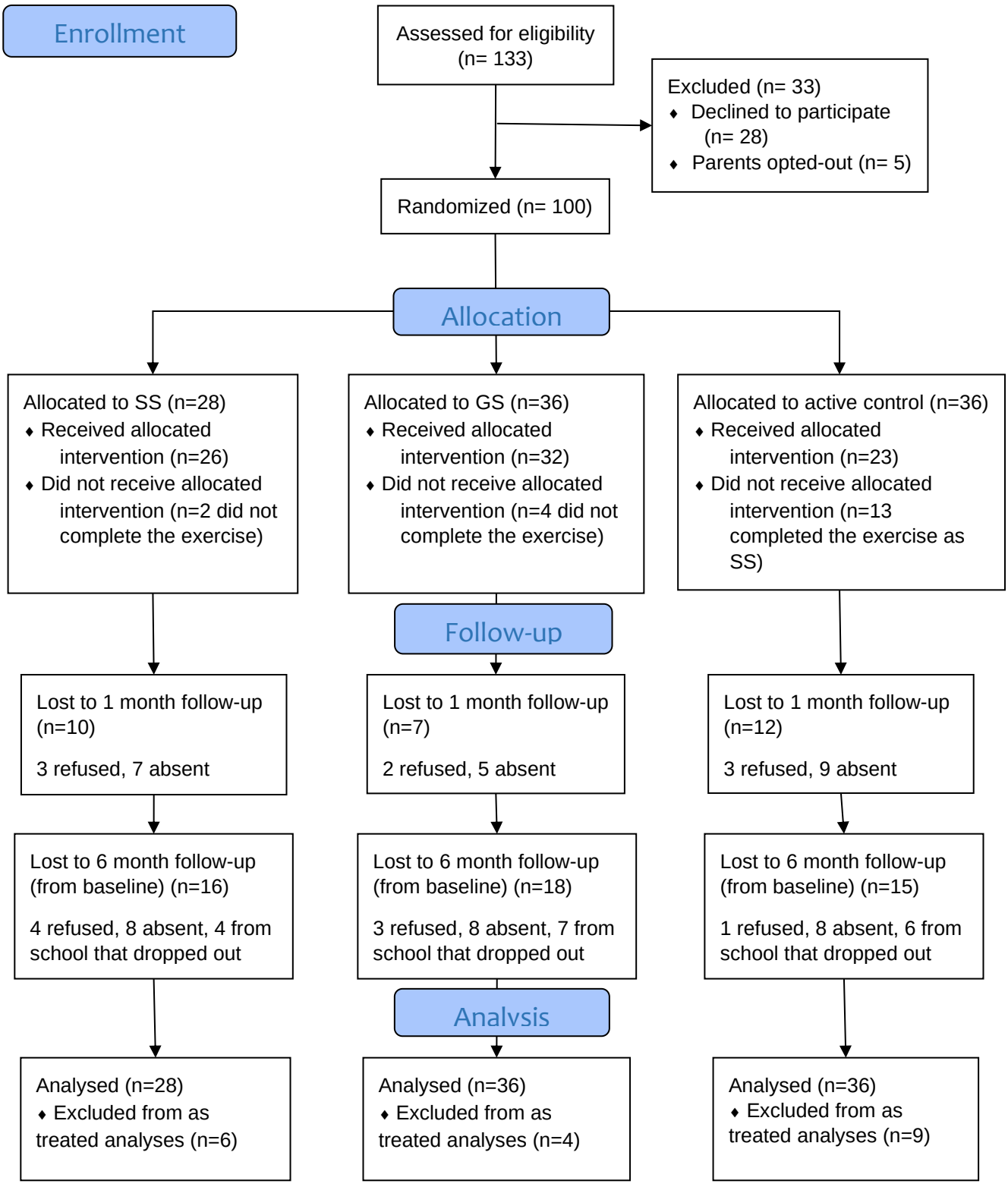
One hundred adolescents between ten and sixteen years old (M = 12.62, SD = 1.54) completed baseline measures and were randomised to one of the three conditions between September and December 2018. Thirty-six participants were assigned to the active control group and 28 and 36 to the specific situations and the generic situation VHS intervention groups respectively. Details for each condition are explained in Section 4.2.3.

Participants were on average from a low socioeconomic background. The mean Index of Multiple Deprivation was 2.63 (SD = 2.47) meaning that, on average, participants lived within the 27% most deprived households in England. Participants were mostly male (73.7% male, 25.4% female, 0.9% other). Sociodemographic characteristics by group at baseline are presented in Table 4.1.

At the one-month follow-up, there was a 71% response rate. At the six-month follow-up, retention was 51% of the baseline participants; a school dropping out of the study contributed to attrition at this stage. In total, there was 81% retention (i.e., participants who were randomised and completed at least one of the follow-up measures). Further details are presented in Figure 4.1.

Figure 4.1

CONSORT Flow Diagram



4.2.2 Measures

Sociodemographic data. A short survey asked for participants' age, gender and postcode. The postcode was used to find the Index of Multiple Deprivation (Ministry of Housing, Communities & Local Government, 2015).

Aggression. Self-reported and teacher-reported aggression was measured with the Peer Conflict Scale (Louisiana State University, 2019) at baseline and 1 and 6 months after intervention delivery. The Peer Conflict Scale is a measure of general aggression with four subscales that measure each combination of form (i.e., relational and overt) and function (i.e., reactive and proactive) of aggression. Each item is responded to on a 4-point Likert scale (1 = not at all true, 4 = definitely true) where higher scores represent higher aggression. We used the PCS –20 Item Version for Youth (PCS-20-Y; Russell, 2014) and the Peer Conflict Scale for Teachers[1].

The PCS-20-Y is a self-report measure with 20 items, 5 for each subscale (i.e., proactive overt, reactive overt, proactive relational and reactive relational). In this study at baseline, Cronbach's α for the total scale was .90 and .75, .85, .76 and .70 for each subscale, respectively, indicating good internal consistency. This measure has good convergent and discriminant validity (Pechorro et al., 2018).

Anger. Anger was measured with the Dimensions of Anger Reactions-5 (DAR-5; Hawthorne et al., 2006) at baseline and 1 and 6 months after intervention delivery. The DAR-5 is a brief measure composed of four anger response parameter items (i.e., frequency, intensity, duration and antagonism) and one social relationship impairment item. Participants are asked how often they have felt that way in the last four weeks, with responses ranging from 1 (None or almost none of the time) to 5 (All or almost all of the time) where higher

[1] Due to low response in both follow-ups (i.e., only 33 at 1-month follow-up and 21 at 6-months follow-up) and unequal response rate by condition, analyses were not conducted with this measure.

scores represent stronger anger reactions. Forbes et al. (2014) found that it was a reliable and valid measure of common anger reactions. The internal consistency in the present study was good (Cronbach's α = .84).

Nonviolent intentions. Intention to use nonviolent strategies to control anger and conflict was measured at baseline by the Violent Intentions scale from the Teen Conflict Survey (Dahlberg et al., 2005). This scale asks participants how likely they are to perform eight different behaviours (e.g., "Ignore the situation") the next time they find themselves really angry at someone or something. Responses range from 1 (very likely) to 4 (very unlikely). High scores indicate a stronger intention to use nonviolent strategies. The internal consistency in the present study was acceptable (Cronbach's α = .73).

Callous-unemotional traits. Participants' callous-unemotional traits were measured with the 12-item version of the Inventory of Callous-Unemotional Traits (ICU-12; Pechorro et al., 2017). It is composed of two subscales: Callousness (e.g., "I do not care if I get into trouble") and Uncaring (e.g., "I try not to hurt others' feelings"). All the items of the Uncaring subscale are reverse coded. Responses range from 1 (Not at all true) to 4 (Definitely true), with higher scores representing higher callous-unemotional traits. Previous studies have shown that the measure is valid and reliable (S. W. Hawes et al., 2014; Pechorro et al., 2017). The internal consistency in the current study for the total scale was below .7 (Cronbach's α = .63), but it was acceptable for each subscale (α = .70 for Callousness and .74 for Uncaring). Due to this reliability issue, moderator analyses were conducted with each subscale independently and not with the total score.

Negative urgency. Negative urgency was measured with the Negative Urgency subscale from the Short UPPS-P Impulsive Behavior Scale (SUPPS-P; Cyders et al., 2014). It is composed of 4 items (e.g., "When I am upset I often act without thinking") with responses

ranging from 1 (disagree strongly) to 4 (agree strongly). Higher scores represent higher negative urgency. Cyders et al. (2014) found that the SUPPS-P and each of its subscales had good psychometric properties. The internal consistency for the negative urgency subscale in the current study was good (Cronbach's α = .80).

4.2.3 Conditions and materials

Participants were randomly assigned to one of three different conditions: one active control condition and two intervention conditions: specific situations and generic situation. Participants assigned to the specific situations and generic situation conditions had to create implementation intentions for either specific situations or a generic situation. The materials provided for each condition are in Appendix F.

Participants in the generic situation condition received a VHS with one generic anger trigger (*If I get angry*) and the ten anger management strategies selected from Chapter 3 (e.g., *then I'll calm myself down*; see Section F.2). They were asked to link the generic trigger with any of the strategies that they considered that they could use by drawing a line between them. In addition, they were asked to write down the most relevant plan. Example plans such as *If I get angry, then I'll avoid putting myself in that situation again in the future* were provided.

Participants in the specific situations condition received the complete VHS developed in Chapter 3 (see Section F.1) with a list of ten anger triggers phrased as IF statements (e.g., *If I get angry when I am accused of something that I didn't do*) and a list of ten anger management strategies phrased as THEN statements (e.g., *then I'll calm myself down*). They were asked to link situations that they believed could trigger their anger with a strategy that they could use to deal with that situation by drawing a line between them. In addition, they were asked to choose the most relevant plan for them and write it down. Example plans were

provided such as *If I get angry when I am criticised in front of other people for something that I have done, then I'll walk away*.

Participants in the active control condition received the same material as participants in the specific situations condition but with different instructions (see Section F.3). They were asked to select all the situations in which they might get angry first and then all the strategies they considered they could use to deal with their anger. They were also asked to write down other situations in which they might get angry. Therefore, they did not link anger triggers to anger management situations and were not prompted to make plans. The similarity of the control condition material to the intervention conditions had the purpose of blinding participants to allocation and has been used in previous studies implementing a VHS (Armitage et al., 2016).

It was decided to implement the VHS only in one occasion to avoid attrition as long term interventions increase the likelihood of non-completion of intervention. In addition, some teachers suggested to display the plans made in the class or to ask the young people to keep their plans to remind the participants of their plans. However, the researchers considered that both of those options would increase the likelihood of contamination of the control group.

4.2.4 Procedure

As in the study reported in Chapter 3, each school sent information sheets and opt-out forms to the carers of the students selected. In addition, meetings were held with the teachers to explain what the study would entail and to ask for their collaboration in both completing the teacher reports and helping the researcher during the data collection and intervention process. Teachers knew which students were participating in the study but were blinded to student allocation.

The researcher met the participants either one-on-one or in small groups during school hours. The size of the groups varied according to school preferences and room availability. Then, the researcher explained the study and elicited participant assent before presenting the baseline survey. They were asked whether they would like to read it by themselves or they wanted the researcher to read the instructions and items aloud. This method was used to deal with possible literacy problems, which are related to aggression and behavioural problems (Davis et al., 1999). The researcher did as preferred by the participants.

After the survey was finished, participants were randomly assigned to condition. Randomization was done with a list of random numbers produced by random.org. The list was composed of numbers 1, 2, and 3, each of them referring to a condition. Materials were ordered in a pile according to the list of random numbers before meeting the participants. Each participant was asked to take the sheet on top of the pile and to complete the exercise on it. The researcher explained the instructions if needed.

Despite the written and oral instructions provided, 19% of the participants did not complete the exercise they were assigned. As can be seen in Figure 4.1, 9% of the participants assigned to an intervention group did not link a trigger with a strategy or make any plans, and 36% of the participants assigned to the control group linked triggers to strategies making plans as if they were in the specific situations condition. These issues were likely due to contamination of participants completing different conditions in the same room.

The researcher went back to the schools twice to collect follow-up measures. The first follow-up was collected approximately one month after the intervention (M = 5.93 weeks, SD = 1.57). The second follow-up was collected approximately six months after the intervention (M = 26.82 weeks, SD = 0.95). A similar procedure to the baseline survey was used.

4.2.5 Analysis

Exploration of the data showed that most outcomes were non-normally distributed and had extreme outliers. Therefore, robust analyses were conducted when available following Field and Wilcox's (2017) recommendation. First, one-way ANOVAs based on trimmed means and bootstrapping were used to conduct randomization checks using the package WRS2 (Mair & Wilcox, 2020) for the R environment (R Core Team, 2019).

It is necessary to establish the efficacy - i.e., the maximum effect in ideal conditions - of an intervention before establishing its effectiveness - i.e., the effect in real conditions - (Armijo-Olivo et al., 2009). Therefore, complete case analyses were conducted to establish the efficacy of the VHS as recommended by Armijo-Olivo et al. (2009), as that was the main aim of the study. An as-treated strategy was used, meaning that each participant was analysed according to the intervention they received, and not to the intervention they were assigned to. As treated analyses were chosen as 19% of participants received a different intervention than the one they were assigned to.

Many authors recommend conducting and reporting intention to treat analyses as well as complete case analysis when reporting the results of randomised controlled trials (Jakobsen et al., 2017; Moher et al., 2010; Ranganathan et al., 2016). Therefore, intention to treat analyses were also conducted and reported. In the intention to treat analyses, all the randomised participants were included in the group they were assigned to, even if they abandoned the study or did not follow the protocol.

To conduct intention to treat analyses, missing data was imputed. Only missing data from baseline, first follow-up and the moderators were imputed and used for intention to treat analyses. More than 50% of the data was missing for the second follow-up and imputation is not recommended when more than 40% of data is missing (Jakobsen et al., 2017). The MICE

package (Buuren & Groothuis-Oudshoorn, 2011) for the R environment was used to conduct multiple imputations of the missing data. Item-level imputation could not be conducted due to the small sample size and the large number of variables. Therefore, each item was imputed using as predictors the other items in the same subscale, the sum scores of other subscales and the demographic variables as recommended by Plumpton et al. (2016). The assigned treatment was also used as a predictor. Following that procedure, 20 complete datasets were imputed as recommended for 30% of missing data by Graham et al. (2007).

ANCOVA is recommended to test the effect of an intervention in a pre-post randomised trial (O Connell et al., 2017). However, the robust ANCOVA of package WRS2 only allows two conditions and one covariate. Therefore, parametric ANCOVAs using type III sums of squares and Helmert contrasts were conducted following Field et al. (2012). Then, robust ANCOVAs based on trimmed means were conducted as a sensitivity analysis as recommended by Field and Wilcox (2017). For the parametric ANCOVAs, condition was included as an independent variable with three levels and baseline scores and sociodemographic variables were specified as covariates. Separate ANCOVAs for each outcome and each follow-up were conducted to maximise the use of the available data. Effect sizes were calculated using Morris' (2008) formula, which takes into account baseline and follow-up scores. If any ANCOVA predicting aggression or anger was significant, a robust mediation analysis based on bootstrap samples with anger as the mediator between condition and aggression was conducted using the WRS2 package for the R environment.

Robust moderation models based on M-estimators were fitted using the package MASS (Venables, 2002) for the R Environment as recommended by Mair and Wilcox (2020). Moderator analyses tested whether intentions at baseline, callous-unemotional traits and negative urgency moderated the relationships between condition and follow-up outcomes including baseline scores as a covariate. Conditions were dummy coded with the specific

situations condition as the reference category. Where the interaction between any of the dummy variables and any of the moderators was significant, simple slopes using one standard deviation above and below the mean of the moderator were fitted to investigate the interaction further.

For the intention to treat analyses, the pool function of the MICE package was used when possible to obtain only one estimate. When this was not possible, the analyses were conducted in each imputed dataset and the range of estimates is presented in the text. If the analysis was significant in more than half of the datasets, it was interpreted as a significant effect.

4.3 Results

4.3.1 Randomization and attrition checks

In order to check if the randomisation was successful, robust one-way ANOVAs comparing the specific situations, the generic situations and the control groups were conducted with sociodemographic data and each measure at baseline as dependent variables. None of the analyses were significant. Detailed results are presented in Table 4.1. These analyses were repeated with groups defined as treated. No differences were found.

Details of attrition in each condition can be seen in Figure 4.1. The difference between conditions was not significant at the first ($\chi^2 = 2.54$; $p = .28$) or at the second follow-up ($\chi^2 = 1.53$; $p = .47$). Robust t-tests based on trimmed means were conducted to compare participants who did not complete any follow-up to participants that completed at least one follow-up in sociodemographic variables and baseline scores. Results can be found in Table 4.2. Participants that dropped out were significantly older. No other differences were found.

Table 4.1

Demographics and Baseline Data per Assigned Group and Randomisation Checks

	SS (*n* = 28)	GS (*n* = 36)	AC (*n* = 36)	F-ratio (df)[a]
Age	12.89 (1.53)	12.35 (1.65)	12.67 (1.67)	0.92 (2,36)
Gender (% male)	55.6 %	70.6 %	77.8%	5.73[b]
IMD	2.86 (2.89)	2.17 (1.79)	2.81 (2.82)	0.14 (2,23)
Anger	17.08 (5.27)	15.47 (5.57)	14.91 (5.04)	1.90 (2,35)
Aggression	31.74 (8.19)	34.41 (12.57)	31.70 (9.34)	0.32 (2,36)
Reactive relational	7.41 (2.68)	7.50 (3.17)	7.30 (2.17)	0.16 (2,35)
Proactive relational	6.67 (2.08)	7.65 (3.27)	7.53 (3.15)	0.86 (2,39)
Reactive overt	10.89 (3.83)	10.94 (4.64)	10.21 (4.28)	0.22 (2,37)
Proactive overt	6.78 (1.78)	7.97 (3.51)	7.71 (3.26)	0.58 (2,38)
Intentions	16.19 (4.07)	17.03 (5.55)	17.09 (4.96)	0.43 (2,37)
Negative urgency	11.56 (3.50)	10.15 (3.55)	9.04 (3.29)	2.31 (2,26)
Callous	13.06 (4.01)	12.37 (4.01)	12.96 (4.62)	0.36 (2,21)
Uncaring	12.06 (3.73)	13.59 (3.42)	14.16 (3.61)	3.09 (2,24)

Note. All variable except gender are represented with M (SD). SS = Specific situations; GS = Generic situation; AC = Active Control; df = degrees of freedom; IMD = Index of Multiple Deprivation

[a] Robust one-way ANOVAs based in bootstrapping; [b] Chi squared test

Two-way between participants ANOVAs comparing trimmed means with condition and attrition as independent variables showed that people that dropped out from each condition were not different on any baseline variables. All the interactions between condition and completion of follow-up were nonsignificant (*F* range [0.13, 2.86]).

4.3.2 As treated analyses

Main effects of condition. Descriptive statistics for each condition at follow-up can be found in Table 4.3. There were no significant differences by condition at either follow-up point in anger, total aggression or in any of the aggression subscales in the robust ANCOVAs. The parametric ANCOVA showed a significant main effect of condition on anger at 6-months follow-up. Tukey post hoc analyses showed that there was a difference

Table 4.2

Attrition Checks

	Dropped out after baseline (n = 19)	Completed at least one follow-up (n = 81)	Test
Age	13.47 (1.87)	12.41 (1.50)	t (23.95) = 2.36, p = .035
Gender (% male)	68.4 %	69.2%	χ^2 (2) = 0.27, p = .875
IMD	2.13 (1.89)	2.75 (2.68)	t (69) = 0.65, p = .534
Anger	14.83 (5.02)	15.92 (5.38)	t (91) = 0.52, p = .575
Aggression	29.83 (8.62)	33.34 (10.56)	t (90) = 1.08, p = .244
Reactive relational	6.68 (1.63)	7.59 (2.87)	t (92) = 0.68, p = .473
Proactive relational	6.53 (2.25)	7.53 (3.07)	t (93) = 1.13, p = .216
Reactive overt	9.61 (4.07)	10.91 (4.28)	t (91) = 0.84, p = .385
Proactive overt	6.83 (1.82)	7.70 (3.23)	t (92) = 0.49, p = .608
Intentions	17.47 (4.81)	16.64 (4.95)	t (91) = 0.95, p = .308
Negative urgency	13.00 (4.24)	10.04 (3.51)	t (67) = 0.57, p = .493
Callous	16.00 (1.41)	12.64 (4.20)	t (64) = 2.33, p = .147
Uncaring	12.00 (8.49)	13.44 (3.51)	t (1.01) = 0.15, p = .503

Note. All variables except gender are represented with *M* (*SD*). IMD = Index of multiple deprivation

between the specific situations and the generic situation conditions adjusted means (t = 2.95, p = .018), where participants who had completed the specific situations condition had less anger at the 6-months follow-up (Adjusted M = 9.40) than participants who had completed the generic situation condition (Adjusted M = 14.51). These findings were confirmed by a robust ANCOVA (F = 2.65, p = 0.03) including only the generic situation and specific situations conditions. Full results for the parametric ANCOVAs including effect sizes are presented in Table 4.4. Mediation analyses were not conducted as none of the effects on aggression were significant.

Moderation effects. *Callousness.* As can be seen in Table G1, callousness was not a significant moderator of the effects of condition on anger, total aggression or reactive relational aggression at any of the follow ups. It was also not a significant moderator for

Table 4.3

Descriptive Statistics (M (SD)) per Group as Treated at Each Follow-up

Outcome	1-month follow-up			6-months follow-up		
	SS (n = 25)	GS (n = 25)	AC (n = 20)	SS (n = 16)	GS (n = 16)	AC (n = 18)
Anger	15.24 (5.63)	13.13 (5.13)	14.80 (3.91)	11.00 (5.79)	15.00 (5.13)	13.78 (4.32)
Aggression	29.05 (7.56)	29.43 (8.21)	32.42 (9.09)	27.47 (7.96)	29.53 (10.25)	31.94 (12.09)
RR	6.83 (2.43)	7.08 (2.86)	7.65 (2.72)	7.00 (2.78)	7.25 (3.82)	7.63 (3.22)
PR	6.48 (1.76)	6.58 (2.47)	7.26 (2.47)	6.69 (2.02)	6.81 (2.69)	7.29 (2.54)
RO	8.67 (2.79)	9.09 (3.57)	9.85 (2.80)	8.40 (3.94)	9.69 (3.94)	9.47 (3.66)
PO	7.00 (2.09)	6.95 (2.32)	7.70 (2.64)	6.40 (2.61)	6.47 (1.92)	7.35 (3.89)

Note. SS = Specific situations; GS = Generic situation; AC = Active Control; RR = Reactive Relational aggression; PR = Proactive Relational aggression; RO = Reactive Overt aggression; PO = Proactive Overt aggression

proactive overt aggression at the 1 month follow up or for reactive overt aggression and proactive relational aggression at the 6 months follow up.

Callousness was, however, a significant moderator of the effect of condition on reactive overt aggression and proactive relational aggression at 1-month follow-up and on proactive overt aggression at the 6 months follow-up. Interactions and simple slopes for the significant moderator effects are detailed in Table 4.5.

At the 1-month follow-up, when callousness was high or average, participants that completed the specific situations VHS had lower reactive overt aggression than participants in the control group. They also had lower reactive overt aggression than participants that completed the generic situation VHS when callousness was high.

In addition, when callousness was high, participants in the specific situations condition had lower proactive relational aggression than participants in the control group. The lack of interaction between callousness and the generic situation dummy variable

Table 4.4

ANCOVA and Effect Sizes for Each Outcome at Each Follow-up

Outcome	1 month					6 months				
	F	df	*p*-value	Cohen's *d* (95% confidence interval)[a]		F	df	*p*-value	Cohen's *d* (95% confidence interval)[a]	
				Specific situations	Generic situation				Specific situations	Generic situation
Anger	0.69	2,38	.509	-0.29 (-0.93, 0.35)	-0.48 (-1.15, 0.20)	4.85	2,26	.016	-0.89 (-1.55, -0.22)	0.06 (-0.61, 0.72)
Aggression	1.01	2,35	.374	-0.48 (-1.13, 0.17)	-0.57 (-1.25, 0.11)	0.64	2,24	.534	-0.60 (-1.26, 0.05)	-0.52 (-1.19, 0.16)
Reactive relational	1.40	2,39	.260	-0.65 (-1.30, -0.01)	-0.47 (-1.13, 0.19)	0.09	2,25	.916	-0.58 (-1.22, 0.07)	-0.40 (-1.06, 0.26)
Proactive relational	0.29	2,39	.749	0.03 (-0.60, 0.65)	-0.17 (-0.81, 0.48)	0.73	2,26	.490	0.09 (-0.53, 0.72)	-0.11 (-0.75, 0.54)
Reactive overt	1.80	2,38	.180	-0.43 (-1.06, 0.21)	-0.44 (-1.11, 0.22)	2.15	2,26	.137	-0.40 (-1.04, 0.24)	-0.23 (-0.89, 0.43)
Proactive overt	0.34	2,38	.710	0.01 (-0.62, 0.64)	-0.32 (-0.98, 0.34)	0.28	2,25	.759	-0.09 (-0.72, 0.54)	-0.39 (-1.05, 0.27)

Note. Analyses were controlled by baseline scores, age, gender and index of multiple deprivation; df = degrees of freedom

[a] Negative effect sizes favour the intervention group.

Table 4.5

Moderation Effects of Callousness

Outcome	Dummy variable[a]	Interaction		Simple slopes			
		t-value	*p*-value	Level of callousness[b]	*B*	*t*-value	*p*-value
1-month follow-up (df = 50)							
Reactive overt aggression	Active Control	1.07	.289	high	2.71*	2.40	.020
				average	1.86*	2.35	.023
				low	1.01	0.90	.372
	Generic Situation	2.52*	.015	high	3.39*	2.85	.006
				average	1.32	1.64	.108
				low	-0.76	0.68	.500
Proactive relational aggression	Active Control	3.87*	< .001	high	2.06*	3.80	< .001
				average	0.63	1.66	.103
				low	-0.79	1.52	.135
	Generic Situation	0.20	.842	high	-0.06	0.10	.921
				average	-0.13	0.36	.720
				low	-0.21	0.4	.691
6-months follow-up (df = 30)							
Proactive overt aggression	Active Control	3.12*	.004	high	2.38*	2.94	.006
				average	0.69	1.16	.255
				low	-1.00	1.24	.225
	Generic Situation	0.89	.381	high	0.67	0.74	.465
				average	0.11	0.17	.866
				low	-0.45	0.5	.621

Note. Analyses were controlled by baseline scores; df = degrees of freedom

[a] Specific situations was used as the reference category.

[b] High and low callousness represent one standard deviation above and below the mean, respectively.

* p < .05

indicated that participants that completed the generic situation VHS also had lower proactive relational aggression than participants in the control group.

At the 6-months follow-up, when callousness was high, participants in the specific situations condition had lower levels of proactive overt aggression than participants in the control group. The interaction with the generic situation condition dummy variable was not significant, indicating that participants in the generic situation conditions had also lower proactive overt aggression than control participants when callousness was high.

Uncaring. As can be seen in Table G2, uncaring was not a significant moderator of the effect of condition at any follow-up on total aggression, reactive overt aggression, proactive overt aggression or proactive relational aggression. In addition, it was not a significant moderation at the 1 month follow-up on anger or at the 6 months follow up on reactive relational aggression. Uncaring was, however, a significant moderator of the effect of condition on reactive relational aggression at the 1-month follow-up and on anger 6 months after the intervention. The interactions and simple slope analyses for the significant moderation effects can be seen in Table 4.6.

When uncaring was high at baseline, the specific situations group had lower reactive relational aggression than the control group one month after the intervention and lower levels of anger 6 months after the intervention. None of the interactions with the generic situation dummy variable were significant. This indicated that participants that completed the generic situation VHS also had lower reactive relational aggression than the control group one month after the intervention and lower anger at the 6-months follow-up when uncaring was high.

*Negative urgency***.** As can be seen in Table G3, negative urgency was not a significant moderator of the effect of condition at any follow-up on total aggression, reactive overt aggression, proactive overt aggression and proactive relational aggression. In addition, it was not a significant moderator for anger at the 1-month follow-up and for reactive relational aggression at the 6 months follow-up. Negative urgency was, however, a significant

Table 4.6

Moderation Effects of Uncaring

Outcome	Dummy variable[a]	Interaction		Simple slopes			
		t-value	*p*-value	Level of uncaring[b]	*B*	*t*-value	*p*-value
1-month follow-up (df = 54)							
Reactive relational aggression	Active control	2.51*	.015	high	2.46*	3.10	.003
				average	1.10	1.95	.056
				low	-0.27	0.35	.728
	Generic situation	1.60	.115	high	1.11	1.36	.179
				average	0.15	0.28	.781
				low	-0.81	1.01	.317
6-months follow-up (df = 30)							
Anger	Active control	2.48*	.019	high	5.68*	2.36	.025
				average	1.81	1.01	.321
				low	-2.05	0.88	.386
	Generic situation	1.76	.089	high	4.62	1.82	.079
				average	1.51	0.78	.442
				low	-1.60	0.59	.560

Note. Analyses were controlled by baseline scores; df = degrees of freedom

[a] Specific situations was used as the reference category.

[b] High and low uncaring represent one standard deviation above and below the mean, respectively.

* p < .05

moderation of the effect of condition on reactive relational aggression at the 1-month follow-up and on anger at the 6 months follow up. The details for the significant moderation effects are presented in Table 4.7.

At 1-month follow-up, when negative urgency was low or average at baseline, participants in the specific situations condition had lower reactive relational aggression than participants in the control group. The interaction between negative urgency and the generic situation dummy variable was not significant, indicating that participants that completed

generic situation VHS also had lower reactive relational aggression than the control group when negative urgency was low or average.

Table 4.7

Moderation Effects of Negative Urgency (NU)

Outcome	Dummy variable[a]	Interaction		Simple slopes			
		t-value	*p*-value	Level of NU[b]	*B*	*t*-value	*p*-value
1-month follow-up (df = 53)							
Reactive relational aggression	Active control	2.76	.008	high	-0.23	0.32	.750
				average	1.19*	2.37	.021
				low	2.60*	3.59	< .001
	Generic situation	0.89	.377	high	-0.10	0.15	.881
				average	0.35	0.72	.475
				low	0.80	1.11	.272
6-months follow-up (df = 28)							
Anger	Active control	3.48	.002	high	-4.76	1.89	.069
				average	0.75	0.46	.649
				low	6.27*	3.11	.004
	Generic situation	3.38	.002	high	-5.15	1.87	.072
				average	0.82	0.46	.649
				low	6.80*	3.02	.005

Note. Analyses were controlled by baseline scores; df = degrees of freedom

[a] The specific situations condition was used as the reference category.

[b] High and low NU represent one standard deviation above and below the mean, respectively.

* p < .05

Six months after the intervention, when negative urgency was low at baseline, participants in the specific situations condition had lower levels of anger than participants in the generic situation condition and the control group.

Intentions. Intentions to use nonviolent strategies did not moderate the relationship between the conditions and any outcome. All the interactions can be found in Table G4.

4.3.3 Intention to treat analyses

Main effects of condition. Both robust and parametric ANCOVAs were conducted for each outcome in each of the 20 datasets. There were no significant differences by condition in anger, total aggression or in any of the aggression subscales. Mediation analyses were not conducted as none of the ANCOVAs were significant.

Moderation effects. Uncaring, intentions and negative urgency did not moderate the relationship between the assigned condition and any of the outcomes. Callousness was a significant moderator of the effect of condition on total aggression, with a significant interaction with the control group dummy variable ($t(93) = 2.29$, $p = .024$). When callousness was low, participants assigned to the specific situations condition had higher total aggression than participants assigned to the control group at 1-month follow-up in 16 datasets (*B* range [-21.80, -10.78]). The same effect was found when callousness was average in 15 datasets (*B* range [-16.46, -8.00]) and when callousness was high in 12 datasets (*B* range [-11.66, -4.95]). The absence of an interaction with the generic situation dummy variable ($t(93) = 1.40$, $p = .166$) indicated that the specific situations and the generic situation condition had the same effect.

Callousness also moderated the effect of condition on proactive overt aggression ($t(93) = 2.02$, $p = .046$) and on proactive relational aggression ($t(93) = 2.32$, $p = .023$). When callousness was low, participants assigned to the specific situations condition had higher proactive overt aggression (*B* range [-5.83, -1.50]) and higher proactive relational aggression (*B* range [-6.21, -2.24]) than participants assigned to the control group at 1-month follow-up in 11 and 17 datasets, respectively. The same effect was found when callousness was average in 8 datasets for proactive overt aggression (*B* range [-4.26, -1.10]) and in 16 datasets for proactive relational aggression (*B* range [-4.62, -1.66]). At high levels of callousness, an effect was found on proactive overt aggression only in 5 datasets (*B* range [-2.70, -0.69]). For

proactive relational aggression, the effect was found in 14 datasets (*B* range [-3.03, -0.82]). The interaction with the generic situation dummy variable was not significant for proactive overt aggression ($t(93) = 1.07$, $p = .289$) or proactive relational aggression ($t(93) = 0.40$, $p = .689$), indicating that the specific situations and the generic situation conditions had the same effect on those outcomes.

4.4 Discussion

The study aim was to test the effect of the BCT *action planning* on its own to reduce aggression among adolescents at risk of aggressive behaviours (i.e., as a targeted intervention). A VHS to prompt the use of anger management strategies when anger triggers were encountered was used as the method to deliver *action planning*. The results showed that *action planning* did not have a generalized effect on any type of aggression. However, the effect sizes' 95% confidence intervals (see Table 4.4) were compatible with a large effect similar to the one found in Chapter 2 ($d = 1.09$). The intervals were quite large, indicating that the study was underpowered to detect the effect. The average effect sizes found in this study were smaller than expected. For $d = 0.60$, which is the largest effect size found for total aggression, a sample size of 138 would have been needed to achieve a power of 0.80. This could explain the lack of significant results. However, a replication of the present study with a larger sample is needed to estimate the effect more precisely.

It is also possible that the large effect size found in the meta-analysis reported in Chapter 2 is due to the combination of *action planning* with other BCTs. It is plausible that the interaction between BCTs inflated the estimated effect size. All the reviewed targeted interventions that included *action planning* also included other BCTs such as *behavioural practice* and *information about antecedents* (see Appendix A). Özabacı (2011) found that behavioural training, including *behavioural practice* among others techniques, was the most

effective component of targeted interventions. Therefore, the combination of *action planning* and *behavioural practice* should be investigated in the future.

Despite the issues described, the effect size found was medium to large following the mean effect size found by Gollwitzer and Sheeran (2006) in their meta-analysis of ninety-four studies using implementation intentions (d = 0.65). This suggests that, to conduct a priori power analysis, it would be more helpful to use the effect size found in a meta-analysis with focus on the specific type of intervention. In any case, the recommendation for future studies is to use the most conservative effect size for priori power analysis.

4.4.1 Moderation effects

Despite the lack of a general effect, several moderation effects were found indicating that the VHS was effective for some participants. The results of the analyses as treated showed that, after one month, both VHS were similarly effective compared to a control group on reducing proactive relational aggression when callousness was high, and on reducing reactive relational aggression when uncaring was high or when negative urgency was low or average. In addition, completing a VHS with specific anger triggers reduced reactive overt aggression one month after the intervention when callousness was average.

After 6 months, as treated analyses showed that both VHS were effective in reducing proactive overt aggression when callousness was high, and on reducing anger when uncaring was high. The VHS with specific situations was more effective than the VHS with generic situations in reducing anger, especially when negative urgency was low. However, no strong conclusions can be taken about the effects on the second follow-up as attrition was over 50% (Jakobsen et al., 2017). If future studies show similar results, it would mean that VHS is a very cost-effective intervention for adolescents with high callous-unemotional traits and low negative urgency, as it needs little time and few resources to be implemented.

Even if the positive effects are confirmed by future studies, any practitioner that wants to implement this VHS needs to be careful, as the intention to treat analyses showed some negative effects. In more than half of the imputed datasets, participants in both intervention groups had higher proactive relational aggression, proactive overt aggression and total aggression than participants in the control group after one month, especially when callousness was low. These negative effects were reduced when callousness increased. Therefore, if these effects are replicable, practitioners should evaluate the level of callousness, and if it is low, refrain from implementing this form of VHS intervention, especially if the behaviour they want to prevent is proactive aggression.

The moderator effects of callousness and uncaring were contrary to expectations, as it was hypothesised that interventions would be more effective for participants with low callous-unemotional traits. However, the intervention had negative effects when callousness was low according to the intention to treat analyses and positive effects when callousness and uncaring were high according to the analyses as treated. These unexpected results might mean that forming implementation intentions is a good technique to reduce aggression in adolescents with high callous-unemotional traits. Previous research that found that young people with callous-unemotional traits were unresponsive to treatment focused on family interventions (D. J. Hawes et al., 2014). Wilkinson et al. (2016) found that when the interventions included components that were aimed directly at the young person and not at their family, the young people with high callous-unemotional traits were often as responsive or more than their counterparts with low callous-unemotional traits. Moreover, Dadds et al. (2012) found that young people with high callous-unemotional traits responded better to Emotion Recognition Training than to Integrative Family Intervention. This previous research together with our results indicates that effective interventions for adolescents with high callous-unemotional traits need to address them directly instead of their families.

Besides, it is possible that the present intervention is especially effective for adolescents with high callous-unemotional traits due to its focus on anger management as previous research has found that adolescents with high callous-unemotional traits have deficits in emotion regulation (Ciucci et al., 2015).

It was hypothesised that the VHS would not reduce reactive aggression for adolescents with high negative urgency. The results supported that hypothesis, as the VHS did not have an effect on reactive overt or reactive relational aggression when negative urgency was high. In other words, the VHS was not effective for participants with a tendency to act impulsively when angry. This is consistent with Burkard et al. (2013), who found that implementation intentions were not effective for people with high urgency that were emotionally activated. On the other side, it was expected that the VHS would be effective when negative urgency was low. This was also supported by the results, as both VHS were effective in reducing reactive relational aggression at the 1-month follow-up and, after 6 months, the specific situations condition was effective in reducing anger.

Contrary to predictions, intentions to avoid violent strategies did not moderate the effect of condition in any outcome. It is possible that it is not intention itself that moderates the effect of implementation intentions, but the stability of intention. Godin et al. (2010) found that implementation intentions to increase physical activity were not effective on participants with stable intentions to change (i.e. participants that before the intervention had high or low intentions stably along several measurements). It was effective only for participants with unstable intentions (i.e., participants whose intention to change fluctuated from low intentions to high intentions or vice versa before the intervention). It is plausible that people with stable high intentions to change make changes regardless of whether they receive implementation intentions or not, while people with unstable intentions might need an

intervention such as implementation intentions to start making changes. Future studies should measure intention stability to test whether that is the case for aggression.

4.4.2 Specific vs generic anger triggers

Another aim of the study was to explore whether a VHS with specific anger triggers and a VHS with a generic trigger had different effectiveness. There were two situations when making plans for specific triggers was more effective than making plans for a generic trigger. When callousness was average, making plans for the specific anger triggers was more effective in reducing reactive overt aggression in the short term. Making plans for specific triggers was also more effective in reducing anger when negative urgency was low six months after the intervention than planning for a general trigger. Therefore, when there was a difference between the VHS approaches, the VHS that used specific anger triggers was more effective. This follows both Gollwitzer and Sheeran's (2006) conclusions and Michie et al.'s (2014) definition of *action planning*. They both agreed that the context in which the behaviour is to be performed needs to be specified for it to be effective.

4.4.3 Limitations and future directions

A further moderator of effectiveness that was not measured in this study is whether the participants implemented the plans after they made it. In implementation intentions, it is assumed that after forming the plans, the actions (THEN statements) are automatically performed in the appearance of the situation (IF statements; Gollwitzer & Sheeran, 2006). However, it is plausible that the plan is automated after a single time using the VHS only for some people and not for others, which would explain the different effects for different types of adolescents. To explore this, it is encouraged that future studies include in the follow-up a measurement of use of the action plans after the intervention.

One of the main strengths of the study was the randomization of participants to conditions. However, 19% of participants did not follow the instructions and made plans when they were not asked to or did not make plans when they were asked to. This raised the question of whether the intention to treat analyses were relevant to evaluate the efficacy of the intervention. To overcome that limitation, as treated analyses were conducted in addition to the intention to treat analyses. Comparison of groups as treated at baseline showed that there were no differences between them. As treated analyses, although often criticised for increasing Type I error and overestimating the effect, show the maximum treatment efficacy (Armijo-Olivo et al., 2009; Ranganathan et al., 2016).

Intention to treat analyses were conducted as recommended by the Consolidated Standards of Reporting Trials (Moher et al., 2010). However, due to the high attrition, a lot of data needed to be imputed. It has been argued in previous studies that the estimation of treatment effect with intention to treat analyses when more than 20% of the data is imputed is not accurate (Armijo-Olivo et al., 2009). In this study, the conclusion reached from the intention to treat analyses complemented the results from the as-treated analyses. As treated analyses indicated that the intervention was effective when callous-unemotional traits were high but, according to the intention to treat analyses, it had a negative effect when callous-unemotional traits were low. However, although complementary, the results were different. Therefore, future studies are needed to clarify the nature of the effect of the VHS on aggression, especially at different levels of callousness, before its use in practice can be recommended.

4.4.4 Conclusion

Although it was effective in some circumstances, the results of this study indicated that the BCT *action planning* was not generally effective on its own to reduce aggression in adolescents at risk of displaying aggression. Future studies need to investigate its effect in

combination with other BCTs. In the targeted interventions reviewed in Chapter 2, *action planning* was always combined with *behavioural practice* and very often combined with *information about antecedents.* Therefore, future studies should disentangle the effect that each of these BCTs has in combination to identify the minimum number of BCTs needed for a targeted intervention to be effective.

In Chapter 5, a similar approach to the one used in this chapter is used to test the effect of a standalone BCT on a universal intervention. The objective is to evaluate whether a universal intervention using only one BCT is effective to reduce aggression. The BCT *problem solving* is tested as it was one of the most effective BCTs for universal interventions in Chapter 2.

Chapter 5. Does problem solving prevent aggression in the adolescent general population? A randomised controlled trial

5.1 Introduction

In this chapter, the effect of a brief universal intervention (i.e., addressed to the general adolescent population) using only one BCT is explored. In the Chapter 2 meta-analysis, it was found that a model including the *behavioural practice* and the *problem solving* BCTs predicted the effect of universal interventions on aggressive behaviour. However, it was difficult to extract their independent effects, as all intervention including *behavioural practice* also included at least three other BCTs and most interventions (92%) including *problem solving* also included *behavioural practice*. Initially, a three-arm design was considered for the present study: a control group, an only *problem solving* condition and a *problem solving + behavioural practice* condition. However, a priori power analysis was conducted for that design and over a thousand participants were needed to achieve 80% power. This recruitment did not seem achievable in the remaining time frame with the resources available. Therefore, only the control condition and the problem solving condition were included in the final design of the study presented in this Chapter.

A review of social problem-solving interventions showed that they are effective to reduce aggressive behaviours in adolescents, especially when they are addressed to the general population (Merrill et al., 2017). However, when looking closely at the interventions included in that review, the same problem arises, as it is not clear if the *problem solving* BCT is what makes social problem-solving interventions effective, as all the included interventions also included *behavioural practice* or other BCTs. Therefore, the main aim of this study is to test whether an intervention including only the BCT *problem solving* is effective in reducing aggressive behaviour among adolescents.

Michie et al. (2014) defined problem-solving as "analyse, or prompt the person to analyse, factors influencing the behaviour and generate or select strategies that include overcoming barriers and/or increasing facilitators" (p. 259). This definition aligns with the first four steps of social problem solving (Merrill et al., 2017): identifying the problem, defining the problem, generating different solutions for the problem, and selecting the best solution. These four steps correspond to the problem-solving process in the social problem-solving model, which has been argued to need a different set of skills that the solution implementation process (D'Zurilla et al., 2004). The final two social problem-solving steps (i.e., enacting the chosen solution and assessing the outcome), which form the solution implementation process, would correspond to other BCTs such as *behavioural experiments*. Therefore, the intervention evaluated in this chapter encourages participants to enact the four first steps already mentioned in situations of interpersonal conflict, which, as seen in Chapter 3, are the most encountered anger triggers.

5.1.1 Mediation and moderation

The brief problem-solving intervention implemented in the present study is expected to improve problem-solving skills, which will lead to better-chosen solutions to conflict and, therefore, reduce aggressive behaviour. Therefore, problem-solving skills are expected to be a mediator of the intervention effect on aggression. This mechanism was found in other interventions to reduce aggression (e.g., Guerra & Slaby, 1990). Furthermore, Merril et al. (2017) emphasised the need to measure the change in problem solving skills to identify the mechanisms that make social problem solving interventions effective.

In addition, callous-unemotional traits are expected to moderate effectiveness. As discussed in Section 4.1.2, previous literature found that young people with callous-unemotional traits are less responsive to treatment, especially parent and family interventions (Frick & White, 2008; D. J. Hawes et al., 2014). However, in Chapter 4, the intervention was

effective only for participants with high callous-unemotional traits. Wilkinson et al. (2016) found that often interventions that included a component that addressed the adolescent directly were more or similarly effective for adolescents with high callous-unemotional traits than for adolescents with low callous-unemotional traits. These two findings together suggest that interventions addressed directly to the adolescent have the potential to change aggressive behaviour in adolescents with high callous-unemotional traits. Therefore, it is expected that the intervention presented in this study will be more effective for people with high levels of callous-unemotional traits, as it is an intervention addressed directly to the adolescent and not to their family.

5.1.2 Online interventions

The *problem solving* BCT is expected to be effective in a universal intervention, but with small effect size. In the meta-analysis reported in Chapter 2, the BCT *problem solving* had an average effect size in universal interventions of $d = 0.19$. Therefore, to access a big sample of the general adolescent population, the intervention evaluated in this chapter is delivered to late adolescents (i.e., 18 to 21 years old) in an online format. The rapid growth in the use of the internet among young people provides an opportunity to deliver interventions universally cheaply and efficiently. Online interventions have increased in the last decade with effective results (Clarke et al., 2015). Youth online interventions that include problem-solving have been successfully applied to depression and anxiety (e.g., van der Zanden et al., 2012). However, an online problem-solving intervention to reduce youth aggression has never been evaluated.

Clarke et al. (2015), in their review of online youth mental health interventions, highlighted that a common issue was non-completion of intervention. This was an issue as greater engagement with the intervention was associated with better outcomes (Clarke et al., 2015). Therefore, in the present study engagement with the different components of the

interventions is measured and assessed as a moderator of effectiveness. It is expected that the intervention will be more effective when more components are completed.

Clarke et al. (2015) also found that online interventions were considered acceptable by young people. However, more acceptance of the intervention was not related to a bigger effect on most of the interventions reviewed. Farrel et al. (2015) conducted a qualitative study to investigate participants' perceptions of a violence prevention program and argued that, even when participants found an intervention to reduce aggression acceptable, they did not use the skills if they did not consider them useful. Furthermore, they found that problem social skills were used less frequently than other skills. Therefore, in the present study participants are asked how frequently they used problem solving strategies in the month following the intervention and how useful they found those strategies to explore acceptance of the intervention.

5.1.3 The present study

In summary, this study aims to test whether an online brief intervention designed to include only the *problem solving* BCT is acceptable and effective to reduce aggressive behaviour in young people. Measures of different types of aggression are taken at baseline and one month after the intervention to assess the efficacy and effectiveness of the intervention. Problem-solving skills will be measured as mediator and callous-unemotional traits as a moderator of effectiveness. It is expected that participants randomised to the intervention will improve their problem-solving skills and consequentially, reduce their aggressive behaviours. Besides, participants with high callous-unemotional traits are expected to have a greater change. To measure whether the intervention is acceptable, the engagement with the intervention is measured and participants in the intervention group are asked follow-up questions about their use of problem-solving strategies.

5.2 Methods

5.2.1 Participants

Ethical approval for this study was provided by the Ethics Committee of the Department of Psychology of the University of Sheffield. The protocol for this randomised controlled trial was registered at ClinicalTrials.gov with identifier NCT04130360.

A priori power analysis was conducted using the effect size obtained when the BCT *problem solving* was present in universal interventions in Chapter 2. The effect size was 0.19. The power analysis indicated that a sample size of 872 was needed to reach 0.80 of power with two independent groups for a two-tailed hypothesis. Recruiting a sample of this size required accessing participants from several sources: volunteers recruited from the Department of Psychology and University of Sheffield participant panels, adverts on social media, posters and flyers in different universities, colleges and sport events across the UK, and Survey circle, Survey Swap, Call for participants, and Prolific participant recruitment services.

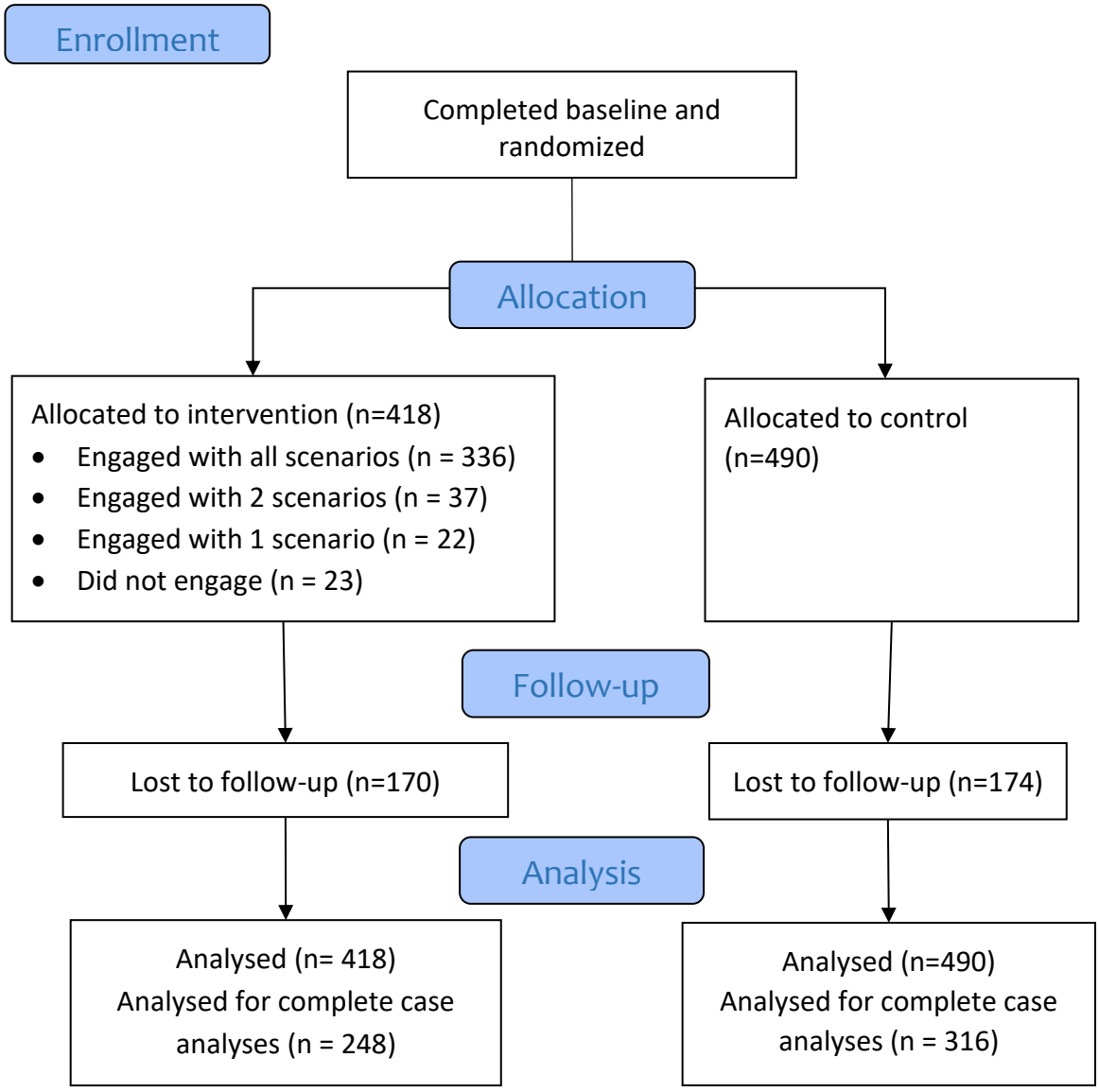
Participants were offered incentives for participation that differed according to the way they were recruited. Student participants from the Department of Psychology of the University of Sheffield were assigned credits once they completed the follow-up. Participants recruited via Prolific were paid for completing the baseline and were offered to enter a prize draw of five £20 Amazon vouchers if they completed the follow-up. Participants recruited via Survey Circle or Survey Swap were offered credits for their accounts after completing the baseline and to enter the prize draw after completing the follow-up. Participants recruited via other methods were also entered in the prize draw if they wished to.

Nine hundred and eight participants between 18- and 21-years old living in the UK were recruited between September 2019 and February 2020. They had a mean age of 19.71

(*SD* = 1.19). Thirty-one per cent were male and 69% female. Fifty-four per cent were randomly assigned to the control condition and 46% to the intervention. Sociodemographic characteristics by group can be seen in Table 5.1. There was 62% retention, with 564 participants completing the follow-up. Further details can be found in Figure 5.1.

Figure 5.1

CONSORT Flow Diagram



5.2.2 Measures

Sociodemographic data. Participants were first asked for their age and gender.

Problem Solving. To measure problem-solving skills and problem-solving self-efficacy, the two scales developed by Maydeu-Olivares and D'Zurilla (1997) were used. They were developed using Form B of the Problem Solving Inventory (PSI; Heppner, 1988) in an attempt to improve its construct validity. The new scales are based in D'Zurilla et al.'s (2004) social problem-solving theory and have good psychometric properties (Maydeu-Olivares & D'Zurilla, 1997).

Maydeu -Olivares and D'Zurilla's scales (1997) are Problem Solving Skills and Problem Solving Self-Efficacy. The Problem Solving Skills scale is composed of nine items that assess the extent to which the respondent uses the social problem-solving steps (e.g., "When a solution to a problem has failed, I do not examine why it didn't work"). The Problem solving self-efficacy scale contains seven items that measure the confidence with which the respondent can solve problems (e.g., "I trust my ability to solve new and difficult problems"). Each item was responded on a 6-point Likert scale, from 1 (strongly disagree) to 6 (strongly agree). Therefore, the total scale scores ranged from 16 to 96, the Problem Solving Skills scale scores ranged from 9 to 54 and the PSSE scores from 7 to 42, with higher scores indicating higher problem solving skills and higher problem solving self-efficacy.

In this study, the internal consistency of the total scale was good ($\alpha = 0.80$) as well as the internal consistency of the PSSE ($\alpha = 0.81$). However, the internal consistency of the Problem Solving Skills scale fell just below .70 ($\alpha = 0.68$).

Aggression. Two different questionnaires were used to measure aggression: the Aggression Questionnaire-Short Form (AQ-SF; Bryant & Smith, 2001) and the Physical - Relational Aggression Scale (PRA; Werner & Nixon, 2005). They are both self-report measures. However, PRA asks for the frequency in which the respondents have conducted several aggressive behaviours in the last month (e.g., "Had a serious fight") from 1 (never) to

5 (5 or more times), while AQ-SF is a trait measurement asking how characteristic of the respondent certain behaviours and feelings are (e.g., “I have trouble controlling my temper”) from 1 (extremely uncharacteristic) to 5 (extremely characteristic).

The AQ-SF is composed of 12 items. Therefore, the total score ranged from 12 to 60, with higher scores representing higher aggression. It has four subscales with three items each; Physical aggression, Verbal aggression, Anger and Hostility. The score for each of them ranged between 3 to 15. The internal consistency of the overall scale for this study was good (α = 0.86) and the internal consistency of each subscale was acceptable (α ranged from .72 to .77).

The PRA is composed of two subscales: Physical aggression and Relational aggression. The Physical aggression subscale is composed of four items and the Relational aggression subscale is composed of five items. The total score ranged from 9 to 45, with higher scores representing higher aggression. For this study, the internal consistency for the total score and Physical aggression were good (α = .86 and .87) and acceptable for Relational aggression (α = .77).

Callous-unemotional traits. Callous-unemotional traits were measure with the ICU-12, which has already been described in Section 4.2.2. In this study, the internal consistency for the total score was good (α = .80) and acceptable for both subscales (α = .79 and .72).

Participants’ perceptions of the intervention. Four questions were generated by the researcher to measure participants’ perceptions of the intervention and its effectiveness. The first three questions asked how often in the last month participants had (a) used the problem-solving steps to resolve their interpersonal conflicts, (b) come across a similar situation to the conflict scenario they generated, and (c) used the solution they chose for that scenario. Those three questions were answered in a 5-point Likert scale from 1 (never) to 5 (always). The

fourth question asked how useful they found using the problem-solving strategies. It could be answered from 1 (not at all useful) to 5 (extremely useful).

5.2.3 Procedure

Potential participants were directed to a Qualtrics (2005) survey. There, they were shown the information sheet with information about the study and they were asked to complete a consent form if they wanted to participate. After completing the consent form, they indicated their age and gender and completed the baseline survey composed of AQ-SF, PRA, PSI and ICU-12. Once they finished the survey, they were randomly assigned to the intervention or the passive control group by Qualtrics (2005) randomisation feature. Participants randomised to the intervention group were then presented with the intervention summarised in Section 5.2.4 and detailed in Appendix H. Participants assigned to the control group were redirected to the final page, where they were asked for their email to be contacted one month later for the follow-up.

One month after completing the baseline, participants were emailed a link to the follow-up survey. If they did not complete it, they were emailed again with a reminder once a week for a maximum of 15 weeks (i.e., until the end of March 2020). The average time between baseline and follow-up was 33.9 days (SD = 9.29). The follow-up survey was composed of the AQ-SF, PRA and PSI. Participants in the intervention group were also asked the four questions about their perceptions of the intervention and its effectiveness.

At the end of the follow-up survey, participants were debriefed. In the debrief information, participants assigned to the control group were offered the possibility to complete the intervention. None of them wished to.

5.2.4 Intervention

To design the intervention, the recommendations from Merril et al. (2017) were followed. In their review, they found that social problem-solving skills interventions were more effective when they included step-by-step explicit explanations and real-life scenarios to help generalisation. Therefore, participants were informed of the six problem-solving steps: (1) Identifying that a problem exists, (2) defining the problem, (3) generating solutions, (4) evaluating the proposed solutions and choose one, (5) enacting the chosen solution, (6) assessing the outcome. Then, they were presented two scenarios of personal conflict and they were prompted to apply the four first steps one by one to find a solution. Once they finished, they were asked to apply the steps to an interpersonal conflict they had experienced in the last month. In the end, they were reminded of the steps and encouraged to practice them in their daily conflicts. The exact wording of the intervention can be found in Appendix G.

The two scenarios of interpersonal conflict presented to the participants were taken from the Social-Emotional Information Processing Questionnaire (SEIP-Q; Coccaro et al., 2017). The SEIP-Q consists of 8 scenarios of interpersonal conflict. To select two, first, those that mentioned driving or working situations were eliminated to make the two finally selected scenarios widely applicable for adolescents. Then, two were selected that matched with at least one of the ten most frequent anger triggers found in Chapter 3. The two scenarios selected for the intervention were:

(1) *You make plans with one of your friends to go on a short trip for the weekend. You're very excited about these plans and have been looking forward to the trip. However, at the last minute, your friend says that he (or she) no longer wants to go on the trip and has made plans with another friend for the weekend.*

(2) *Imagine that you go to the first meeting of a club you want to join. You would like to make friends with the other people in the club. You walk up to some of the other club members and say, "Hi!" but they don't say anything back.*

For each scenario, the participants had to (1) identify the problem, (2) generate at least two possible solutions to the scenario, and (3) select the one they think is the best solution and explain why. Then, they were asked to describe an interpersonal conflict they have had in the last month following the example of the previous scenarios and complete the same three steps.

5.2.5 Analysis

Exploration of the data showed that most outcomes were positively skewed. Therefore, robust analyses were used when possible as in Chapter 4. First, to assess if the randomization was successful, robust t-test based on trimmed means with bootstrap were conducted on baseline scores to compare the intervention and control group characteristics using the WRS2 package (Mair & Wilcox, 2020) for the R environment (R Core Team, 2019). The same analyses were conducted for the attrition checks.

Similar to Chapter 4, both complete case analyses and intention to treat analyses were conducted to evaluate the efficacy and the effectiveness of the intervention, respectively. Plumpton et al.'s (2016) model was again used to impute the missing data as described in Chapter 4. However, on this occasion, due to the bigger sample, it was possible to impute missing data separately for each condition as recommended by Sullivan et al. (2016). Thirty complete datasets were imputed for each condition and then combined in pairs to conduct the intention to treat analysis.

To assess if the intervention was effective, robust ANCOVAs based on trimmed means were conducted to compare the control group to the intervention group in each

outcome with baseline scores as a covariate using the WRS2 package. This ANCOVA compares the groups at five points of the covariate, analysing whether the difference in the groups on the dependent variable is significant at each of the points controlling for Type I error (Wilcox, 2016). Effect sizes with the original means and standard deviations were also calculated using Morris' (2008) formula.

To assess if callous-unemotional traits were a moderator of effectiveness, robust moderation models based on M-estimators were fitted using the package MASS (Venables, 2002). If the interaction was significant, simple slopes were fitted following the same procedure used in Chapter 4.

For the intention to treat analyses, analyses were conducted using the pool function in the MICE package (Buuren & Groothuis-Oudshoorn, 2011) when possible. When it was not possible, analyses were conducted in each of the 30 imputed datasets. If an analysis was significant in 15 or more of the datasets, it was interpreted as a significant effect.

To explore engagement, acceptance and perceptions of the intervention, frequencies of the answers for each follow-up question were reported. In addition, to analyse whether more engagement predicts a bigger effect, robust regression analyses using M estimators were conducted the package MASS (Venables, 2002) with follow up scores as outcomes and engagement and baseline scores as predictors.

5.3 Results

5.3.1 Randomization and attrition checks

Robust t-tests were conducted to compare intervention and control group data at baseline. Results can be seen in Table 5.1. Participants assigned to intervention and control groups did not have any differences at baseline in sociodemographic data or relevant measures.

Table 5.1

Demographic and Baseline Characteristics by Condition and Randomization Checks

	Intervention	Control	Test
Age	19.73 (1.19)	19.68 (1.20)	t (905) = 0.49, p = .621
Gender (% male)	30.2%	30.7%	χ^2 (2) = 0.20, p = .904
Aggression Questionnaire	29.77 (8.80)	30.70 (9.04)	t (889) = 1.53, p = .124
Physical aggression	5.97 (2.76)	6.09 (2.83)	t (889) = 0.59, p = .549
Verbal aggression	7.94 (3.07)	8.26 (2.94)	t (889) = 1.89, p = .055
Hostility	8.75 (2.83)	9.01 (2.92)	t (889) = 1.17, p = .255
Anger	7.10 (3.06)	7.34 (3.01)	t (889) = 1.42, p = .157
PRA	12.46 (5.00)	12.61 (5.31)	t (883) = 0.45, p = .649
Physical aggression	5.13 (2.51)	5.09 (2.51)	t (883) = 0.26, p = .792
Relational aggression	7.33 (3.12)	7.53 (3.33)	t (883) = 0.85, p = .386
Problem Solving Inventory	66.83 (8.80)	66.51 (8.15)	t (905) = 1.17, p = .253
Problem solving skills	38.55 (5.11)	38.42 (5.13)	t (905) = 0.24, p = .816
Problem solving self-efficacy	28.28 (5.37)	28.11 (4.78)	t (905) = 0.82, p = .419
ICU-12	19.36 (5.05)	19.73 (5.42)	t (885) = 0.81, p = .441
Callousness	10.38 (2.84)	10.60 (3.45)	t (882) = 0.26, p = .800
Uncaring	8.98 (3.08)	9.14 (2.99)	t (885) = 0.97, p = .325

Note. All variables except gender are represented with *M* (*SD*). PRA = Physical – Relational Aggression Scale; ICU-12 = Inventory of Callous Unemotional Traits – 12 Items Version

Drop-out was not significantly different in the intervention and in the control group (χ^2 (1) = 2.55, p = .110). Robust t-tests were conducted to compare participants who completed the follow up to those who dropped out in sociodemographic characteristics and baseline scores. As can be seen in Table 5.2, a lower proportion of male completed the follow-up. Besides, participants that completed the follow-up were younger, had higher scores in AQ-SF and Physical aggression, and lower scores in Verbal aggression, PRA, Relational aggression, ICU-12 and Callousness. Participants that completed the follow-up also had lower problem-solving skills.

Two-way between participants ANOVAs for trimmed means with condition and completion of follow-up as independent variables showed that people that dropped out from

each condition were not different at baseline in any of the variables. All the interactions between condition and completion of follow-up were nonsignificant (*F* range [0.02, 2.39]).

Table 5.2

Attrition Checks

	Dropped out (n = 344)	Completed follow-up (n = 564)	Test
Age	19.94 (1.27)	19.56 (1.12)	t (905) = 4.06, p < .001
Gender (% male)	36.3%	27.3%	χ^2 (2) = 8.25, p = .016
Aggression Questionnaire	66.34 (8.42)	66.77 (8.15)	t (905) = 2.24, p = .024
Physical aggression	38.01 (4.93)	38.68 (5.20)	t (905) =3.03, p = .003
Verbal aggression	28.33 (4.87)	28.08 (5.15)	t (905) = 2.09, p = .033
Hostility	31.11 (9.40)	29.88 (8.66)	t (889) = 0.57, p = .561
Anger	6.44 (2.91)	5.84 (2.72)	t (889) = 1.81, p = .069
PRA	7.53 (3.15)	7.09 (2.96)	t (889) = 2.11, p = .036
Physical aggression	8.80 (2.88)	8.95 (2.87)	t (889) = 1.89, p = .083
Relational aggression	8.35 (3.02)	8.01 (2.98)	t (889) = 2.37, p = .019
Problem Solving Inventory	13.33 (5.96)	12.13 (4.69)	t (547) = 0.57, p = .567
Problem solving skills	5.48 (2.95)	4.92 (2.24)	t (532) = 2.26, p = .020
PS self-efficacy	7.86 (3.55)	7.21 (3.05)	t (588) = 0.16, p = .878
ICU-12	20.31 (5.55)	19.15 (5.02)	t (617) = 2.81, p = .005
Callousness	11.03 (3.38)	10.21 (3.04)	t (617) = 3.35, p < .001
Uncaring	9.30 (3.06)	8.93 (3.00)	t (885) = 2.07, p = .041

Note. All variables except gender are represented with *M* (*SD*). PRA = Physical – Relational Aggression Scale; PS = Problem Solving; ICU-12 = Inventory of Callous Unemotional Traits – 12 Items Version

5.3.2 Complete case analysis

Effect of the intervention. Descriptive statistics of the scores at follow-up are presented in Table 5.3. Robust ANCOVAs based on trimmed means were conducted for each outcome with the baseline score as a covariate. Only the ANCOVA measuring the effect on verbal aggression was significant. Participants in the intervention group had lower verbal aggression at follow-up (difference in trimmed means = 0.71) when verbal aggression at baseline was moderate (baseline verbal aggression = 8; p = .003). It was not significant at any

of the other model points. Mediation analyses were not conducted as any of the effects on problem solving were significant.

Table 5.3

Descriptive Statistics at Follow-Up and Effect Sizes

Outcome	Intervention		Control		Cohen's *d* (95% confidence interval)
	M	*SD*	*M*	*SD*	
AQ-SF	28.54	8.71	29.58	9.49	-0.01 (-0.14, 0.12)
Physical aggression	5.63	2.81	5.76	3.02	0.00 (-0.13, 0.13)
Verbal aggression	7.59	2.97	7.98	3.00	-0.02 (-0.15, 0.11)
Hostility	8.39	2.90	8.82	3.23	-0.06 (-0.19, 0.07)
Anger	6.94	3.04	7.02	3.05	0.05 (-0.08, 0.18)
PRA	11.32	3.80	11.82	4.81	-0.07 (-0.20, 0.06)
Physical aggression	4.82	1.98	4.96	2.38	-0.07 (-0.20, 0.06)
Relational aggression	6.53	2.33	6.86	2.89	-0.04 (-0.17, 0.09)
PSI	67.75	8.68	66.75	8.19	0.08 (-0.05, 0.21)
PS skills	39.19	5.13	38.54	5.29	0.10 (-0.03, 0.23)
PS self-efficacy	28.56	5.13	28.22	4.93	0.03 (-0.10, 0.16)

Note. AQ-SF = Aggression Questionnaire – Short Form; PRA = Physical – Relational Aggression Scale; PSI = Problem Solving Inventory; PS = Problem Solving

Moderation analyses. Robust moderation models based on M-estimators were fitted for each aggression outcome with callous-unemotional traits as a moderator. None of the moderation analyses were significant.

5.3.3 Intention to treat analysis

Effect of the intervention. Robust ANCOVAs were conducted for each outcome in each of the 30 imputed datasets. The intervention did not have an effect on problem solving, as the effect on the total score of PSI was only significant in six datasets, and the effects on problem solving skills and problem-solving self-efficacy were only significant in four datasets.

The intervention was effective in verbal aggression. The intervention had a significant effect in 17 datasets when verbal aggression at baseline was moderate (verbal aggression at baseline = 8). The intervention group showed on average between 0.07 and 0.98 less verbal aggression than the control group when verbal aggression at baseline was moderate. No significant effects were found at any of the other model points in any datasets.

A negative effect was found for physical aggression and anger as measured by the AQ. When physical aggression was low at baseline (physical aggression at baseline = 3 and 4), the ANCOVA was significant in 27 datasets. Participants in the intervention group showed between 0.15 and 0.70 more physical aggression at follow-up than participants in the control group when physical aggression at baseline was low. No significant effects were found for the other model points for physical aggression. For anger, the intervention had a negative effect when anger was high at baseline (anger at baseline = 14). The intervention group had significantly more anger at follow-up than the control group in 18 datasets when anger was high at baseline, with a trimmed mean difference between 0.12 and 1.99. No significant effects were found at the other model points for anger. There was a significant effect on hostility only in 2 datasets and in 11 datasets for total aggression, indicating that the intervention did not have an effect on any of them.

The intervention had no effect on total aggression, physical aggression or relational aggression as measured by the PRA. ANCOVAs were non-significant in all the datasets for physical and relational aggression and only ANCOVAs in two datasets were significant for total aggression.

Moderation analyses. Robust moderation models based on M-estimators were fitted for each aggression outcome with callous-unemotional traits as a moderator in each dataset and the results were pooled. None of the moderation analyses were significant.

5.3.4 Engagement and fidelity checks

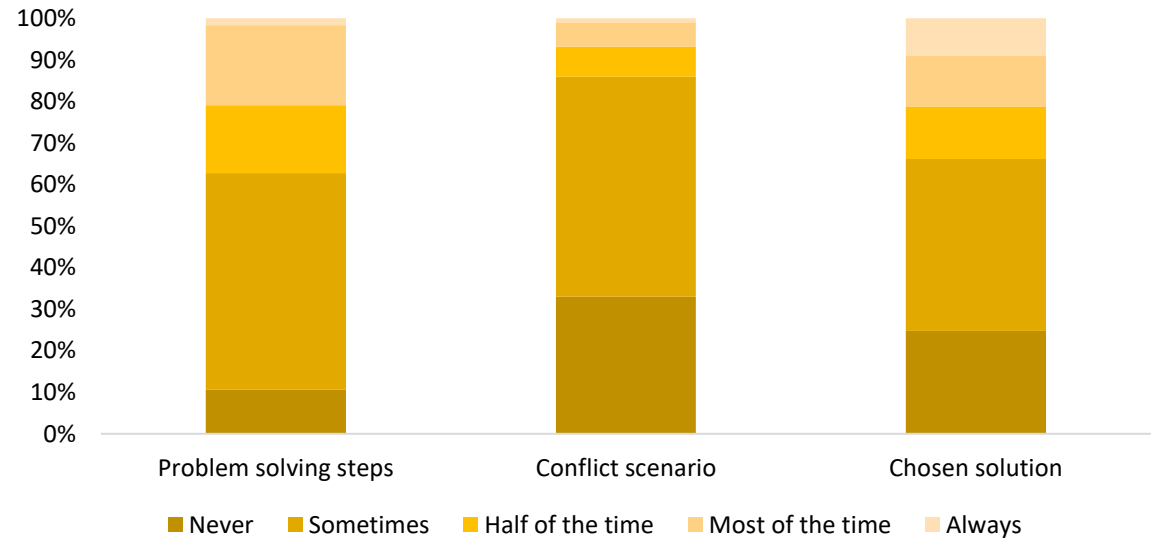
Engagement. Of the participants assigned to the intervention, 80% completed the problem-solving steps in all three scenarios. Only 5% did not complete the problem-solving steps in any of the scenarios. The other 15% completed the problem-solving steps for one or two of the researcher-proposed scenarios but did not add their own scenario. Details can be found in Figure 5.1.

After controlling for baseline scores, engagement was a significant predictor of total aggression as measured by the PRA (β = -0.71, p = .008), verbal aggression (β = -0.60, p = .031) and relational aggression (β = -0.52, p = .018). Intervention participants had lower total aggression, verbal aggression and relational aggression at follow-up when they had completed more scenarios.

Fidelity checks. As can be seen in Figure 5.2, most of the intervention participants that completed the follow-up indicated that they had used the problem solving steps "sometimes" and only 11% reported "never" using them in the last month. Forty-five per cent

Figure 5.2

Cumulative Percentages of Frequency of Use of Problem Solving Steps in the Last Month



reported encountering the scenario they generated “sometimes” in the last month and 28% “never” encountered it in the same period. Similarly, 37% used “sometimes” the solution they chose in the previous month and 20% “never” used it.

Finally, 37% and 38% found using the problem-solving steps moderately and slightly useful, respectively. Fifteen per cent found it very or extremely useful and 10% found it not at all useful.

5.4 Discussion

The main aim of this study was to assess the effect of an intervention only using the BCT *problem solving* on aggression in adolescents. Both complete case analyses and intention to treat analyses showed that the intervention was effective in reducing verbal aggression when verbal aggression was moderate at baseline. However, it was not effective in reducing total aggression or any other type of aggression.

Likely, the effect found for this BCT in Chapter 2 reducing total aggression (d = 0.19) is due to its frequent combination with the BCT *behavioural practice*. This interpretation is consistent with the review on social problem-solving interventions conducted by Merrill et al. (2017), which found that those interventions were effective, but most of them included *behavioural practice* as a part of the intervention. Furthermore, the theory of social problem solving (D’Zurilla et al., 2004) includes a final step called “solution implementation and verification” (p.14) and highlights that, although the skills needed for problem-solving and for solution implementation are different, both are needed for good functioning. This indicates that social problem solving would work best with a behavioural practice component involved in it.

The limited use of the problem-solving strategies during the month following the intervention might be another indication that the inclusion of *behavioural practice* is needed

to promote behaviour change. Future research should evaluate the effect of the combination of the BCTs *problem solving* and *behavioural practice* to confirm this hypothesis. In addition, it should evaluate whether this combination increases the use of problem solving after the intervention and if this, in consequence, increases the effects on aggression.

The intention to treat analyses found some negative effects. When physical aggression was low at baseline, participants in the intervention group showed higher physical aggression at follow-up than participants in the control group. Besides, when anger was high at baseline, participants in the intervention group showed higher anger at follow-up than participants in the control group. It is important to note, however, that previous research has shown that estimation of treatment effect with intention to treat when more than 20% of the data is imputed is not accurate (Armijo-Olivo et al., 2009). Therefore, further research is needed to confirm the negative effects on anger and physical aggression.

5.4.1 Mediation and moderation effects

Unexpectedly, the intervention did not increase problem solving skills or problem solving self-efficacy. However, this is common in the literature, as Merril et al. (2017) found that the interventions included in their review of social problem solving interventions found little evidence of skills improvement. Besides, D'Zurilla et al. (2004) established the difference between process measures, which assess the ability to find effective solutions to problems, and outcome measures, which assess the ability to apply problem-solving skills. The measure used in this study was a process measure. Therefore, it is possible that the intervention improved the ability to apply problem-solving skills instead of the skills itself. However, this is impossible to test with the available data in this study. Future studies evaluating problem solving interventions should take this difference into account and use both process and outcome measures to establish the mechanisms in which the interventions are effective.

Finally, callous-unemotional traits did not moderate the effect of the intervention on any outcome. It was expected that the intervention would be more effective for people with higher levels of callous-unemotional traits as it is an intervention addressed directly to the adolescent and not to the family. However, this finding is consistent with the findings in Wilkinson et al.'s (2016) review, where half of the studies reviewed did not find that callous-unemotional traits moderated intervention effectiveness. It is also important to note that the level of callous-unemotional traits in the sample of the present study was very low. This made it difficult to find a specific effect for participants with high callous-unemotional traits.

5.4.2 Engagement and acceptability

The high engagement with the intervention designed and delivered in this study showed its acceptability. Furthermore, as expected, and supporting previous findings (Clarke et al., 2015), a higher engagement predicted lower total aggression, verbal aggression and relational aggression at follow-up after controlling for baseline scores.

The fact that 90% of the intervention participants perceived the intervention useful in some degree supported the acceptability of the intervention. Clarke et al. (2015) also found in their review high acceptability of online promotion and prevention programmes. This finding is important as online interventions can reach more people using fewer resources than face to face intervention, which is especially important in universal interventions.

5.4.3 Limitations and future directions

This was the first study to assess the effect on aggression of the BCT *problem solving* on its own. It used a strong methodology, randomising participants to the control or the intervention group. However, this study is not free of limitations. Participants were late adolescents (i.e., 18 to 21 years old), which limits the comparison with previous studies and the generalisation of the results to younger adolescents. Therefore, a replication of this study

with younger adolescents is needed to confirm the intervention's effectiveness in reducing verbal aggression, especially as the results from Chapter 2 indicated that interventions with older adolescents were more effective in reducing this type of aggression.

Another limitation was that loss to follow-up was quite high. Thirty-eight per-cent of the sample did not complete the follow-up. This led to a reduction of power and a need for high imputation of data for the intention to treat analyses. Furthermore, the participants who did not complete the study were those with higher aggression scores at baseline. This is a common issue in online interventions for young people, where the participants with the most need of the intervention tend to drop out early (Clarke et al., 2015). The effect of the attrition was mitigated in the present study as attrition was similar in both conditions and participants that dropped out from each condition had similar characteristics.

To account for the attrition, intention to treat analyses were conducted in addition to complete case analyses. The fact that both complete case analyses and intention to treat analyses found the same effect give the researcher confidence in the results despite the limitations of the study.

5.4.4 Conclusion

A brief online intervention using only the *problem solving* BCT was effective in reducing verbal aggression in late adolescents with a moderate level of verbal aggression. The intervention was acceptable, with a high level of engagement. Higher engagement predicted lower levels of aggression at follow-up after controlling for baseline scores. Future research needs to test whether this effect generalises to younger adolescents

Despite those encouraging results, the use of problem-solving strategies after the intervention was limited, although participants found them useful. It is expected that the combination of the BCT *problem solving* with the BCT *behavioural practice* will increase the

implementation of problem-solving skills outside the intervention and, in consequence, increase the effect of the intervention. Future research needs to test this hypothesis.

Chapter 6. General discussion

This thesis aimed to identify the most effective intervention components to reduce aggression among adolescents, utilising the BCT taxonomy version 1 (Michie et al., 2014). To achieve this aim, a meta-analysis of randomised controlled trials was conducted to identify the most effective BCTs for universal and targeted interventions and for different types of aggression. It was hypothesised that the most effective BCTs would be different for universal and targeted interventions and the findings supported that hypothesis. To confirm the results and evaluate the effect of the identified BCTs on their own, two randomised controlled trials were conducted: a universal intervention with the BCT *problem solving* and a targeted intervention with the BCT *action planning*.

6.1 Summary of main findings

In Chapter 2, a multi-level meta-analysis found that the most effective BCT for targeted interventions was *action planning*, while the most effective BCTs for universal interventions were *problem solving* and *behavioural practice*. However, it was difficult to establish the independent effect of each BCT as most of the interventions included comprised more than one BCT. The inclusion of more BCTs did not make the interventions more effective, which indicated that interventions with only one BCT could be effective. Therefore, two randomised controlled trials of brief interventions were conducted to evaluate the independent effect of the identified BCTs. Brief interventions were chosen as the meta-analysis results showed that shorter interventions (by number of weeks) were more effective than longer interventions. In addition, brief interventions with only one session facilitated recruitment and prevented non-completion of the intervention.

To evaluate the independent effect of the BCT *action planning* on a targeted sample, a VHS was developed in Chapter 3. The VHS had the objective of helping the participants create plans to manage their anger. Participants linked anger triggers with the anger

management strategies they planned to use instead of aggressive behaviours. Anger management was chosen as anger is an important predictor of aggression (Roberton et al., 2012) and therefore represents an important cue to address. The VHS was created in Chapter 3 informed by the responses of 30 adolescents referred due to anger issues and behavioural problems. The efficacy of the VHS in reducing anger and aggression on a targeted sample was evaluated in Chapter 4 with a randomised controlled trial. The results showed that the VHS was not generally effective, although it was effective in people high in callous-unemotional traits and low in negative urgency.

The efficacy of the BCT *problem solving* on a universal adolescent sample was evaluated in Chapter 5 with another randomised controlled trial. An online intervention based on the social problem-solving steps was developed using two scenarios from the SEIP-Q (Coccaro et al., 2017). To increase the relevance of the intervention, participants were also asked to describe a conflict that they had had in the previous month and apply the same steps. The results showed that the intervention was only effective in reducing verbal aggression, and only when the level of verbal aggression was moderate at baseline.

6.2 Implications

This thesis represents the first application of the BCT taxonomy version 1 (Michie et al., 2013) to aggression research. This shows the potential to use a common language by practitioners and researchers in the prevention and intervention of aggression and behavioural problems. This is helpful as previous attempts to find which components were effective in interventions to reduce aggression lacked common definitions (Özabacı, 2011; S. J. Wilson & Lipsey, 2007), which made the results difficult to compare. Up to now, the BCT taxonomy had been used primarily in health psychology (e.g., Ashton et al., 2020; Black et al., 2020), but the research presented in this thesis has demonstrated its generalisability and usefulness

in another behavioural domain. Identifying which BCTs are effective in reducing aggressive behaviour can help optimise and develop cost-effective interventions.

This thesis also contributed to the adolescent aggression literature finding further evidence that short interventions can be more effective than long interventions to reduce aggression in adolescents, although further research was needed to find how short an intervention can be and still be effective. In Chapter 4 and Chapter 5, it was showed that brief interventions composed of only one session of 20 minutes or less can reduce specific types of aggression. These findings support the development of cost-effective brief interventions, as the shorter an intervention is, the fewer resources it requires.

Another contribution of this thesis is in understanding the effectiveness of interventions for adolescents with high callous-unemotional traits. Previous literature had highlighted that children and adolescents with high callous-unemotional traits were less responsive to interventions than children and adolescents low on those traits (Frick & White, 2008; D. J. Hawes et al., 2014; Muñoz & Frick, 2012). However, that was not found in this thesis, as the intervention evaluated in Chapter 4 was only effective with the participants with higher callous-unemotional traits and the intervention evaluated in Chapter 5 was similarly effective for the whole sample -no moderation effect for callous-unemotional traits was found-. One possible explanation is that interventions addressed directly to the adolescents may have a larger potential to change aggressive behaviours in adolescents with high callous-unemotional traits than family interventions. Both interventions evaluated in this thesis were addressed directly to the adolescents. This is supported by Wilkinson et al.'s (2016) review of interventions involving young people, which found that half of the studies did not have different effects on adolescents with different levels of callous-unemotional traits and one was more effective for the participants with higher callous-unemotional traits: emotion recognition training (Dadds et al., 2012). Deficits in emotion recognition in themselves and

others, as well as deficits in emotion regulation, are associated with high callous-unemotional traits (Ciucci et al., 2015). This might explain why emotion recognition training and the anger management intervention evaluated in Chapter 4 were especially effective on adolescents with high callous-unemotional traits, while the intervention evaluated in Chapter 5, which did not address emotion recognition or regulation, was not. Dadds et al. (2012) also provided further evidence that family interventions are less effective for adolescents with high callous-unemotional traits than interventions addressed to the adolescents, as the active control group used was a parent training intervention, which was less effective for the participants with high callous-unemotional traits.

Besides these general implications, there were some chapter-specific implications. For example, the exploration of anger triggers and anger management strategies conducted in Chapter 3 can be helpful not only to develop the VHS evaluated in this thesis but also for other anger management interventions. Anger management interventions are frequently used to reduce aggressive behaviours in children and adolescents (Candelaria et al., 2012) and having information of which triggers are more frequently encountered by this population and which anger management strategies they consider more useful can help tailor the design of many different interventions to enhance their effectiveness. This is especially important as a complaint from this population is the lack of relevance of the content of many existing violence prevention curriculums (Farrell, Mehari, Kramer-Kuhn, et al., 2015).

Finally, Chapter 5 showed that online interventions to reduce aggression can be acceptable and effective. This follows the findings of Clarke et al.'s (2015) review which found that online youth mental health promotion and prevention interventions were generally effective and perceived as acceptable. However, none of the interventions included in that review focused on peer aggression. Therefore, the findings of Chapter 5 contributed to that literature as the engagement with the intervention was high and most participants found the

intervention useful. The knowledge that online interventions are effective and feasible is especially important in current times, in which adolescents are affected by mental health issues but cannot access traditional mental health care due to the measures taken to prevent the spread of COVID-19 (Golberstein et al., 2020).

6.3 Limitations

To study the effect of the BCTs *action planning* and *problem solving*, a specific implementation methodology had to be chosen. It is possible that the effects found and reported in this thesis would have been different if another implementation methodology had been used. For example, *action planning* could have been implemented by asking participants to think of the last time they were aggressive and to make an action plan of what they were going to do instead the next time that they encountered a similar situation. In that way, the focus would have been on aggressive behaviour instead of anger. This methodology, although considered at the design stage, was discarded for different reasons. First, it was considered too confrontational by the researchers and the stakeholders consulted. Second, making plans only for one specific situation was considered a disadvantage; the more possible future situations that were covered, the more likely they were to be encountered and, therefore, the appropriate response deployed. Finally, it was considered that asking participants to think of an alternative behaviour to the one they normally use would constitute an additional BCT: *behavioural substitution*. When designing the interventions implemented in this thesis, careful thought was given to including only the desired BCTs.

An important limitation that influenced the design and results of the experimental studies in this thesis was the issues with recruitment. Initially, the sample for the studies reported in Chapter 3 and Chapter 4, which focused on at-risk adolescents, was going to be recruited from the services provided by the Sheffield City Council for adolescents with anger and behavioural issues, as described in Section 3.2.1. However, this was not possible due to

some changes in those services during the recruitment for Chapter 3. The plan was first modified to recruit students from several schools for children with social and emotional mental health issues. However, after meeting with representatives from several schools and starting baseline recruitment, it became clear that the target sample size would be difficult to recruit due to the busy schedules of those schools and high absenteeism among at-risk adolescents among other reasons. Then, mainstream schools, which completed the sample, were contacted and recruited. In total, recruitment for the study in Chapter 4 took one and a half years, which limited the time available for the last study.

These issues also influenced the design of the study reported in Chapter 5. Following the results of Chapter 2 regarding universal interventions, where both *behavioural practice* and *problem solving* were found as predictors of effect, a three-arm design was considered for Chapter 5: a control group, an only *problem solving* condition and a *problem solving + behavioural practice* condition. However, a priori power analysis was conducted for that design and over a thousand participants were needed to achieve 80% power. This recruitment did not seem achievable in the remaining time frame with the resources available. Therefore, only one of the intervention conditions was included in the final design. The recruitment objective for that design was also quite high, and that is why late adolescents over 18 years old were recruited, as going through the process of recruiting from schools had proved unfeasible. Both the age of participants, the limitation to two conditions instead of three and the limited time frame that only allowed a short-term follow-up limited the possible conclusions from that study.

Recruitment issues were accompanied by high attrition and deviations from the protocol. These are common limitations in intervention and prevention research (Armijo-Olivo et al., 2009; Clarke et al., 2015). In the randomised controlled trial presented in Chapter 4, there was 29% attrition at the one-month follow-up and 49% at the six-months follow-up,

and in the one reported in Chapter 5, there was 38% attrition after one month. That, together with deviations from the protocol (in Chapter 4, 19% of the participants deviated from the condition they were assigned to, and in Chapter 5, 20% of the participants assigned to the intervention group did not complete the intervention) made it difficult to find the real effect of the intervention. To overcome these limitations, both complete case analysis and intention to treat analysis were conducted in both randomised controlled trials. Complete case analysis allows for a test of the efficacy (i.e., the potential maximum effect under ideal conditions) and intention to treat analysis the effectiveness (i.e., effect in the real world where not everyone complies with the intervention; Armijo-Olivo et al., 2009) of an intervention. Intention to treat analysis also allows to conduct analyses with the complete sample, which is helpful in underpowered studies, and it is the recommended procedure by the Consolidated Standards of Reporting Trials (Moher et al., 2010). However, to conduct intention to treat analyses, imputation of missing data is needed. Previous research highlighted that estimation of treatment effects when more than 20% of the data is imputed is not accurate (Armijo-Olivo et al., 2009). Therefore, in this thesis, although both complete case and intention to treat analyses were conducted for comparison purposes, complete case analysis was given more weight in the conclusions.

Another common limitation in intervention research is multiple comparisons, which arise when there are several outcomes and time points (Moher et al., 2010). All the studies in this thesis have this limitation, which is hard to tackle. The issue with multiple comparisons is that some analyses might result significant due to chance (Moher et al., 2010). Several measures have been taken in this thesis to mitigate this limitation. First, Bonferroni correction was used in the comparisons conducted in Chapter 3. In Chapter 4 and 5, both complete case analysis and intention to treat analysis were conducted to reinforce the confidence in the results. Finally, the trials reported in Chapter 4 and 5 were attempts to replicate the results

from Chapter 2. As a result, effect sizes with confidence intervals were reported in Chapter 2, 4 and 5 as another measure of effect besides the statistical analyses based on *p* values.

Data distribution was also another limitation, especially in Chapter 4 and 5. Skewed and non-normal data is common in aggression research (e.g., Eron et al., 2002; Wade et al., 2018). Previous research has often attempted to handle this issue with data transformations (e.g., Multisite Violence Prevention Project, 2014; Wade et al., 2018). However, these techniques have further limitations such as not dealing effectively with outliers or changing the hypothesis being tested (Field & Wilcox, 2017). In this thesis, robust analyses were used following the recommendations from Field and Wilcox (2017) to deal with violations of statistical assumptions. Robust analyses, although often limited in the number of variables that the models can include, do not assume a normal distribution of the data and protect against assumptions violations.

6.4 Future directions

This thesis has identified the individual BCTs that are related to larger effect sizes to reduce aggression (Chapter 2). However, interventions including only the identified most effective BCTs: *action planning* for targeted interventions (Chapter 4) and *problem solving* for universal interventions (Chapter 5) did not have an overall significant effect on reducing aggression. It is important to note, however, that the 95% confidence intervals of the effect sizes for total aggression in each randomised controlled trial included the effect sizes estimated in the meta-analysis for those BCTs. In Chapter 2, all interventions that included *action planning* or *problem solving* were comprised of more BCTs. Therefore, that combination of BCTs may cause larger effect sizes. For example, both *action planning* and *problem solving* were often combined with *behavioural practice*, which was the most frequently used BCT. *Behavioural practice* was also found as the most effective strategy in Özabacı's (2011) meta-analysis of cognitive behavioural therapy for children at high risk of

being aggressive. Future research should focus on investigating which combination of BCTs produce the largest effects in reducing aggression. One way to do this would be to apply a machine learning technique called Classification and Regression Trees analysis that can identify the effective intervention component combinations and therefore recommend how BCTs should be combined in the future. This approach has been used elsewhere; for example, Dusseldorp et al. (2014) applied that machine learning technique to meta-analysis data to identify which combinations of components were effective in physical activity and healthy eating interventions. However, to achieve that successfully, it is important that future intervention reports include detailed accounts of the contents of the intervention, including the BCTs used, so that the meta-analysis dataset can be coded effectively.

The meta-analysis reported in Chapter 2 also indicated that shorter interventions were more effective than longer interventions. In the intervention studies reported in this thesis, it was found that interventions lasting approximately 15 minutes are effective in some situations and for some types of aggression. However, it is still unknown what is the minimum duration that an intervention must last to be generally effective in reducing aggression. Once the most efficient combination of BCTs is found, research should focus on finding the minimum duration that the intervention should have to be effective. In doing so, we will be closer to designing more cost-effective interventions to reduce aggression among adolescents.

Age and gender did not have a significant moderation effect in the meta-analysis reported in Chapter 2, which indicates that they do not moderate the effectiveness of interventions to reduce aggression. However, not finding a significant effect does not equal absence of effect, as it can be caused by a lack of statistical power. Therefore, future studies should confirm those results to make sure that interventions are effective through all adolescents regardless of gender and age. It is important to notice that normal hypothesis

testing cannot be used to test for no difference and therefore, future studies should use equivalence tests and Bayesian estimations to clarify whether the null effect found in this thesis translates to an absence of effect or an absence of evidence (Harms & Lakens, 2018).

Finally, a secondary finding of this thesis that warrants further investigation is the effectiveness of interventions for people with high callous-unemotional traits. Unexpectedly, the intervention evaluated in Chapter 4 was more effective for participants with higher callous-unemotional traits and the intervention evaluated in Chapter 5 was similarly effective regardless of the level of callous-unemotional traits. These findings challenge the notion that interventions are often less effective for this population. Although some hypothesis had been provided in Section 6.2 for when and how interventions are effective for this population, this is still uncertain and needs further investigation as adolescents with high callous unemotional traits present a serious pattern of aggressive behaviour (Rowe et al., 2010).

6.5 Conclusions

Notwithstanding the above limitations, this thesis has shown the potential of applying the BCT taxonomy version 1 (Michie et al., 2014) to research on interventions to reduce and prevent aggression. The taxonomy allows practitioners and researchers to use a common language when developing, applying, and evaluating interventions. In addition, the research presented in this thesis has shown the potential for effectiveness of brief interventions using the BCTs *action planning* for adolescents at higher risk of being aggressive, especially those with high callous-unemotional traits, and *problem solving* for a general population of adolescents. However, future research needs to address which combinations of BCTs are most effective in reducing overall aggressive behaviour in adolescents.

Appendix A. Characteristics of included studies in the meta-analysis

Table A1

Characteristics of Included Studies

Study	Study design	Participant characteristics	Relevant outcome measure	Interventions	Comparators	Level of intervention	Setting and country	Cohen's *d*[a]
Abdulmalik et al. (2016)	CRCT	N = 40 Age (mean) = 12 100% male	a) Outcome: Aggression Measure: Teacher Rating of Students' Aggressive Behaviours Type: teacher report b) Outcome: Aggression Measure: Self-Rated Aggression Scale Type: self-report	Thinking group 6 sessions 2 sessions/week 40 min/session 5 BCTs: 1.2, 4.1, 4.3, 11.2, 15.4	Waiting list	Targeted	2 public primary schools in Nigeria	(a) 1.2 (b) 0.9
Ahmad et al. (2016)	RCT	N = 10 Age (mean) = 11.6	Outcome: Aggression Measure: Direct and Indirect Aggression Scales Type: teacher report	Cognitive Behaviour Therapy 6 weeks 2 sessions/week 30 min/session 10 BCTs: 2.3, 2.4, 3.1, 4.1, 4.2, 5.4, 5.6, 8.1, 8.3, 11.2	Play group	Targeted	School in Pakistan	1.01
Atria and Spiel (2007)	CRCT	N = 112 Age (mean) = 17 51% male	Outcome: Bullying Measure: Olweus' Bully/Victim Questionnaire Type: self-report Follow-up: (a) post-test (b) 4 months	Viennese Social Competence training 7 months 13 lessons 1.5h/lesson 7 BCTs: 1.1, 1.2, 1.3, 1.7, 5.3, 8.1, 8.2	No treatment	Targeted	Vocational school in Austria	(a) 0.40 (b) 0.22

Baldry and Farrington (2004)	CRCT	N = 239 Age (mean) = 13.33 58% male	Outcome: (a) Bullying (b) Physical aggression (c) Threats (d) Direct bullying (e) Verbal aggression (f) Indirect bullying (g) Total bullying Measure: Olweus Bully/Victim Questionnaire Type: self-report Follow-up: 4 months	Bulli & Pupe 3weeks 3h/week 6 BCTs: 4.2, 5.3, 6.3, 8.1, 8.2, 13.2	No treatment	Universal	h) 2 middle schools i) 1 high school in Italy	(a,h) -0.33 (b,h) -0.25 (c,h) -0.12 (d,h) -0.29 (e,h) -0.33 (f,h) -0.06 (g,h) -0.18 (a,i) -0.07 (b,i) 0.13 (c,i) 0.10 (d,i) 0.07 (e,i) 0.02 (f,i) -0.01 (g,i) 0.05
Barekatain, et al. (2006)	RCT	N = 36 Age (mean) = 14.17 100% male	Outcome: Aggression Measure: Aggression Questionnaire Type: self-report Follow-up: (a) post-test (b) 2 months	c) Rational Emotive Behavioural therapy 10 weeks 1h/week 2 BCTs: 8.2, 13.2 d) Relaxation Therapy 10 weeks 1h/week 6 BCTs: 2.3, 4.2, 8.1, 8.2, 8.6, 12.5	Waiting list	Targeted	Iran	(a,c) 1.11 (a,d) 1.42 (b,c) 1.33 (b,d) 1.49
Betzalel and Shechtman (2017)	RCT	N = 187 Age (mean) = 12.96 63% male	a) Outcome: Violence Measure: Modified National Youth Survey Type: self-report Follow-up: (c) post-test (d) 3 months b) Outcome: Aggression Measure: Buss-Perry Aggression Questionnaire	e) Superhero Bibliotherapy 8 sessions 1 session/week 50 min/session 1 BCT: 16.3 f) Affective Bibliotherapy 8 sessions 1 session/week 50 min/session	No treatment	Targeted	2 foster homes in Israel	(a,c,e) 0.26 (b,c,e) 0.21 (a,c,f) -0.56 (b,c,f) 1.14 (a,d,e) 0.52 (b,d,e) 0.52 (a,d,f) 0.07 (b,d,f) 0.23

			(Physical Aggression + Anger) Type: self-report Follow-up: (c) post-test (d) 3 months	1 BCT: 16.3				
Blake et al. (2017)	RCT	N = 144 Age (mean) = 14.48 40% male	Outcome: Aggression Measure: Youth Self Report (Aggressive Behavior) Type: self-report	Sleep SENSE 7 weeks 90 min/week 12 BCTs: 1.1, 1.2, 1.4, 1.5, 2.3, 3.1, 5.4, 8.1, 8.3, 11.2, 12.1, 13.2	Study skills educational program	Universal	University and school in Australia	0.20
Bonell et al. (2015)	CRCT	N = 1144 Age (mean) = 12.11 54% male	Outcome: Aggression Measure: AAYP violence subscale (4 items) Type: self-report	Initiating change Locally in bullying and Aggression Through the School Environment 8 months 3 BCTs: 3.1, 11.2, 12.2	No treatment	Universal	8 secondary schools in the UK	0.01
Bonell et al. (2018)	CRCT	N = 6667 Year 7 44.9% male	Outcome: Aggression Measure: Edinburgh Study of Youth Transitions and Crime Follow-up: (a) 24 months (b) 36 months	Learning Together 3 years 6 meetings per year 5-10 lessons per year 3 BCTs: 3.1, 11.2, 12.2	No treatment	Universal	40 secondary schools in the UK	(a) 0.03 (b) 0.01
Booth (1995)	RCT	N = 53 Age (mean) = 13.42 67% male	a) Outcome: Aggression Measure: Youth Self-Report checklist (Aggression) Type: self-report Follow-up: (c) post-test (d) 4 months b) Outcome: Aggression	Chill-out program: anger control training 12 sessions 45min/session 19 BCTs: 1.3, 1.7, 2.3, 3.1, 3.2, 4.1, 4.2, 4.3, 5.3, 5.6, 6.1, 8.1, 8.2, 10.1, 10.2, 10.3, 10.4, 10.6, 13.2	Treatment as usual 1 BCT: 3.1	Targeted	Suburban junior high school in the US	(a,c) 0.56 (b,c) 1.01 (a,d) 0.25 (b,d) 0.63

			Measure: Teacher's Report Form (Aggression) Type: teacher report Follow-up: (c) post-test (d) 4 months					
Bosworth et al. (1996); Bosworth et al. (2000)	CRCT	N = 558 6th, 7th and 8th grade 46% male	Outcome: Aggression Measure: Modified UT-Health Science Centre Aggression Scale + Conflict Tactic Scale Type: self-report Follow-up: 4 months	SMART Talk 16 weeks 40min/week 8 BCTs: 1.2, 1.8, 4.1, 4.2, 8.1, 8.2, 9.1, 13.2	No treatment	Universal	Suburban middle school in the US	0.04
Botvin et al. (2006)	CRCT	N = 4858 6th grade 51% male	Outcome: Physical aggression (a) Any (b) More than 3 times Type: self-report Follow-up: 3 months Outcome: Fighting (c) Any (d) More than 3 times Type: self-report Follow-up: 3 months Outcome: Verbal aggression (e) Any (f) More than 5 times Type: self-report Follow-up: 3 months	Life Skills Training 15 sessions 7 BCTs: 2.7, 6.1, 8.1, 8.2, 8.6, 10.3, 11.2	Standard health education curriculum	Universal	Public and parochial schools in the US	(a) 0.15 (b) 0.05 (c) 0.13 (d) 0.16 (e) 0.15 (f) 0.06
Boulton and Flemington (1996)	CRCT	N = 170 Year 7-10 52% male	Outcome: Bullying Type: self-report	Sticks and Stones video watching + discussion 1 session 2 BCTs: 5.6, 9.1	Standard curriculum	Universal	Semi-rural secondary school in the UK	-0.07

Bunford (2016)	RCT	N = 16 Age (mean) = 16.3 100% male	a) Outcome: Physical Aggression Measure: Buss-Perry Aggression Questionnaire (Physical Aggression) Type: self-report b) Outcome: Physical Aggression Measure: Modified Overt Aggression Scale (Physical Aggression) Type: self-report	Interpersonal Skills Group 7 weeks 14 BCTs: 1.1, 1.2, 1.3, 1.6, 1.7, 2.2, 2.7, 4.1, 4.2, 5.3, 5.4, 8.1, 8.6, 8.7,	Waiting list	Targeted	Juvenile correctional facility in the US	(a) 0 (b) 0.11
Cappella and Weinstein (2006)	RCT	N = 134 Age (mean) = 10.5 100% female	Outcome: (a) Overt aggression (b) Relational aggression Measure: Modified Children's Social Behavior Scale Type: peer nominations Follow-up: 3 weeks Outcome: (c) Overt aggression (d) Relational aggression Measure: Modified Children's Social Behavior Scale Type: teacher report Follow-up: 3 weeks	Social Aggression prevention program 10 sessions in 10 weeks 1 session/week 40 minutes/session 7 BCTs: 1.2, 2.7, 4.1, 4.2, 5.3, 6.1, 8.2	Reading club	Universal	6 urban schools in the US	(a) 0.02 (b) 0.00 (c) -0.05 (d) -0.09
Carraro et al. (2014)	CRCT	N = 210 Age (mean) = 13.27 58% male	Outcome: (a) Physical aggression (b) Verbal aggression Measure: Aggression Questionnaire short version Type: self-report	Play fighting in physical education 4 weeks 2 h/week 3 BCTs: 4.1, 6.1, 8.1	No treatment	Universal	2 suburban junior high schools in Italy	(a) 0.61 (b) 0.67

Castillo et al. (2013)	CRCT	N = 590 Age (mean) = 13.83 48% male	Outcome: (a) Physical aggression (b) Verbal aggression Measure: Aggression Questionnaire Type: self-report Follow-up: 6 months	INTEMO program 6 months 1h/2 weeks 6 BCTs: 1.2, 4.2, 5.3, 8.1, 11.2, 13.2	No treatment	Universal	8 public schools in Spain	(a) 0.22 (b) 0.20
Chapman et al. (2013)	CRCT	N = 314 Age (mean) = 13.6	Outcome: Violence Measure: Australian self-report Delinquency Scale (Violence Risk Behaviours) Type: self-report Follow-up: 6 months	Skills for Preventing Injury in Youth + school connectedness component 8 weeks 50min/week 5 BCTs: 4.2, 5.3, 8.1, 11.2, 13.2	No treatment	Universal	5 secondary schools in Australia	1.00
Chaux et al. (2016)	CRCT	N = 1075 Age (mean) = 13.36 48% male	Outcome: (a) Bullying (b) Cyberbullying Measure: European Cyberbullting Intervention Project Questionnaire Type: self-report Follow-up: 6 months	c) Medienhelden long version 15 sessions 45 min/session 8 BCTs: 4.1, 5.3, 6.2, 8.1, 10.3, 11.2, 13.1, 13.2 d) Medienhelden short version 4 sessions 90 min/session 8 BCTs: 4.1, 5.3, 6.2, 8.1, 10.3, 11.2, 13.1, 13.2	Waiting list	Universal	5 schools in Germany	(a,c) 0.25 (a,d) 0.14 (b,c) 0.27 (b,d) 0.00
Cheng et al. (2008)	RCT	N = 166 Age (mean) = 13 66% male	a) Outcome: Fighting Type: self-report b) Outcome: Fighting with injuries	Mentoring + home visits + case management + list of community resources Minimum 6 sessions	Case management + list of community resources	Targeted	2 urban emergency departments in the US	(a) 0.04 (b) 0.19 (c) -0.19

			Type: self-report c) Outcome: Weapon carrying Type: self-report	2 to 6 months 5 BCTs: 1.3, 1.9, 4.1, 8.1, 12.2				
Coleman et al. (1992)	RCT	N = 52 Age (mean) = 15.75 74% male	Outcome: Aggression Measure: Behavior Incident Report Type: observation	Aggression Replacement Training 10 weeks 50h/week 20 BCTs: 1.2, 1.4, 2.2, 2.3, 4.1, 4.2, 5.3, 6.1, 6.2 8.1, 8.2, 8.4, 8.6, 9.1, 10.2, 10.4, 10.9, 13.2, 15.2, 15.4	No treatment	Targeted	Residential treatment centre in the US	-0.50
Crooks et al. (2011); Wolfe et al. (2009)	CRCT	N = 1722 9th grade 47% male	a) Outcome: Physical aggression Measure: National Longitudinal Survey of Children and Youth Delinquent Behavior Inventory (3 items) Type: self-report Follow-up: 2 years b) Outcome: Physical aggression Measure: National Longitudinal Survey of Children and Youth Delinquent Behavior Inventory (8 items) Type: self-report Follow-up: 2 years	Fourth R: skills for youth Relationships + school-level components 21 sessions 1.25h/session 7 BCTs: 2.2, 4.1, 5.1, 5.3, 8.1, 8.2, 13.2	No treatment	Universal	20 high schools in Canada	(a) -0.05 (b) 0.05
Cross et al. (2015); Cross et al. (2016);	CRCT	N = 3382 8th grade 47% male	Outcome: Cyberbullying Type: self-report Follow-up:	Cyber Friendly Schools + usual responses to bullying	Usual responses to bullying	Universal	35 secondary schools in Australia	(a) 0.07 (b) 0.07

Shaw et al. (2015)			(a) post-test (b) 12 months	1.5 years 4 BCTs: 3.1, 6.3 8.1, 9.1				
Cunningham et al. (2009); Walton et al. (2010)	RCT	N = 726 Age (mean) = 16.8 44% male	Outcome: Aggression Measure: unknown Type: self-report Follow-up: (a) 3 months (b) 6 months (c) 12 months	d) Computer brief intervention + brochure 1 session 30 minutes 10 BCTs: 1.3, 1.9, 2.2, 5.3, 6.2, 8.1, 9.2, 12.5, 13.2, 15.1 e) Therapist brief intervention + brochure 1 session 35 minutes 12 BCTs: 1.3, 1.6, 1.9, 2.2, 3.1, 5.3, 6.2, 8.1, 9.2, 12.5, 13.2, 15.1	Brochure 12.5	Targeted	Level I trauma centre in the US	(a,d) 0.17 (a,e) 0.30 (b,d) 0.00 (b,e) 0.10 (c,d) 0.06 (c,e) 0.28
Deffenbacher, et al. (1996)	RCT	N = 120 6^{th}, 7^{th}, and 8^{th} grade 52.5% male	Outcome: Anger out Measure: Anger Expression Inventory Type: self-report	a) Cognitive-relaxation coping skills 9 weekly sessions 45 min/session 7 BCTs: 1.2, 4.1, 4.2, 8.1, 11.2, 15.2, 15.4 b) Social skills training 9 weekly sessions 45 min/session 8 BCTs: 1.2, 4.1, 4.2, 8.1, 8.2, 8.6, 15.2, 15.3,	No treatment	Targeted	1 middle school and 1 junior high school in the US	(a) 0.76 (b) 1.01
Densley et al. (2017)	CRCT	N = 391 Age range: 12 – 14 60% male	Outcome: Violence Measure: Delinquency Inventory (3 items) Type: self-report Follow-up: (a) post-test	Growing Against Gangs and Violence 5 weeks 6 sessions/5 weeks 4 BCTs: 5.1, 5.3, 8.1, 13.2	No treatment	Universal	4 schools in the UK	(a) 0.55 (b) 0.88

			(b) 1 month					
DeSmet et al. (2018)	CRCT	N = 249 8th grade 41.5% male	Outcome: (a) Bullying (b) Cyberbullying Type: self-report Follow-up: 1 month	Friendly ATTAC 1 session 6 BCTs: 2.2, 4.1, 6.3, 10.3, 13.1, 14.2	Waiting list	Universal	2 secondary schools in Belgium	(a) 0.09 (b) 0.05
Domino (2013)	CRCT	N = 336 Age (mean) = 12.2 46% male	Outcome: Bullying Measure: Peer Relations Questionnaire (Perpretation) Type: self-report	Take the lead 16 weeks 45 min/week 8 BCTs: 1.2, 4.1, 5.3, 6.2, 8.1, 8.2, 11.2, 13.4	Waiting list	Universal	Suburban middle school in the US	0.66
Eron et al. (2002)	CRCT	N = 2181 4th grade 61% male	Outcome: Aggression Measure: Peer Nomination Inventory (Aggression) + Teacher Report Form (Aggression) Type: peer and teacher report	a) Yes I Can curriculum + teacher consultation 16 months 1h/week 1 BCT: 12.2 b) Yes I Can curriculum + teacher consultation + small-group training 16 months 2h/week 10 BCTs: 1.2, 2.1, 2.2, 4.1, 5.2, 5.3, 8.1, 8.2, 10.2, 10.3, 10.6	No treatment	Universal and targeted	16 schools in the US	(a) -0.45 (b) -0.62
Espelage et al. (2013)	CRCT	N = 3616 Age (mean) = 11.24 52% male	(a) Outcome: Fighting Measure: University of Illinois Fighting Scale Type: self-report (b) Outcome: Verbal/relational bullying	Second Step: Student success Through Prevention 15 weeks 50 min/week 15 BCTs: 1.2, 1.4, 1.9, 2.2, 4.1, 5.1, 5.3, 6.1,	Waiting list	Universal	36 schools in the US	(a) 0.20 (b) 0.05

			Measure: University of Illinois Bully Scale Type: self-report	8.1, 8.2, 8.6, 9.3, 11.2, 13.2, 15.4				
Etscheidt (1984)	CRCT	N = 30 Age (mean) = 15.17 80% male	Outcome: Aggression Type: Observation Follow-up: (a) post-test (b) 2 weeks (c) 1 month	(c) Cognitive behavioural interpersonal problem solving 3 weeks 2.5h/week 15 BCTs: 1.1, 1.2, 1.4, 1.8, 2.1, 4.1, 4.2, 5.3, 5.6, 6.2, 8.1, 8.2, 9.3, 10.5, 10.6 (d) Cognitive behavioural interpersonal problem solving + reinforcement contingent 3 weeks 2.5h/week 15 BCTs: 1.1, 1.2, 1.4, 1.8, 2.1, 4.1, 4.2, 5.3, 5.6, 6.2, 8.1, 8.2, 9.3, 10.3, 10.6	Instruction in social skills	Targeted	School for chronically disruptive adolescents in the US	(a,c) 2.77 (a,d) 4.08 (b,c) 1.84 (b,d) 3.96
Farrell et al. (2001)	CRCT	N = 626 Age (mean) = 11.7 50% male	Outcome: (a) Threatening (b) Weapon carrying (c) Threatening with a weapon (d) Fighting Measure: Problem Behavior Frequency Scales (Violent Behavior) Type: self-report Follow-up:	Responding in Peaceful and Positive Ways 25 weeks 50 min/week 6 BCTs: 1.2, 4.1, 8.1, 8.2, 12.3, 15.2	No treatment	Universal	3 public middle schools in the US	(a,e) 0.05 (b,e) 0.14 (c,e) -0.06 (d,e) 0.51 (a,f) 0.10 (b,f) 0.29 (c,f) 0 (d,f) 0.05

			(e) Post-test (f) 6 months					
Farrell et al. (2003)	CRCT	N = 476 Age (mean) = 12.8 47% male	Outcome: (a) Violence (b) Nonphysical aggression Measure: Problem Behavior Frequeny Scales Type: self-report Follow-up: (c) post-test (d) 6 months	Responding in Peaceful and Positive Ways 6th Grade + Responding in Peaceful and Positive Ways 7th Grade + peer mediation 9 BCTs: 1.2, 1.9, 4.1, 4.3, 8.1, 9.3, 12.3, 13.2, 15.2	Responding in Peaceful and Positive Ways 6th Grade + peer mediation 5 BCTs: 4.1, 8.1, 1.2, 15.2, 12.3	Universal	2 middle schools in the US	(a,c) -0.11 (a,d) 0.03 (b,c) -0.03 (b,d) 0.06 (b,d,m) 0.37 (b,d,f) -0.14
Farrell et al. (2002)	RCT	N = 204 6th grade 55% male	Outcome: (a) Physical Aggression (b) Nonphysical aggression Measure: Problem Behavior Frequency Scale Type: self-report Follow-up: (c) post-test (d) 12 months	Responding in Peaceful and Positive Ways 6th grade 25 lessons 2 lessons/week 17 BCTs: 1.2, 1.8, 2.7, 3.1, 4.1, 4.2, 5.3, 6.1, 6.2, 8.1, 8.2, 9.2, 11.2, 12.3, 13.1, 15.2, 15.4	No treatment	Universal	Rural middle school in the US	(a,c) 0.28 (a,d) 0.01 (b,c) 0.17 (b,d) -0.02
Feindler et al. (1986)	CRCT	N = 21 Age range: 13-18 100% male	Outcome: Physical Aggression Type: Disciplinary records	The art of self-control 12 sessions in 8 weeks 13 BCTs: 1.2, 2.2, 2.3, 4.1, 4.2, 5.2, 5.3, 6.1, 8.1, 8.2, 10.2, 11.2, 15.4	Waiting list	Targeted	Psychiatric treatment facility in the US	0.13
Fekkes (2005)	CRCT	N = 2848 Age (mean) = 10.1 50% male	Outcome: Bullying Type: self-report Follow-up: (a) post-test (b) 1 year	Olweus anti-bullying program 9 months 7 BCTs: 1.1, 1.9, 2.2, 7.1, 8.1, 10.4, 10.11	No treatment	Universal	50 elementary schools in the Netherlands	(a) -0.06 (b) -0.10
Flewelling et al.(1999);	RCT	N = 255 Age (mean) = 14 100% male	Outcome: Weapon carrying Type: self-report Follow-up:	c) Supporting Adolescents with Guidance and	Waiting list	Targeted	US	(a,c) -0.37 (a,d) -0.24 (b,c) -0.16

Ringwalt et al. (1996)			(a) 6 months (b) 18 months	Employment (SAGE): Afrocentric rites of passage (ROP) + summer job training and placement (JTP) + Junior Achievement (JA) ROP: 7 months (biweekly 2h seminars + mentoring) JTP: 6 weeks JA: 3 months (weekly sessions) 7 BCTs: 1.2, 3.1, 4.1, 5.3, 8.1, 8.2, 10.2 d) SAGE: JTP + JA JTP: 6 weeks JA: 3 months (weekly sessions) 3 BCTs: 4.1, 8.1, 10.2				(b,d) -0.25
Foshee et al. (2014)	CRCT	N = 1886 Age (mean) = 13.9 49% male	Outcome: weapon carrying Type: self-report Follow-up: 1 year	Safe Dates 4 months 5 BCTs: 5.3, 6.3, 8.1, 12.5, 13.2	No treatment	Universal	14 public schools in the US	0.20
Franco et al. (2016)	RCT	N = 27 Age (mean) = 15.85 59% male	Outcome: (a) Physical aggression (b) Verbal aggresison Measure: Aggression Questionnaire Type: self-report	Meditacion Fluir 10 sessions 1 h/week 6 BCTs: 1.4, 4.1, 8.1, 8.3, 11.2, 13.2	Waiting list	Targeted	High school in Spain	(a) 0.80 (b) 1.00
Friedman et al. (2002)	RCT	N = 201 Age (mean) = 15.5 100% male	Outcone: Violence Measure: Adolescent Drug Abuse Diagnosis (Violent Offenses) Type: self-report	Botvin Life Skills Training + Prothow/Sith anti-violence + Values	Treatment as usual	Targeted	Residential treatment facility in the US	-0.06

			Follow-up: 6 months	Clarification + Treatment as usual 9 weeks 5h/week 15 BCTs: 1.2, 1.3, 4.1, 4.2, 5.1, 5.3, 6.1, 6.3, 8.2, 10.3, 10.9, 11.2, 13.2, 13.5, 15.4				
Garaigordobil and Martínez-Valderrey (2015)	CRCT	N = 176 Age range: 13 – 15 44% male	Outcome: (a) Bullying (b) Cyberbullying Measure: Cyberbullying: Screening of Peer Harassment Type: self-report	Cyberprogram 2.0 19 weeks 1h/week 7 BCTs: 1.2, 4.1, 5.3, 5.6, 8.1, 11.2, 13.2	No treatment	Universal	3 secondary schools in Spain	(a) 0.75 (b) 0.69
Gilberg (1982)	RCT	N = 30 Age (mean) = 16.46 100% male	Outcome: Aggression Measure: Classroom Observation Checklist for Aggressiveness Type: Observation	Cognitive role-taking training 8 weeks 1h/week 3 BCTs: 2.2, 5.3, 8.1	1. Telling stories 2. No treatment	Targeted	School for boys in the US	0.75
Gillen (2018)	RCT	N = 95 Age (mean) = 16.91 100% male	Outcome: (a) Total aggression (b) Reactive aggression (c) Proactive aggression Measure: Peer Conflict Scale Type: self-report	Motivational Interviewing + residential treatment 3 weekly sessions 1 h/session 11 BCTs: 1.2, 3.1, 4.2, 5.3, 6.2, 8.1, 8.2, 9.2, 12.2, 12.3, 15.3	Residential treatment	Targeted	Residential program in the US	(a) -0.39 (b) -0.32 (c) -0.47
Goldbeck and Schmid (2003)	RCT	N = 50 Age (mean) = 10.2 50% male	Outcome: Aggression Measure: Child Behavior Checklist (Aggression) Type: parent-report	Autogenic relaxation training 8 weeks 30 min/week 9 BCTs: 1.2, 2.3, 2.4, 4.1, 8.1, 8.3, 8.6, 11.2, 12.5	Waiting list	Targeted	Outpatient paediatric setting in Germany	0.28

Goldstein et al. (2018)	RCT	N = 70 Age (mean) = 17.45 100% female	Outcome: (a) Physical Aggression (b) Indirect Aggression Measure: Aggression Questionnaire Type: self-report Outcome: (c) Physical Aggression (d) Reactive overt aggression (e) Proactive overt aggression (f) Relational aggression (g) Reactive relational aggression (h) Proactive relational aggression Measure: Peer Conflict Scale Type: self-report	Juvenile Justice Anger Management Treatment for Girls + treatment as usual 8 weeks 2 sessions/week 90min/session 19 BCTs: 1.1, 1.2, 2.2, 3.1, 4.1, 4.2, 4.3, 5.3, 6.1, 8.1, 8.2, 8.6, 10.1, 10.2, 10.4, 11.2, 12.3, 13.2, 15.4	Treatment as usual	Targeted	3 residential juvenile justice facilities in the US	(a) 0.70 (b) 0.97 (c) 0.74 (d) 0.77 (e) 0.51 (f) 0.55 (g) 0.70 (h) 0.35
Goldstein et al.	CRCT	N = 12 Age (mean) = 15.8 100% female	Outcome: (a) Total aggression (b) Physical aggression (c) Verbal aggression Measure: Aggression Questionnaire Type: self-report d) Outcome: Relational Aggression Type: peer nominations	Anger Management for Female Juvenile Offenders + treatment as usual 9 weeks 3h/week 13 BCTs: 1.1, 1.2, 1.4, 1.5, 4.2, 6.1, 8.1, 8.2, 10.2, 10.3, 11.2, 12.4, 15.4	Treatment as usual	Targeted	Residential juvenile justice facility in the US	(a) 4.10 (b) 0.78 (c) 8.70 (d) 1.20
Gottfredson, Cross, Wilson, Connell, et al.	RCT	N = 447 Age (mean) = 12.22 54% male	Outcome: Aggression Measure: All Star questionnaire	All Stars + homework assistance + leisure activities + attendance	No treatment	Targeted	5 urban middle schools in the US	0.08

(2010); Gottfredson, Cross, Wilson, Rorie, et al. (2010)			Type: self-report	monitoring and rewarding 30 weeks 3 sessions/week 3h/session 13 BCTs: 1.2, 1.3, 2.1, 3.2, 4.1, 6.2, 6.3, 8.1, 10.1, 10.2, 10.4, 13.3, 14.4				
Griffin Jr. et al. (2009)	RCT	N = 199 8th grade 62% male	Outcome: Violence Measure: Monitoring the Future survey (5 items) Type: self-report	Building Resiliency and Vocational Excellence 6 months 10 BCTs: 1.3, 2.7, 3.1, 5.3, 6.1, 6.2, 6.3, 8.1, 8.6, 10.3	No treatment	Targeted	Middle school in the US	-0.17
Guerra and Slaby (1990)	RCT	N = 165 Age (mean) = 17.17 50% male	Outcome: Aggression Measure: Behavior Rating Scale (Aggressive Behavior) Type: staff report	Cognitive mediation training 12 weeks 1h/week 10 BCTs: 1.2, 1.3, 2.4, 4.1, 4.2, 4.3, 5.3, 8.1, 8.2, 13.2	1. Basic skills sessions 2. No treatment	Targeted	Juvenile correctional facility in the US	0.82
Gusmões et al. (2018)	CRCT	N = 8247 Age range: 11 - 15 49.1% male	a) Outcome: Bullying Type: self-report Follow-up: (c) 6 months (d) 18 months b) Outcome: Physical Aggression Type: self-report Follow-up: (c) 6 months (d) 18 months	Unplugged 12 weeks 1 lesson/week 50 min/lesson 16 BCTs: 1.2, 1.3, 2.1, 2.2, 2.3, 4.1, 4.2, 5.1, 5.3, 5.4, 6.2, 8.1, 8.2, 8.6, 13.1, 13.4	No treatment	Universal	72 elementary schools in Brazil	(a,c) 0 (b,c) -0.05 (a,d) -0.03 (b,d) -0.06

Hanewinkel et al. (2010)	CRCT	N = 3490 Age (mean) = 12.63 50% male	Outcome: Bullying Measure: unknown Type: self-report Follow-up: 1 month	Smokefree Class competition: be smart, don't start 6 months 3 BCTs: 1.1, 1.8, 10.6	No treatment	Universal	Schools in Germany	0.03
Harrington et al. (2001)	CRCT	N = 1655 Age (mean) = 12 45% male	Outcome: Violence Measure: items from delinquency scales Type: self-report Follow-up: (a) post-test (b) 1 year	All stars 5 BCTs: 1.3, 1.9, 5.3, 6.2, 6.3	No treatment	Universal	14 middle schools in the US	(a) -0.04 (b) -0.06
Hecht et al. (2008); Nieri et al. (2015)	CRCT	N = 581 Age (mean) = 11 46% male	a) Outcome: fighting Type: self-report Follow-up: 1 month b) Outcome: weapon carrying Type: self-report Follow-up: 1 month	Keepin' it REAL 10 sessions + 5 booster sessions 45 min/session 10 BCTs: 1.2, 4.1, 5.3, 6.1, 6.2, 6.3, 8.1, 11.2, 12.3, 13.3	No treatment	Universal	30 public schools in the US	(a) 0.01 (b) 0.17
Herrmann and McWhirter (2003)	CRCT	N = 216 7^{th}, 8^{th} and 9^{th} grade 45% male	a) Outcome: Aggression Measure: Missouri Peer Relations Inventory (Aggression) Type: self-report b) Outcome: Aggression Measure: Missouri Peer Relations Inventory (Aggression) Type: parent-report c) Outcome: Aggression Type: official records	Student-Created Aggression Replacement Education 8weeks 30 min/week 8 BCTs: 2.3, 4.1, 4.2, 4.3, 8.1, 8.2, 11.2, 15.4	Enter here curriculum	Targeted	2 alternative schools in the US	(a) 0.03 (b) 0.01 (c) -0.19

Hudley and Graham (1993)	RCT	N = 24 Age (mean) = 10.5 100% male	a) Outcome: Aggression Measure: Teacher Checklist (aggression) Type: teacher report b) Outcome: Reactive Aggression Measure: Teacher Checklist (reactive aggression) Type: teacher report	Attribution retraining program 6 weeks 2h/week 4 BCTs: 1.4, 4.2, 4.3, 8.1	1. Building thinking skills 2. No treatment	Targeted	Two elementary schools in the US	a) 0.59 b) 0.52
Huey (1984)	RCT	N = 48 8^{th}-9^{th} grade 100% male	Outcome: Aggression Measure: Walker Problem Behavior Identification Checklist (Acting-Out) Type: teacher report	1. Counsellor-led assertive training 4 weeks 2.5h/week 4 BCTs: 2.2, 6.1, 8.1, 10.2 2. Peer-led assertive training 4 weeks 2.5h/week 4 BCTs: 2.2, 6.1, 8.1, 10.3	1. Counsellor-led discussion group 2. Peer-led discussion group 3. No treatment	Targeted	Urban high school in the US	1.19
Johnston et al. (2002)	RCT	N = 631 Age (mean) = 16.4 65.2% male	Outcome: Weapon carrying Type: self-report Follow-up: (a) 3 months (b) 6 months	Behaviour Change Counselling 1 session of 20 minutes 3 BCTs: 3.1, 13.3, 15.1	No treatment	Universal	Emergency department in the US	(a) -0.10 (b) 0.19
Jones (1991)	RCT	N = 18 Age (mean) = 13.75 50% male	Outcome: Aggression Measure: Behavior Incident Report Type: observation	a) Aggression Replacement Training 10 weeks 3h/week 19 BCTs: 1.2, 1.4, 2.2, 4.1, 4.2, 5.3, 6.1, 6.2, 8.1, 8.2, 8.4, 8.6, 9.1,	No treatment	Targeted	High school in Australia	(a) 0.75 (b) -0.06

				10.2, 10.4, 10.9, 13.2, 15.2, 15.4 b) Moral reasoning 10 weeks 1 h/week 3 BCTs: 1.2, 6.2, 13.2				
Jordans et al. (2010)	CRCT	N = 325 Age (mean) = 12.7 51% male	Outcome: Physical aggression Measure: Aggression Questionnaire (Physical Aggression) Type: self-report	Classroom-based intervention 5 weeks 3h/week 5 BCTs: 8.1, 11.2, 12.5, 13.2, 15.4	Waiting list	Targeted	4 schools in Nepal	0.11
Karataş (2011)	RCT	N = 36 9^{th}-11^{th} grade 50% male	Outcome: Aggression Measure: Scale of Determining Conflict Resolution Behavior (Aggression) Type: self-report	Psychodrama 10 weeks 1 session/week 90-120 min/session 4 BCTs: 2.7, 8.1, 11.2, 13.4	1. No treatment 2. Interaction group	Targeted	High school in Turkey	1.70
Karataş and Gökçakan (2009)	RCT	N = 36 9^{th} grade 48% male	a) Outcome: (a) Total aggression (b) Physical aggression (c) Indirect aggression Measure: Aggression Scale Type: self-report	d) Cognitive Behavior Therapy 10 sessions 1 session/week 90-120 min/session 1 BCT: 3.1 e) Psychodrama 14 sessions 1 session/week 90-120 min/session 2 BCTs: 2.7, 11.2	No treatment	Targeted	High school in Turkey	(a,d) 4.42 (b,d) 3.37 (a,e) 2.51 (c,d) 2.00 (c,e) 2.61
Kärnä et al. (2013)	CRCT	N = 19191 8^{th} and 9^{th} grade	a) Outcome: Bullying Measure: Olweus' Bully/Victim Questionnaire (Bullying)	KiVa Antibullying program + internet forum 13-23 lessons	No treatment	Universal and targeted	78 schools in Finland	(a) 0.04 (b) 0 (b,m) 0.11 (b,f) 0

			Type: self-report b) Outcome: Bullying Measure: Participant Role Questionnaire (Bullying) Type: peer nominations	6 BCTs: 3.1, 5.3, 8.1, 12.2, 12.5, 13.2				
Kazdin et al. (1987)	RCT	N = 56 Age (mean) = 10.9 80% male	Outcome: Aggression Measure: School Behavior Checklist (aggression) Type: teacher-report Follow-up: (a) 1 month (b) 1 year	c) Cognitive behavioural problem solving skills training 10 weeks 1.5h/week 10 BCTs: 1.2, 2.2, 3.1, 6.1, 7.4, 8.1, 10.2, 10.4, 14.1, 14.2 d) Nondirective relationship theory 10 weeks 1.5h/week 6 BCTs: 3.1, 3.3, 7.4, 10.2, 14.2, 14.3	Sessions with therapist 4 BCTs: 3.1, 7.4, 14.2, 14.3	Targeted	Psychiatric hospital in the US	(a,c) 0.96 (a,d) 0.24 (b,c) 0.65 (b,d) -0.21
Kliewer et al. (2011)	CRCT	N = 258 7th grade 45% male	a) Outcome: Physical Aggression Measure: Problem Behavior Frequency Scale (Physical Aggression) Type: self-report Follow-up: (c) 2 months (d) 6 months b) Outcome: Aggression Measure: Teacher Report Form (Aggressive Behavior) Type: teacher report Follow-up: (c) 2 months	e) Standard expressive writing 5 weeks 1h/week 3 BCTs: 4.1, 6.1, 8.1 f) Enhanced expressive writing 5 weeks 1h/week 3 BCTs: 4.1, 6.1, 8.1	Non-emotional writing 3 BCTs: 4.1, 6.1, 8.1	Targeted	3 urban middle schools in the US	(a,c,e) -0.12 (b,c,e) 0.48 (a,c,f) -0.12 (b,c,f) 0.17 (a,d,e) -0.02 (b,d,e) -0.09 (a,d,f) -0.09 (b,d,f) -0.06

			(d) 6 months					
Komro et al. (2004); Perry et al. (2003)	CRCT	N = 6237 Age (mean) = 13 52% male	a) Outcome: physical aggression Measure: Physical Violence Scale Type: self-report b) Outcome: Weapon carrying Measure: Weapon Carrying Scale Type: self-report c) Outcome: verbal aggression Measure: Verbal Violence Scale Type: self-report	d) Drug Abuse Resistance Education 10 weeks 13 BCTs: 1.2, 1.4, 5.1, 5.3, 6.2, 8.1, 8.2, 9.1, 9.2, 10.4, 10.11, 12.3, 13.2 e) Drug Abuse Resistance Education + Play and Learning Under supervision 14weeks 15 BCTs: 1.2, 1.4, 4.1, 5.1, 5.3, 6.2, 8.1, 8.2, 9.1, 9.2, 10.4, 10.11, 12.2, 12.3, 13.2	Waiting list	Universal	24 middle schools in the US	(a,d,m) -0.03 (a,e,m) 0.1 (a,d,f) -0.13 (a,e,f) -0.03 (b,d,m) 0.07 (b,e,m) 0.10 (a,d,f) -0.11 (a,e,f) -0.07 (c,d,m) -0.01 (c,e,m) 0.10 (c,d,f) -0.08 (c,e,f) -0.04
Kozina (2018)	CRCT	N = 73 8th grade 47% male	Outcome: Physical Aggression Measure: Aggression Scale for Pupils and Students Type: self-report Follow-up: (a) post-test (b) 6 months	My friends 10 workshops + 2 booster sessions 1 session/week 45 min/workshop 7 BCTs: 1.2, 4.1, 8.1, 10.3, 10.9, 11.2, 15.4	No treatment	Universal	2 urban schools in Slovenia	(a) 0.54 (b) 0.45
Krahé and Busching (2015); Möller et al. (2012)	RCT	N = 683 Age (mean) = 13.3 50% male	Outcome: (a) Physical aggression (b) Relational aggression Type: self-report Follow-up: (c) 18 months (d) 30 months	Class-based intervention 5 weeks 1.5 h/week 6 BCTs: 2.3, 5.3, 7.1, 8.1, 8.2, 13.2	No treatment	Universal	10 secondary schools in Germany	(a,c) 0 (a,d) -0.14 (b,c) -0.06 (b,d) -0.09

Lee et al. (2009)	RCT	N = 30 9th grade 80% male	a) Outcome: Aggression Measure: Self-rated scale Type: self-report b) Outcome: Aggression Type: peer nominations	Assertion training 8 weeks 50 min/week 7 BCTs: 1.2, 2.2, 2.3, 6.1, 6.2, 8.1, 15.2	1. How to make a decision 2. No treatment	Targeted	Secondary school in Canada	(a) 1.16 (b) 0.08
Li and Chen (2017)	RCT	N = 40 Age (mean) = 10.13 40% male	Outcome: physical aggression Measure: Aggression Questionnaire (physical aggression) Type: self-report	Neurofeedback training program 20 sessions 3 sessions/week 30 min/session 4 BCTs: 2.7, 4.1, 8.1, 8.7	Developing training course	Targeted	Schools in China	0.02
Lindstrom Johnson et al. (2015)	RCT	N = 200 Age (mean) = 16.68 40% male	Outcome: Fighting Measure: United States Youth Risk Behavior Surveillance System (Violence) Type: self-report	Healthy futures 5 months 1session/month 6 BCTs: 1.2, 3.1, 1.3, 8.1, 3.2, 1.6	TAU	Universal	Paediatric primary care clinic in the US	0.05
Lochman et al. (1984); Lochman et al. (1985)	RCT	N = 76 Age (mean) = 11.17 100% male	Outcome: Aggression Measure: Missouri Children's Behavior Checklist (Aggression) Type: parent and techer report Follow-up: 1 month	a) Anger coping 12 weeks 1h week 9 BCTs: 1.2, 4.2, 5.3, 6.1, 6.2, 8.1, 8.2, 8.6, 15.4 b) Goal setting 12 weeks 1h week 3 BCTs: 1.3, 2.5, 10.3 c) Anger coping + goal setting 12 weeks 1h week	No treatment	Targeted	8 suburban schools in the US	(a) 0.30 (b) -0.60 (c) 0.30

				12 BCTs: 1.2, 1.3, 2.5, 4.2, 5.3, 6.1, 6.2, 8.1, 8.2, 8.6, 10.3, 15.4				
Moody (1981)	RCT	N = 24 Age (mean) = 13.9 100% male	a) Outcome: Aggression Measure: Pittsburgh Adjustment Survey Scales (Aggressive Behavior) Type: teacher report b) Outcome: Aggression Type: teacher observation	Assertion training 5 weeks 1.5h/week 11 BCTs: 2.2, 4.1, 5.3, 5.4, 5.6, 6.1, 6.2, 8.1, 8.2, 8.6, 10.4	1. Group counselling 2. No treatment	Targeted	Middle school in US	(a) -1.04 (b) -2.26
Moore and Shannon (1993)	RCT	N = 58 Age (mean) = 14	Outcome: Aggression Measure: Formal Incident Report (aggressive behavior) Type: observation	Anger control treatment 10 weeks 2.5h/week 7 BCTs: 2.3, 2.7, 4.2, 10.2, 10.4, 14.1, 15.4	Treatment as usual 4 BCTs: 2.7, 10.2, 10.4, 14.1	Targeted	Residential treatment facility in the US	-0.06
Multisite Violence Prevention Project (2014)	CRCT	N = 2780 6th grade 65% male	Outcome: (a) Physical Aggression (b) Nonphysical aggression Measure: Behavioral Assessment System for Children + Problem Behavior Frequency Scale Type: teacher + parent + self-report Follow-up: (d) post-test (e) 2 years c) Outcome: Aggression Measure: Behavioral Assessment System for Children Type: teacher-report Follow-up:	Guiding Responsibility and Expectations for Adolescents for Today and Tomorrow (GREAT) for students + GREAT for teachers 1 year 20 sessions 15 BCTs: 1.2, 1.9, 4.1, 4.2, 5.3, 6.1, 8.1, 8.2, 9.3, 10.6, 11.2, 12.3, 13.2, 15.2, 15.4	No treatment	Universal	37 middle schools in the US	(a,d) 0.08 (c,d) 0.01 (a,e) 0.03 (b,e) -0.10 (c,e) 0.06

			(d) post-test (e) 2 years					
Newton (1994)	RCT	N = 48 7th and 8th grade 76% male	Outcome: Violence Measure: school referrals Type: official records	Aim high: students helping students (mentoring program) 16 weeks 1h/week 2 BCTs: 3.1, 3.2	No treatment	Targeted	Urban middle school in the US	0.72
Nickel et al. (2005)	RCT	N = 87 100% male	Outcome: Anger out Measure: STAXI Type: self-report	Progressive muscle relaxation 30 min/session 2 sesions/week 8 weeks 4 BCTs: 4.1, 8.1, 8.6, 11.2	Extremity movement BCTs: 4.1, 8.1, 8.6	Targeted	Home	2.67
Nocentini and Menesini (2016)	CRCT	N = 1045 Age (mean) = 10.93 49% male	Outcome: Bullying Measure: Florence Bullying Scale (perpetration) + Olweus' global key question (bullying)	KiVa 10 lessons 90 min/lesson 9 BCTs: 1.2, 1.8, 4.1, 4.3, 5.3, 8.1, 12.2, 12.5, 13.1	No treatment	Universal and targeted	13 schools in Italy	0.21
Norlander (2008)	RCT	N = 72 Age (mean) = 15.18 75% male	Outcome: Anger-out Measure: State-Trait Anger Expression Inventory-2 Type: self-report	Cognitive Behaviour Therapy 18 sessions 8 weeks 3 sessions/week 10 BCTs: 3.1, 4.1, 4.2, 8.1, 8.2, 8.3, 11.2, 13.2, 15.2, 15.4	No treatment	Targeted	Alternative Education Program in the US	0.16
Parker and Kupersmidt (2016)	CRCT	N = 118 Age (mean) = 11.7	Outcome: Aggression Type: teacher report	Moment 4 weeks 20 lessons 1 lesson/day 15min/lesson	Waiting list	Universal	Middle-schools in the US	1.21

				12 BCTs: 1.2, 1.4, 2.1, 4.1, 4.3, 6.1, 8.1, 8.2, 8.3, 8.6, 9.1, 11.2				
Parker et al. (2014)	CRCT	N = 111 Age (mean) = 10.09 42% male	Outcome: Aggression Measure: Child Behavior Checklist (Aggression) Type: Teacher report	Master Mind 20 lessons 4 weeks 1 lesson/day 15 min/lesson 15 BCTs: 1.2, 1.4, 4.1, 4.3, 5.3, 6.1, 8.1, 8.3, 8.6, 9.1, 10.4, 10.5, 11.2, 13.4, 15.4	Waiting list	Universal	2 elementary schools in the US	0.54
Petit (1998)	RCT	N = 90 Age (mean) = 16 47.30% male	a) Outcome: Aggression Measure: Teacher's Report Form (Aggression) Type: teacher report b) Outcome: Anger-Out Measure: State-Trait Anger Expression Inventory (Anger-Out) Type: self-report	Anger Management for Youth: Stemming Aggression and Violence 9 weeks 2 sessions/week 50 min/session 16 BCTs: 1.1, 1.2, 1.5, 2.2, 2.3, 3.1, 4.1, 4.2, 4.3, 5.3, 5.5, 8.1, 8.2, 8.6, 10.3, 15.4	1. No treatment 2. Educational videos	Targeted	Alternative education centres in the US	(a) -0.64 (b) -0.08
Puskar et al. (2015)	RCT	N = 179 Age (mean) = 15.61 48% male	a) Outcome: Physical aggression Type: self-report Follow-up: (c) post-test (d) 6 (e) 12 months b) Outcome: Anger-out Measure: State-Trait Anger Expression Inventory 2 (Anger-Out) Type: self-report	Teaching Kids to Cope with Anger 8 weeks 1 h/week 7 BCTs: 1.2, 4.1, 4.2, 5.3, 8.1, 11.2, 13.2	No treatment	Universal	3 rural public high schools in the US	(a,c) -0.26 (b,c) -0.02 (a,d) 0.07 (b,d) 0.11 (a,e) -0.08 (b,e) -0.00

			Follow-up: (c) post-test (d) 6 months (e) 12 months					
Şahin (2012)	RCT	N = 38 6th grade	Outcome: Bullying Measure: Scale of Identifying Bullying Type: self-report Follow-up: 2 months	Empathy training 11 sessions 1 session/week 75 min/session 6 BCTs: 2.2, 3.1, 4.1, 6.1, 6.2, 8.1	Discussion about daily issues	Targeted	Primary schools in Turkey	6.36
Shechtman (2000)	RCT	N = 70 Age range: 10 – 16 71% male	a) Outcome: Aggression Measure: Youth Self Report (Aggression) Type: self-report b) Outcome: Aggression Measure: Teacher Report Form (Aggression) Type: teacher report	Bibliotherapy and clarifying processes 10weeks 45 min/week 13 BCTs: 1.1, 1.2, 3.3, 4.1, 4.2, 4.3, 5.3, 5.6, 6.3, 8.1, 8.2, 9.2, 11.2	Waiting list	Targeted	Special education classrooms in 10 schools in Israel	(a) 0.63 (b) 0.42
Shechtman and Ifargan (2009)	CRCT	N = 904 5th, 6th, 7th and 8th grade 57% male	Outcome: (a) Total Aggression (b) Physical Aggression (c) Verbal aggression Measure: Aggression Questionnaire Type: self-report Outcome: (d) Physical aggression (e) Verbal aggression (f) Relational aggression Measure: Illinois Aggression Scale Type: self-report	g) Psychoeducational intervention 4 months 1h/week 5 BCTs: 1.1, 1.2, 1.3, 3.1, 8.1 h) Counselling 4 months 1h/week 8 BCTs: 1.1, 1.2, 1.3, 4.1, 4.2, 5.3, 5.6, 10.4	No treatment	i) Universal j) Targeted	Elementary and junior high schools in Israel	(a,g,i) 0.37 (b,g,i) 0.28 (c,g,i) 0.18 (d,g,i) 0.37 (e,g,i) 0.36 (f,g,i) 0.34 (a,h,i) 0.39 (b,h,i) 0.31 (c,h,i) 0.15 (d,h,i) 0.26 (e,h,i) 0.25 (f,h,i) 0.26 (a,g,j) 0.72 (b,g,j) 0.65 (c,g,j) 0.49 (d,g,j) 0.35 (e,g,j) 0.47

								(f,g,j) 0.45 (a,h,j) 0.66 (b,h,j) 0.55 (c,h,j) 0.45 (d,h,j) 0.45 (e,h,j) 0.64 (f,h,j) 0.36
Shetgiri et al. (2011)	CRCT	N = 108 9th grade 42% male	Outcome: Fighting (a) Last 3 months (b) Last 12 months Type: self-report Follow-up: 1 month	School-based violence and substance use prevention program + field trips and community service 7 months 40 min/week 10 BCTs: 1.2, 1.3, 2.2, 3.1, 4.1, 5.1, 6.2, 8.1, 11.2, 13.2	No treatment	Targeted	Urban high school in the US	(a) 0.05 (b) -0.16
Shinde et al. (2018)	CRCT	N = 13035 9th grade 54% male	Outcome: Violence Type: self-report	a) Strengthening Evidence Base on School-Based Interventions for Promoting Adolescent Health Program (SEHER) delivered by counsellor + AEP 8 months Several activities each month, one assembly per week 3 BCTs: 3.1, 8.1, 10.4 b) SEHER delivered by teacher + AEP 8 months	Adolescent Education Program (AEP)	Universal and targeted	Government-run secondary schools in India	(a) 0.21 (b) -0.17

				Several activities each month, one assembly per week 3 BCTs: 3.1, 8.1, 10.4				
Shlafer et al. (2013); Sieving et al. (2011)	RCT	N = 253 Age (mean) = 15.59 100% female	(a) Outcome: Violence Measure: Add Health (5 items) Type: self-report (b) Outcome: Relational aggression Type: self-report	Prime Time 18months 1 session /week 11 BCTs: 1.2, 2.3, 2.4, 3.1, 8.1, 10.2, 10.9, 11.2, 12.2, 13.1, 13.2	No treatment	Targeted	US	(a) -0.12 (b) 0.28
Silvia et al. (2010); Silvia et al. (2011)	CRCT	N = 10717 6th grade 49% male	a) Outcome: Physical Aggression Measure: Problem Behavior Frequency Scale (Aggression) Type: self-report b) Outcome: Weapon carrying Measure: Problem Behavior Frequency Scale (Weapons-related) Type: self-report c) Outcome: Physical aggression Measure: Problem Behavior Frequency Scale (Not weapons-related) Type: self-report	Responding in Peaceful and Positive Ways + Best Behavior program 3 school years 16 lessons/school year 50 min/lesson 22 BCTs: 1.2, 1.9, 4.1, 4.2, 4.3, 5.3, 6.1, 8.1, 8.2, 8.6, 9.3, 10.3, 10.6, 10.11, 11.2, 12.3, 13.1, 13.2, 14.2, 14.8, 15.2, 15.4	No treatment	Universal	40 middle schools in the US	(a) -0.01 (b) -0.05 (c) -0.01

Simon et al. (2002); Sussman et al. (1997); Sussman et al. (2002); Sussman et al. (1998)	CRCT	N = 2863 Age (mean) = 16.8 55% male	a) Outcome: Violence Type: self-report Follow-up: 1 year b) Outcome: Weapon carrying Type: self-report Follow-up: 1 year	Project Towards No Drug Abuse 3 weeks 2.5h/week 12 BCTs: 1.9, 3.2, 4.1, 4.2, 4.3, 5.3, 6.2, 6.3, 8.2, 9.2, 11.2, 13.2	No treatment	Targeted	21 continuation high schools in the US	(a,m) 0.11 (a,f) -0.06 (b,m) 0.22 (b,f) -0.17
Singh (2017)	RCT	N = 126 Age (mean) = 13.4 56% male	a) Outcome: Physical Aggression Measure: Aggression Questionnaire (Physical Aggression) Type: self-report b) Outcome: Aggression Measure: Aggression Questionnaire Type: self-report	Social Cognitive intervention 6 weeks 1 session/week 70 min/session 12 BCTs: 1.2, 2.2, 2.3, 2.4, 2.7, 4.2, 4.3, 5.3, 5.4, 8.1, 8.6, 9.2	Study skills	Targeted	Schools in India	(a) 1.03 (b) 0.96
Stallard et al. (2010); Stallard et al. (2013)	CRCT	N = 5761 Years 8, 9, 10 and 11 53% male	Outcome: Bullying Measure: Olweus Bully/Victim Questionnaire (Bullying) Type: self-report Follow-up: (a) post-test (b) 6 months	Resourceful Adolescent Programme 11 sessions 1h/session 7 BCTs: 1.2, 3.1, 8.1, 8.2, 11.2, 13.2, 13.4	1. Standard curriculum with facilitators 2. No treatment	Universal	8 schools in the UK	(a) 0.05 (b) 0.05
Stevens et al (2000)	CRCT	N = 1104 Age range: 10 – 16	Outcome: Bullying Measure: Bullying Inventory (Bullying) + Life in School Checklist (Bully) Type: self-report Follow-up: (a) post-test (b) 1 year	c) Flemish anti-bullying intervention + support from research group 4 weeks 1.5h/week 9 BCTs: 3.3, 4.1, 5.3, 6.1, 8.1, 8.2, 10.1, 13.2, 14.2	No treatment	Universal	(e) 9 primary schools (f) 9 secondary schools in Belgium	(a,c,e) 0.18 (a,d,e) 0.15 (a,c,f) -0.21 (a,d,f) 0.09 (b,c,e) 0.44 (b,d,e) 0.52 (b,c,f) -0.10 (b,d,f) 0.09

				d) Flemish anti-bullying intervention 4 weeks 1.5h/week 9 BCTs: 3.3, 4.1, 5.3, 6.1, 8.1, 8.2, 10.1, 13.2, 14.2				
Stoltz et al. (2013)	CRCT	N = 271 4th grade 71% male	Outcome: (a) Reactive Aggression (b) Proactive Aggression Measure: Teacher Rating of Aggression (child version) Type: self-report Outcome: (c) Reactive Aggression (d) Proactive Aggression Measure: Teacher Rating of Aggression Type: teacher report Outcome: (e) Reactive Aggression (f) Proactive Aggression Measure: Teacher Rating of Aggression (parent version) Type: parent report (h) Mother (i) Father g) Outcome: Aggression Measure: Social Information Processing test Type: self-report	Stay Cool Kids 8 weeks 1 session/week 45 min/session 11 BCTs: 1.2, 1.3, 1.8, 2.3, 4.2, 8.1, 8.2, 8.6, 11.2, 13.2, 13.4	No treatment	Targeted	48 elementary schools in the Netherlands	(a) 0.21 (b) 0.22 (c) 0.28 (d) 0.30 (e,h) 0.32 (f,h) 0.18 (e,i) 0.11 (f,i) 0.3 (g) 0
Swaim and Kelly (2008)	CRCT	N = 1492 7th and 8th grade	Outcome: Physical aggression	Resolve it, Solve it 2 years	No treatment	Universal	6 rural middle schools in the US	(m) -2.19 (f) 0.17

		47% male	Type: self-report	2 BCTs: 6.1, 12.5				
Uzunoglu and Baysan Arabaci (2017)	RCT	N = 16 Age (mean) = 16 50% male	Outcome: Anger-out Measure: State-Trait Anger Expression Inventory (Anger-Out) Type: self-report	Anger Management Education Program 6 weeks 1 session/week 60 min/session 5 BCTs: 1.2, 4.1, 4.2, 4.3, 8.1	Waiting list	Targeted	Psychiatric hospital in Turkey	0.63
Van Manen et al. (2004)	RCT	N = 97 Age (mean) = 11.2 100% male	a) Outcome: Reactive Aggression Measure: Teacher Rating Scale for Reactive and proactive Aggression (Reactive Aggression) Type: teacher-report b) Outcome: Proactive Aggression Measure: Teacher Rating Scale for Reactive and proactive Aggression (Proactive Aggression) Type: teacher-report	c) Social cognitive intervention program 11 weeks 70min/week 16 BCTs: 1.2, 2.7, 4.1, 4.2, 5.3, 7.1, 8.1, 8.6, 9.2, 10.4, 10.6, 10.9, 13.2, 14.3, 14.4, 15.4 d) Social skills training 11 weeks 70min/week 6 BCTs: 6.1, 7.1, 8.1, 8.2, 10.2, 14.1	Waiting list	Targeted	Outpatient mental health clinic in the Netherlands	(a,c) 0.55 (b,c) 0.17 (a,d) 0.17 (b,d) -0.51
Wade et al. (2018)	CRCT	N = 361 Age (mean) = 12.7 100% male	Outcome: Aggression Measure: Aggression Scale Type: self-report	Acting Teens Avoiding Screen Time 8 months 9 BCTs: 1.1, 2.2, 2.3, 3.1, 4.1, 5.3, 8.1, 8.7, 13.1	Waiting list	Targeted	14 secondary schools in Australia	0.10
Wagner et al. (2014)	RCT	N = 514 Age (mean) = 16.24 59% male	Outcome: Aggression Measure: Timeline Follow-Back (1 item) Type: self-report Follow-up: (a) post-test	Guided self-change 5 weeks 1session/week 8 BCTs: 1.2, 1.3, 2.2, 2.3, 3.1, 5.1, 6.2, 9.2	TAU	Targeted	16 high schools in the US	(a) 0.23 (b) -0.21 (c) -0.39

			(b) 3 months (c) 6 months					
Yorgun (2007)	RCT	N = 24 9th and 10th grade	Outcome: (a) Physical violence (b) Instrumental violence (c) Verbal violence Measure: Violent Behavior Checklist Type: self-report	Violence Management training 8 weeks 2 sessions/week 50 min/session 14 BCTs: 1.2, 1.4, 3.3, 4.1, 4.2, 4.3, 5.3, 8.1, 8.2, 8.6, 9.3, 12.4, 13.2, 15.4	No treatment	Targeted	School in Turkey	(a) -0.20 (b) 0.63 (c) 1.44
Zimmerman (1987)	CRCT	N = 36 Age (mean) = 15.75 100% male	a) Outcome: Aggression Measure: Behavior Incident Report (aggression intensity) Type: observation b) Outcome: Aggression Measure: Behavior Incident Report (aggression frequency) Type: observation	Aggression Replacement Training 10 weeks 3h/week 22 BCTs: 1.2, 1.4, 2.2, 2.3, 4.1, 4.2, 5.3, 6.1, 6.2, 8.1, 8.2, 8.4, 8.6, 9.1, 10.1, 10.2, 10.4, 10.5, 10.9, 13.2, 15.2, 15.4	No treatment	Targeted	Youth residential facility for delinquent boys in the US	a) 0.42 b) 0.43

Notes. Subscales used are between brackets under the measure. If follow-up is not indicated, the measure was taken only within one week after the intervention; RCT = Randomised Controlled Trial; CRCT = Cluster randomised controlled trial; m = males; f = females.

[a] Letters in brackets indicate for which outcome, follow-up and intervention group is the effect size.

Appendix B. Chapter 2 analyses without outliers

Table B1

Results of Moderator Analyses for Study Characteristics Based on 343 ESs from 100 Studies

Moderator variables	# studies	#ES	ES[a] (95% CI)	Omnibus test	p-value	Variance level 2[b]	Variance level 3[c]
Age (mean)	97	332	0.01 (-0.03, 0.04)	F(1,330) = 0.13	.721	0.020	0.186
Gender (proportion male)	94	326	-0.05 (-0.14, 0.04)	F(1,324) = 1.32	.251	0.019	0.181
Duration (in weeks)	99	341	-0.005 (-0.009, -0.002)*	F(1,339) = 7.64	.006*	0.020	0.166
Outcome				F(9,327) = 1.02	.422	0.020	0.174
General aggression	40	83	0.29 (0.17, 0.41)*				
Physical aggression	40	100	0.21 (0.11, 0.32)*				
Bullying	16	44	0.22 (0.08, 0.35)*				
Weapon carrying	9	22	0.16 (0.01, 0.31)*				
Fighting	7	11	0.27 (0.10, 0.45)*				
Reactive aggression	5	10	0.30 (0.03, 0.57)*				
Proactive aggression	5	10	0.21 (-0.06, 0.48)				
Anger-out	6	9	0.51 (0.24, 0.78)*				
Verbal aggression	12	24	0.20 (0.06, 034)*				
Relational aggression	12	24	0.25 (0.11, 0.40)*				
Functions of aggression				F(1,27) = 0.75	.395	0.000	0.501
Reactive	11	19	0.50 (0.05, 0.95)*				
Proactive	5	10	0.42 (-0.05, 0.89)				
Forms of aggression				F(1,181) = 0.29	.591	0.030	0.120
Direct	49	159	0.17 (0.06, 0.28)*				
Relational	12	24	0.21 (0.05, 0.37)*				
Target				F (1,341) = 10.90	.001*	0.019	0.167
Universal	46	190	0.14 (0.03, 0.25) *				
Targeted	56	152	0.36 (0.25, 0.47) *				

Note. # studies = number of independent studies; # ES = number of effect sizes; CI = confidence interval

[a] For categorical predictors, ES is Cohen's d for each category. For continuous predictors, ES is β for that specific predictor. [b] Variance between the effect sizes from the same study. [c] Variance between studies.

*p < 0.05

Table B2

Behaviour Change Technique Analyses for Universal Iinterventions Based on 188 ESs from 51 Intervention Groups

BCT No.	Behaviour Change Techniques	#IG present	#ES present	ES present (95% CI)	ES absent (95% CI)	t-value	p-value	Difference
1.1	Goal setting (behavior)	6	11	0.16 (-0.00, 0.33)	0.11 (0.04, 0.17)*	0.67	0.502	0.06
1.2	Problem solving	24	80	0.14 (0.06, 0.23)*	0.08 (-0.00, 0.16)	1.02	0.307	0.06
1.3	Goal setting (outcome)	5	29	0.07 (-0.12, 0.27)	0.12 (0.05, 0.18)*	0.39	0.695	-0.04
1.4	Action planning	6	11	0.12 (-0.11, 0.34)	0.11 (0.05, 0.17)*	0.03	0.974	0.00
1.8	Behavioral contract	5	6	0.12 (-0.05, 0.29)	0.11 (0.05, 0.17)*	0.11	0.911	0.01
1.9	Commitment	6	20	0.03 (-0.12, 0.18)	0.13 (0.06, 0.19)*	1.19	0.237	-0.10
2.2	Feedback on behavior	5	27	0.05 (-0.13, 0.22)	0.12 (0.06, 0.18)*	0.80	0.428	-0.07
3.1	Social support (unspecified)	13	27	0.09 (-0.01, 0.20)	0.12 (0.05, 0.18)*	0.36	0.716	-0.02
4.1	Instruction on how to perform a behavior	25	83	0.14 (0.07, 0.22)*	0.08 (0.01, 0.15)*	1.46	0.145	0.06
4.2	Information about antecedents	10	56	0.04 (-0.06, 0.14)	0.13 (0.07, 0.20)*	1.60	0.111	-0.09
4.3	Re-attribution	5	13	0.11 (-0.11, 0.32)	0.11 (0.05, 0.17)*	0.02	0.984	-0.00
5.1	Information about health consequences	6	33	0.14 (-0.03, 0.31)	0.11 (0.04, 0.17)*	0.36	0.723	0.03
5.3	Information about social and environmental consequences	27	93	0.12 (0.04, 0.20)*	0.10 (0.02, 0.19)*	0.33	0.743	0.02

6.1	Demonstration of the behavior	12	35	0.13 (0.01, 0.25)*	0.11 (0.04, 0.18)*	0.31	0.756	0.02
6.2	Social comparison	9	37	0.12 (-0.02, 0.27)	0.11 (0.04, 0.18)*	0.17	0.864	0.01
6.3	Information about others' approval	6	17	0.04 (-0.13, 0.20)	0.12 (0.06, 0.19)*	0.94	0.351	-0.09
8.1	Behavioral practice/rehearsal	38	119	0.14 (0.07, 0.20)*	0.03 (-0.07, 0.14)	1.78	0.076	0.10
8.2	Behavior substitution	19	82	0.06 (-0.03, 0.15)	0.15 (0.07, 0.22)*	1.35	0.178	-0.08
8.6	Generalisation of target behavior	6	35	0.09 (-0.09, 0.26)	0.11 (0.05, 0.18)*	0.31	0.760	-0.03
9.1	Credible source	7	13	0.06 (-0.14, 0.25)	0.12 (0.05, 0.18)*	0.58	0.561	-0.06
10.3	Non-specific reward	6	19	0.15 (-0.03, 0.32)	0.11 (0.04, 0.17)*	0.42	0.676	0.04
10.4	Social reward	7	20	0.07 (-0.07, 0.22)	0.12 (0.05, 0.18)*	0.56	0.573	-0.04
10.11	Future punishment	6	27	0.06 (-0.12, 0.25)	0.12 (0.05, 0.18)*	0.54	0.588	-0.05
11.2	Reduce negative emotions	19	42	0.17 (0.07, 0.26)*	0.08 (0.00, 0.15)*	1.39	0.165	0.09
12.2	Restructuring the social environment	6	13	0.11 (-0.00, 0.23)	0.11 (0.05, 0.17)*	0.06	0.955	0.00
12.3	Avoidance/reducing exposure to cues of behavior	7	33	0.05 (-0.10, 0.20)	0.12 (0.06, 0.19)*	0.92	0.361	-0.08
13.1	Identification of self as role model	7	36	0.09 (-0.08, 0.25)	0.12 (0.05, 0.18)*	0.31	0.759	-0.03
13.2	Framing/reframing	22	65	0.11 (0.02, 0.20)*	0.12 (0.03, 0.20)*	0.16	0.874	-0.01
15.4	Self-talk	6	19	0.12 (-0.05, 0.29)	0.11 (0.05, 0.18)*	0.10	0.92	0.01

Note. BCT = Behaviour Change Technique; # IG = number of intervention groups; # ES = number of effect sizes; CI = confidence interval; meta-regression with number of BCTs: $F(1,186) = 0.01$, $p = .916$; meta-regression including all the BCTs that are reported in 5 IG or more: $F(29,158) = 0.91$, $p = .610$.

*p < 0.05

Table B3

Behaviour Change Technique Analyses for Targeted Interventions Based on 156 ESs from 70 Intervention Groups

BCT No.	Behaviour Change Techniques	#IG present	#ES present	ES present (95% CI)	ES absent (95% CI)	*t*-value	*p*-value	Difference
1.1	Goal setting (behavior)	10	28	0.61 (0.17, 1.06)*	0.38 (0.17, 0.56)*	0.94	0.351	0.23
1.2	Problem solving	35	69	0.43 (0.21, 0.65)*	0.41 (0.18, 0.65)*	0.14	0.886	0.02
1.3	Goal setting (outcome)	15	43	0.17 (-0.18, 0.51)	0.51 (0.30, 0.73)*	1.72	0.088	-0.35
1.4	Action planning	9	14	0.98 (0.46, 1.49)*	0.34 (0.15, 0.54)*	2.28	0.024	0.63*
1.9	Commitment	5	14	0.07 (-0.59, 0.73)	0.45 (0.26, 0.65)*	1.11	0.270	-0.39
2.2	Feedback on behavior	20	36	0.36 (0.04, 0.68)*	0.45 (0.23, 0.66)*	0.48	0.634	-0.09
2.3	Self-monitoring of behavior	16	34	0.28 (-0.07, 0.63)	0.48 (0.26, 0.69)*	0.98	0.330	-0.20
2.4	Self-monitoring of outcome(s) of behavior	5	6	0.59 (-0.21, 1.39)	0.50 (0.25, 0.75)*	0.22	0.830	0.09
2.7	Feedback on outcome(s) of behavior	7	10	0.71 (0.26, 1.16)*	0.39 (0.19, 0.58)*	1.39	0.166	0.32
3.1	Social support (unspecified)	14	29	0.45 (0.22, 0.67)*	0.42 (0.22, 0.61)*	0.36	0.719	0.03
4.1	Instruction on how to perform a behavior	33	60	0.40 (0.19, 0.62)*	0.44 (0.22, 0.67)*	0.34	0.736	-0.04
4.2	Information about antecedents	32	69	0.47 (0.25, 0.67)*	0.38 (0.16, 0.60)*	0.77	0.441	0.09
4.3	Re-attribution	12	29	0.49 (0.09, 0.89)*	0.40 (0.19, 0.62)*	0.37	0.711	0.09
5.3	Information about social and environmental consequences	29	59	0.38 (0.16, 0.60)*	0.46 (0.25, 0.66)*	0.75	0.454	-0.08
5.6	Information about emotional consequences	6	16	0.46 (0.14, 0.77)*	0.42 (0.23, 0.61)*	0.27	0.789	0.04
6.1	Demonstration of the behavior	17	27	0.50 (0.17, 0.83)*	0.40 (0.20, 0.61)*	0.54	0.587	0.10
6.2	Social comparison	18	35	0.20 (-0.16, 0.55)	0.49 (0.29, 0.70)*	1.45	0.148	-0.30
6.3	Information about others' approval	5	9	0.07 (-0.53, 0.67)	0.46 (0.26, 0.66)*	1.23	0.222	-0.39
8.1	Behavioral practice/rehearsal	52	97	0.44 (0.24, 0.63)*	0.38 (0.12, 0.64)*	0.47	0.640	-0.06
8.2	Behavior substitution	29	62	0.36 (0.13, 0.60)*	0.47 (0.25, 0.68)*	0.79	0.431	-0.10
8.6	Generalisation of target behavior	17	36	0.46 (0.15, 0.78)*	0.41 (0.20, 0.62)*	0.33	0.745	0.05
9.2	Pros and cons	8	22	0.36 (-0.09, 0.80)	0.43 (0.23, 0.63)*	0.33	0.744	-0.08
10.2	Material reward (behavior)	16	28	0.36 (0.01, 0.72)*	0.44 (0.23, 0.65)*	0.40	0.691	-0.08

10.3	Non-specific reward	10	14	0.32 (-0.15, 0.80)	0.44 (0.24, 0.64)*	0.45	0.655	-0.11
10.4	Social reward	9	22	0.48 (0.19, 0.76)*	0.41 (0.22, 0.61)*	0.49	0.625	0.06
10.9	Self-reward	6	8	0.48 (-0.02, 0.99)	0.42 (0.22, 0.61)*	0.26	0.796	0.07
11.2	Reduce negative emotions	20	39	0.58 (0.29, 0.88)*	0.34 (0.12, 0.56)*	1.38	0.171	0.24
13.2	Framing/reframing	20	46	0.38 (0.07, 0.68)*	0.44 (0.23, 0.66)*	0.38	0.703	-0.07
15.2	Mental rehearsal of successful performance	7	9	0.58 (-0.03, 1.18)	0.41 (0.21, 0.61)*	0.53	0.599	0.17
15.4	Self-talk	18	28	0.45 (0.14, 0.76)*	0.41 (0.21, 0.62)*	0.21	0.837	0.04

Note. BCT = Behaviour Change Technique; # IG = number of intervention groups; # ES = number of effect sizes; CI = confidence interval; meta-regression with number of BCTs: $F(1,154) = 0.12$, $p = .736$; meta-regression including all the BCTs that are reported in 5 IG or more: $F(29,126) = 0.90$, $p = 0.613$.

*p < 0.05

Table B4

Moderator Analyses by Subtype of Aggression Without Outliers

Moderator variables	#studies	#ES	*d*[a] (95% CI)	Omnibus test	*p*-value	Variance level 2[b]	Variance level 3[c]
Reactive aggression	10	18					
Age[d]	8	15	-0.08 (-0.18, 0.02)	F(1,13) = 3.28	.093	0.000	0.068
Gender[e]	10	18	-0.53 (-1.35, 0.29)	F(1,16) = 1.86	.192	0.000	0.089
Duration[f]	10	18	0.08 (-0.04, 0.20)	F(1,16) = 1.90	.187	0.000	0.085
Physical aggression	48	131					
Age[d]	46	128	-0.01 (-0.04, 0.03)	F(1,126) = 0.08	.785	0.018	0.040
Gender[e]	46	129	-0.03 (-0.14, 0.09)	F(1,127) = 0.18	.669	0.017	0.034

Duration[f]	47	129	-0.003 (-0.01, 0.001)	F(1,127) = 2.19	.142	0.018	0.043
Target				F (1,129) = 1.17	.282	0.017	0.044
Universal	28	84	0.11 (0.03, 0.20) *				
Targeted	20	47	0.19 (0.07, 0.32)**				
Verbal aggression	11	24					
Age[d]	10	23	0.20 (0.02, 0.38)*	F(1,21) = 5.05	.035*	0.005	0.080
Gender[e]	10	23	0.11 (-0.01, 0.23)	F(1,21) = 3.54	.074	0.003	0.058
Duration[f]	11	24	-0.00 (-0.03, 0.03)	F(1,22) = 0.00	.984	0.006	0.091
Target				F (1,22) = 10.01	.005**	0.005	0.031
Universal	7	16	0.17 (0.01, 0.33)*				
Targeted	5	8	0.55 (0.30, 0.80)***				
Relational aggression	12	23					
Age[d]	11	21	0.08 (-0.01, 0.17)	F(1,19) = 3.57	.074	0.000	0.027
Gender[e]	12	23	0.39 -(0.003, 0.77)	F(1,21) = 4.25	.052	0.000	0.176
Duration[f]	12	23	0.00 (-0.01, 0.01)	F(1,21) = 0.01	.92711	0.000	0.125
Target				F (1,21) = 23.29	< .001***	0.009	0.000
Universal	8	16	0.04 (-0.04, 0.12)				
Targeted	5	7	0.56 (0.35, 0.76)***				

Note. # studies = number of independent studies; # ES = number of effect sizes; d = mean effect size; CI = confidence interval

[a] For categorical predictors, ES is Cohen's *d* for each category. For continuous predictors, ES is β for that specific predictor. [b] Variance between the effect sizes from the same study. [c] Variance between studies. [d] Mean, in years. [e] Proportion of males. [f] In weeks.

*$p < 0.05$

Table B5

Behaviour Change Technique Analyses by Subtype of Aggression Without Outliers

BCT No.	Behaviour Change Technique	#IG present	#ES present	ES present (95% CI)	ES absent (95% CI)	*t*-value	*p*-value	Difference
Reactive aggression[a]		18	12					
5.3	Information about social and environmental consequences	5	8	0.19 (-0.18, 0.55)	0.40 (0.05, 0.75)*	0.91	.376	-0.21
8.2	Behavior substitution	7	11	0.27 (-0.06, 0.59)	0.35 (-0.06, 0.75)	0.35	.728	-0.08
8.6	Generalisation of target behavior	5	9	0.45 (0.09, 0.81)*	0.18 (-0.14, 0.45)	1.29	.215	0.27
11.2	Reduce negative emotions	5	11	0.29 (-0.06, 0.65)	0.30 (-0.08, 0.69)	0.04	.967	-0.01
13.2	Framing/reframing	5	11	0.32 (-0.05, 0.70)	0.27 (-0.13, 0.67)	0.22	.832	0.05
15.4	Self-talk	5	6	0.37 (-0.01, 0.75)	0.25 (-0.01, 0.56)	0.57	.578	
Physical aggression[b]		54	131					
1.1	Goal setting (behavior)	5	13	0.45 (0.16, 0.74)*	0.12 (0.05, 0.19)*	2.18	.031*	0.33
1.2	Problem solving	27	75	0.16 (0.05, 0.26)*	0.12 (0.02, 0.23)	0.45	.653	0.03
1.3	Goal setting (outcome)	12	36	0.05 (-0.12, 0.21)	0.17 (0.08, 0.25)*	1.32	.191	-0.12
1.4	Action planning	6	12	0.17 (-0.12, 0.45)	0.14 (0.06, 0.22)*	0.18	.857	0.03
1.9	Commitment	9	29	0.05 (-0.12, 0.21)	0.17 (0.08, 0.25)*	1.31	.194	-0.12
2.2	Feedback on behaviour	10	28	0.23 (0.05, 0.40)*	0.12 (0.04, 0.20)*	1.08	.282	0.11
2.3	Self-monitoring of behaviour	5	16	0.16 (-0.09, 0.40)	0.14 (0.06, 0.22)*	0.13	.894	0.02
2.7	Feedback on outcomes of behaviour	7	14	0.19 (-0.02, 0.40)	0.13 (0.05, 0.21)*	0.46	.645	0.05
3.1	Social support (unspecified)	15	29	0.19 (0.07, 0.31)*	0.12 (0.04, 0.21)*	1.05	.297	0.07
4.1	Instruction on how to perform a behavior	25	71	0.13 (0.04, 0.23)*	0.15 (0.05, 0.24)*	0.20	.840	-0.01
4.2	Information about antecedents	18	52	0.13 (0.01, 0.25)*	0.15 (0.06, 0.24)*	0.27	.790	-0.02
4.3	Re-attribution	6	20	0.26 (0.05, 0.47)*	0.12 (0.04, 0.20)*	1.18	.238	0.14

5.1	Information about health consequences	8	26	0.11 (-0.07, 0.29)	0.15 (0.06, 0.23)*	0.39	.696	-0.04
5.3	Information about social and environmental consequences	29	78	0.14 (0.04, 0.23)*	0.15 (0.04, 0.26)*	0.17	.864	-0.01
6.1	Demonstration of the behavior	15	31	0.19 (0.05, 0.33)*	0.12 (0.03, 0.21)*	0.79	.433	0.07
6.2	Social comparison	11	37	0.02 (-0.13, 0.18)	0.18 (0.09, 0.26)*	1.71	.090	-0.15
6.3	Information about others' approval	7	13	0.01 (-0.19, 0.20)	0.16 (0.08, 0.24)*	1.50	.137	-0.16
8.1	Behavioral practice/rehearsal	41	103	0.16 (0.08, 0.25)*	0.08 (-0.06, 0.21)	1.09	.279	0.08
8.2	Behavior substitution	20	62	0.06 (-0.05, 0.17)	0.19 (0.10, 0.29)*	1.83	.069	-0.13
8.6	Generalisation of target behavior	9	32	0.20 (0.03, 0.38)*	0.13 (0.04, 0.21)*	0.74	.456	0.07
9.2	Pros and cons	7	22	0.23 (0.02, 0.44)*	0.13 (0.05, 0.21)*	0.87	.388	0.10
9.3	Comparative imagining of future outcomes	5	15	0.02 (-0.20, 0.25)	0.16 (0.08, 0.24)*	1.10	.275	-0.13
10.2	Material reward (behaviour)	6	9	0.25 (-0.04, 0.54)	0.13 (0.05, 0.21)*	0.80	.424	0.12
10.3	Non-specific reward	6	20	0.11 (-0.10, 0.33)	0.14 (0.06, 0.23)*	0.26	.793	-0.03
10.4	Social reward	6	20	0.16 (-0.04, 0.36)	0.14 (0.06, 0.22)*	0.19	.848	0.02
11.2	Reduce negative emotions	19	43	0.12 (-0.00, 0.25)	0.15 (0.06, 0.25)*	0.33	.740	-0.03
12.3	Avoidance/reducing exposure to cues of behavior	8	31	0.11 (-0.07, 0.30)	0.14 (0.07, 0.22)*	0.31	.757	-0.03
13.2	Framing/reframing	23	54	0.10 (-0.01, 0.21)	0.17 (0.07, 0.28)*	0.97	.335	-0.07
15.4	Self-talk	11	25	0.18 (0.00, 0.36)*	0.13 (0.05, 0.22)*	0.48	.634	0.05
Verbal aggression[c]		13	24					
1.2	Problem solving	8	17	0.33 (0.02, 0.64)*	0.26 (-0.10, 0.62)	0.32	.752	0.07
4.1	Instruction on how to perform a behavior	7	12	0.33 (0.11, 0.55)*	0.26 (0.04, 0.47)*	1.17	.257	0.07
4.2	Information about antecedents	5	9	0.30 (0.03, 0.56)*	0.29 (0.05, 0.53)*	0.04	.965	0.01
5.3	Information about social and environmental consequences	7	13	0.27 (0.03, 0.52)*	0.31 (0.06, 0.57)*	0.36	.722	-0.04
8.2	Behavior substitution	5	9	0.06 (-0.15, 0.27)	0.38 (0.19, 0.57)*	2.34	.029*	-0.32

13.2	Framing/reframing	6	9	0.25 (-0.10, 0.59)	0.33 (0.04, 0.62)*	0.40	.697	-0.09
Relational aggression[d]		13	23					
3.1	Social support (unspecified)	5	8	0.35 (0.16, 0.54)*	0.04 (-0.09, 0.17)	2.90	.009*	0.30
4.1	Instruction on how to perform a behavior	6	10	0.16 (-0.10, 0.42)	0.26 (-0.00, 0.53)	0.76	.458	-0.10
4.2	Information about antecedents	7	12	0.18 (-0.08, 0.44)	0.25 (-0.02, 0.51)	0.50	.621	-0.07
5.3	Information about social and environmental consequences	8	14	0.13 (-0.08, 0.34)	0.34 (0.06, 0.62)*	1.49	.150	-0.21
6.1	Demonstration of the behaviour	6	9	0.19 (-0.15, 0.53)	0.25 (-0.09, 0.58)	0.23	.820	-0.05
8.2	Behavior substitution	8	13	0.12 (-0.14, 0.38)	0.39 (0.01, 0.77)*	1.25	.225	-0.28
11.2	Reduce negative emotions	7	9	0.25 (-0.08, 0.58)	0.18 (-0.14, 0.51)	0.30	.768	0.07
13.2	Framing/reframing	7	13	0.12 (-0.17, 0.41)	0.41 (0.00, 0.81)*	1.19	.246	-0.29
15.4	Self-talk	5	7	0.25 (-0.13, 0.62)	0.20 (-0.11, 0.51)	0.20	.845	0.05

Note. BCT = Behaviour Change Technique; # IG = number of intervention groups; # ES = number of effect sizes; CI = confidence interval

[a] Meta-regression for number of BCTs: F(1,16) = 0.11; p = .748; meta-regression including BCTs with 5 or more IG: F(6,11) = 0.84, p = .568

[b] Meta-regression for number of BCTs: F(1,129) = 0.04; p = .835; meta-regression including BCTs with 5 or more IG: F(30,100) = 1.37, p = .125

[c] Meta-regression for number of BCTs: F(1,22) = 0.65; p = .431; meta-regression including BCTs with 5 or more IG: F(6,17) = 0.52, p = .786

[d] Meta-regression for number of BCTs: F(1,21) = 0.10; p = .758; meta-regression including BCTs with 5 or more IG: F(8,14) = 0.41, p = .898

*p < 0.05

Appendix C. Moderator analyses by subtype of aggression

Table C1

Moderator Analyses by Subtype of Aggression

Moderator variables	#studies	#ES	*d*[a] (95% CI)	Omnibus test	p-value	Variance level 2[b]	Variance level 3[c]
Reactive aggression	11	19					
Age[d]	9	16	0.05 (-0.20, 0.29)	F(1,14) = 0.17	.684	0.000	0.774
Gender[e]	11	19	0.29 (-1.41, 1.98)	F(1,17) = 0.13	.728	0.000	0.608
Duration[f]	11	19	0.08 (-0.18, 0.34)	F(1,17) = 0.45	.511	0.000	0.576
Proactive aggression	10	5					
Duration[f]	5	10	0.09 (-0.04, -0.22)	F(1,8) = 2.45	.156	0.000	0.056
Physical aggression	49	133					
Age[d]	47	130	0.01 (-0.05, 0.06)	F(1,128) = 0.04	.851	0.044	0.066
Gender[e]	47	131	-0.13 (-0.29, 0.03)	F(1,129) = 2.76	.099	0.041	0.062
Duration[f]	48	131	-0.008 (-0.01, -0.004)*	F(1,129) = 15.94	<.001*	0.045	0.041
Target				F (1,131) = 2.80	.097	0.044	0.067
Universal	29	85	0.08 (-0.03, 0.19)				
Targeted	21	48	0.23 (0.002, 0.08)*				
Verbal aggression	12	25					
Age[d]	11	24	0.26 (0.07, 0.45)*	F(1,22) = 7.95	.010*	0.005	0.106
Gender[e]	11	24	0.10 (-0.02, 0.23)	F(1,22) = 3.21	.087	0.003	0.072
Duration[f]	12	25	-0.00 (-0.03, 0.03)	F(1,23) = 0.00	.988	0.006	0.129
Target				F (1,23) = 11.21	.003*	0.005	0.036
Universal	7	16	0.18 (0.02, 0.35)*				
Targeted	6	9	0.59 (0.34, 0.84)*				
Relational aggression	12	24					
Age[d]	11	22	0.15 (-0.02, 0.32)	F(1,20) = 3.46	.078	0.000	0.209
Gender[e]	12	24	0.45 (0.05, 0.85)*	F(1,22) = 5.35	.030*	0.000	0.355
Duration[f]	12	24	-0.00 (-0.02, 0.02)	F(1,22) = 0.00	.959	0.000	0.344
Target				F (1,22) = 28.04	< .001*	0.016	0.000

Universal	8	16	0.04 (-0.06, 0.13)
Targeted	5	8	0.61 (0.43, 0.86)*

Note. # studies = number of independent studies; # ES = number of effect sizes; d = mean effect size; CI = confidence interval

[a] For categorical predictors, ES is Cohen's d for each category. For continuous predictors, ES is β for that specific predictor. [b] Variance between the effect sizes from the same study. [c] Variance between studies. [d] Mean, in years. [e] Proportion of males. [f] In weeks.

*$p < 0.05$

Table C2

Behaviour change Technique Analyses by Subtype of Aggression

BCT No.	Behaviour Change Technique	#IG present	#ES present	ES present (95% CI)	ES absent (95% CI)	*t*-value	*p*-value	Difference
Reactive aggression[a]		19	13					
4.1	Instruction on how to perform a behavior	8	11	0.51 (-0.10, 1.21)	0.52 (-0.18, 1.21)	0.01	.989	-0.01
5.3	Information about social and environmental consequences	5	8	0.36 (-0.29, 1.02)	0.62 (0.04, 1.20)*	0.71	.486	-0.26
8.2	Behavior substitution	7	11	0.42 (-0.12, 0.96)	0.63 (0.05, 1.20)*	0.75	.463	-0.20
8.6	Generalisation of target behavior	5	9	0.61 (-0.02, 1.24)	0.46 (-0.10, 1.01)	0.55	.587	0.16
11.2	Reduce negative emotions	6	12	0.54 (-0.05, 1.13)	0.49 (-0.12, 1.10)	0.16	.874	0.05
13.2	Framing/reframing	5	11	0.48 (-0.20, 1.16)	0.54 (-0.07, 1.15)	0.16	.874	-0.06
15.4	Self-talk	5	6	0.45 (-0.17, 1.08)	0.55 (0.004, 1.09)*	0.34	.735	-0.10

Physical aggression[b]		55	133					
1.1	Goal setting (behavior)	5	13	0.46 (0.10, 0.81)*	0.11 (0.02, 0.20)*	1.85	.066	0.35
1.2	Problem solving	27	75	0.16 (0.03, 0.29)*	0.11 (-0.02, 0.24)	0.59	.559	0.05
1.3	Goal setting (outcome)	12	36	0.05 (-0.16, 0.25)	0.16 (0.05, 0.27)*	0.96	.341	-0.11
1.4	Action planning	6	12	0.19 (-0.17, 0.54)	0.13 (0.03, 0.23)*	0.29	.770	0.06
1.9	Commitment	9	29	0.04 (-0.17, 0.25)	0.16 (0.05, 0.26)*	0.98	.329	-0.12
2.2	Feedback on behaviour	10	28	0.23 (0.01, 0.45)*	0.11 (0.01, 0.22)*	0.98	.327	0.12
2.3	Self-monitoring of behaviour	5	16	0.17 (-0.14, 0.47)	0.13 (0.03, 0.23)*	0.22	.826	0.04
2.7	Feedback on outcomes of behaviour	7	14	0.19 (-0.07, 0.45)	0.13 (0.03, 0.23)*	0.43	.667	0.06
3.1	Social support (unspecified)	16	30	0.22 (0.07, 0.37)*	0.10 (0.00, 0.21)*	1.38	.170	0.12
4.1	Instruction on how to perform a behavior	25	71	0.13 (0.01, 0.26)*	0.14 (0.02, 0.26)*	0.05	.964	-0.00
4.2	Information about antecedents	18	52	0.13 (-0.02, 0.28)	0.14 (0.02, 0.25)*	0.07	.942	-0.01
4.3	Re-attribution	6	20	0.26 (-0.00, 0.52)	0.12 (0.02, 0.22)*	1.02	.308	0.15
5.1	Information about health consequences	8	26	0.10 (-0.13, 0.34)	0.14 (0.04, 0.25)*	0.29	.771	-0.04
5.3	Information about social and environmental consequences	29	78	0.14 (0.02, 0.25)*	0.13 (-0.00, 0.27)	0.02	.985	0.00
6.1	Demonstration of the behavior	15	32	0.11 (-0.07, 0.29)	0.15 (0.03, 0.26)*	0.34	.733	-0.04
6.2	Social comparison	11	37	0.02 (-0.18, 0.22)	0.17 (0.06, 0.27)*	1.27	.207	-0.15
6.3	Information about others' approval	7	13	0.00 (-0.24, 0.25)	0.16 (0.06, 0.26)*	1.14	.258	-0.15
8.1	Behavioral practice/rehearsal	41	103	0.16 (0.06, 0.27)*	0.05 (-0.12, 0.21)	1.23	.221	0.12
8.2	Behavior substitution	20	62	0.06 (-0.08, 0.21)	0.18 (0.06, 0.30)*	1.27	.208	-0.12
8.6	Generalisation of target behavior	9	32	0.20 (-0.02, 0.42)	0.12 (0.01, 0.22)*	0.68	.500	0.08
9.2	Pros and cons	7	22	0.23 (-0.03, 0.50)	0.12 (0.02, 0.22)*	0.77	.444	0.11
9.3	Comparative imagining of future outcomes	5	15	0.01 (-0.28, 0.30)	0.15 (0.05, 0.25)*	0.88	.379	-0.14
10.2	Material reward (behaviour)	6	9	0.28 (-0.08, 0.63)	0.12 (0.03, 0.22)*	0.82	.413	0.15
10.3	Non-specific reward	6	20	0.13 (-0.15, 0.40)	0.14 (0.03, 0.24)*	0.07	.948	-0.01

10.4	Social reward	6	20	0.17 (-0.09, 0.42)	0.13 (0.03, 0.23)*	0.26	.798	0.03
11.2	Reduce negative emotions	19	43	0.13 (-0.02, 0.29)	0.14 (0.02, 0.26)*	0.03	.979	-0.00
12.3	Avoidance/reducing exposure to cues of behavior	8	31	0.12 (-0.10, 0.35)	0.14 (0.03, 0.24)*	0.12	.909	-0.01
13.2	Framing/reframing	23	54	0.10 (-0.04, 0.25)	0.16 (0.03, 0.29)*	0.63	.533	-0.06
15.4	Self-talk	11	25	0.19 (-0.03, 0.41)	0.12 (0.02, 0.23)*	0.52	.604	0.06
Verbal aggression[c]		14	25					
1.2	Problem solving	9	18	0.44 (0.07, 0.81)*	0.27 (-0.15, 0.70)	0.61	.548	0.17
1.4	Action planning	5	7	0.86 (0.21, 1.51)*	0.25 (-0.10, 0.61)	1.69	.105	0.61
4.1	Instruction on how to perform a behavior	7	12	0.37 (0.13, 0.61)*	0.31 (0.07, 0.55)*	1.04	.307	0.06
4.2	Information about antecedents	6	10	0.36 (0.07, 0.65)*	0.34 (0.07, 0.60)*	0.20	.845	0.02
5.3	Information about social and environmental consequences	7	13	0.32 (0.05, 0.59)*	0.37 (0.10, 0.65)*	0.48	.633	-0.05
8.2	Behavior substitution	6	10	0.17 (-0.14, 0.48)	0.40 (0.14, 0.65)*	1.18	.252	-0.23
11.2	Reduce negative emotions	5	7	0.41 (-0.05, 0.88)	0.35 (-0.01, 0.70)	0.24	.815	0.07
13.2	Framing/reframing	6	9	0.29 (-0.12, 0.69)	0.41 (0.06, 0.75)*	0.46	.648	-0.12
Relational aggression[d]		14	24					
1.2	Problem solving	9	14	0.26 (-0.19, 0.71)	0.44 (-0.20, 1.07)	0.47	.641	-0.18
3.1	Social support (unspecified)	5	8	0.38 (-0.01, 0.77)	0.26 (-0.08, 0.61)	0.78	.445	0.12
4.1	Instruction on how to perform a behavior	6	10	0.24 (-0.14, 0.62)	0.37 (-0.00, 0.74)	0.85	.403	-0.13
4.2	Information about antecedents	7	12	0.26 (-0.11, 0.64)	0.36 (-0.02, 0.74)	0.66	.516	-0.10
5.3	Information about social and environmental consequences	8	14	0.23 (-0.10, 0.56)	0.44 (0.06, 0.82)*	1.34	.195	-0.21
6.1	Demonstration of the behaviour	6	9	0.24 (-0.28, 0.76)	0.39 (-0.12, 0.90)	0.42	.677	-0.15
8.1	Behavioral practice/rehearsal	9	14	0.31 (-0.05, 0.67)	0.31 (-0.11, 0.73)	0.02	.985	0.00
8.2	Behavior substitution	8	13	0.16 (-0.25, 0.56)	0.61 (0.03, 1.18)	1.32	.199	-0.45

11.2	Reduce negative emotions	7	9	0.45 (-0.03, 0.93)	0.17 (-0.33, 0.67)	0.88	.389	0.28
13.2	Framing/reframing	7	13	0.13 (-0.30, 0.56)	0.61 (0.05, 1.16)*	1.43	.168	-0.48
15.4	Self-talk	5	7	0.30 (-0.28, 0.89)	0.33 (-0.15, 0.80)	0.06	.952	-0.02

Note. BCT = Behaviour Change Technique; # IG = number of intervention groups; # ES = number of effect sizes; CI = confidence interval

[a] Meta-regression for number of BCTs: F(1,17) = 0.73; p = .406; meta-regression including BCTs with 5 or more IG: F(7,11) = 0.78, p = .626.

[b] Meta-regression for number of BCTs: F(1,131) = 0.00; p = .998; meta-regression including BCTs with 5 or more IG: F(30,102) = 0.62, p = .934.

[c] Meta-regression for number of BCTs: F(1,23) = 1.40; p = .249; meta-regression including BCTs with 5 or more IG: F(7,17) = 1.55, p = .218.

[d] Meta-regression for number of BCTs: F(1,22) = 0.59; p = .453; meta-regression including BCTs with 5 or more IG: F(10,13) = 0.74, p = .683

*p < 0.05

Appendix D. Anger triggers list

Everybody gets angry from time to time. A list of reasons that people might get angry appears below. Please read each statement carefully and tick the box to the right of the statement that best describes whether or not you get angry in these situations or for these reasons. There are not right or wrong answers.

For each statement, you can mark if you NEVER, SOMETIMES or OFTEN get angry in that situation or for that reason. Mark each sentence by ticking the appropriate box. If you don't understand the sentence, please, mark the N/U box and ask your teacher what it means.

I get angry if…	Never	Sometimes	Often	N/U
… someone lets me down				
… people are unfair				
… something stops me doing what I planned to do				
… I am delayed				
… someone embarrasses me				
… I have to take orders from someone who isn't as able as me				
… I have to work with people who don't have the required skills				
… I do something stupid				
… I am not given credit for something I have done				
… someone looks through my things without my permission				
… I am criticised in front of other people for something that I have done				
… someone pushes in front of me when I am queuing to get something				
… I see someone bully another person				
… I am told off, while someone else doing the same thing is not				
… I am accused of something that I didn't do				
… I am overcharged by someone				
… someone keeps making noise when I am trying to concentrate				
… I am watching a TV programme and someone comes along and changes the channel				
… I need to get somewhere in a hurry but I get stuck in traffic				

… I make plans to do something with a person who backs out at the last minute				
… I lend something to someone and they fail to return it				
… someone is always disagreeing with me				
… people think that they are better than I am				
… people think that they are always right				
… I am slowed down by another person's mistakes				
… I get cold food that is supposed to be hot				
… someone starts giving me a hard time				
… I am hungry and tired and someone plays a practical joke on me				
… I am carrying a drink and someone bumps into me				
... people act like they know it all				
… people don't listen to me when I talk to them				
… someone looks over my shoulder while I am working				
… someone makes fun of the clothes I am wearing				
… someone else gets credit for work that I did				

Are there any other situations or reasons you usually get angry that are not on the list above? Please, write them below:

I get angry if…

Appendix E. Anger management strategies list

People use different ways to control their anger. A list of ways that some people use to control their anger appears below. Read each way that can be used and indicate how useful you think it would be for controlling your own anger. Each person has his/her own ways of controlling their anger, so there are no right or wrong answers.

You can mark if you think that each way could be NOT AT ALL useful, a LITTLE useful or VERY useful for you when you are angry. Mark each sentence by ticking the appropriate box. If you don't understand the sentence, please, mark the N/U box and ask your teacher what it means.

To control my anger, how useful would it be to...	Not at all useful	A little useful	Very Useful	N/U
… try to see positive things in other people				
… try to understand why someone is bothering me				
… think of something else				
… swallow my pride and let it go				
… calm myself down				
… stay cool				
… take deep breaths				
… imagine something calm and relaxing				
… try to find a solution for the problem				
… speak about the problem to the person I have the conflict with				
… say something constructive				
… walk away				
… repeat a calming word or phrase, such as "relax" or "take it easy"				
… calm myself by relaxing my muscles				
… avoid using extreme words like 'never' and 'always' to describe people and situations				
… think in a logical and realistic way about the situation				

… express what I want in terms of desires: “I would like…” instead of demands: “I must have…”				
… identify the problem and making a plan to solve it				
… listen to the other person and thinking carefully about what I want to say				
… stop taking myself too seriously				
… make sure that I give myself some ‘quiet time’				
… suggest discussing the problem another time				
… avoid putting myself in that situation again in the future				

Are there any ways that you successfully control your anger that are not on the list above? Please, write them below:

I control my anger by….

Appendix F. Chapter 4 Material and Volitional Help Sheets

F.1. Specific situations VHS with instructions

Everyone gets angry sometimes. However, some people find it harder to control their anger than others. We want you to plan how to control your anger. Research shows that if people can spot situations in which they get angry and link them with a way to deal with those situations, they are much more likely to be successful in controlling their anger.

On the back of the sheet you'll find two columns: on the left-hand side of the sheet is a list of common **ways in which people get angry**; on the right-hand side of the sheet is a list of **possible ways to control your anger**.

For each way you might get angry (left-hand side), please **draw a line** linking it to a way you would deal with it (right-hand side). Go through and do one line at a time but you can make as many or as few lines as you like.

When you finish drawing the lines, **write** your plans below.

Here is an **example** of how you could do it:

Ways you might get angry	**Ways to deal with your anger**
If I get angry when I am criticised in front of other people for something that I have done…	… then I'll stay cool
If I get angry when people act like they know it all…	… then I'll avoid putting myself in that situation again in the future
If I get angry when someone looks through my things without my permission…	… then I'll walk away

Plans:

If I get angry when I am criticised in front of other people for something that I have done, then I'll walk away.

If I get angry when someone looks through my things without my permission, then I'll avoid putting myself in that situation again in the future

Ways you might get angry	Ways to deal with your anger
If I get angry when I am accused of something that I didn't do…	… then I'll calm myself down
If I get angry when I am told off, while someone else doing the same thing is not…	… then I'll make sure that I give myself some 'quiet time'
If I get angry when I see someone bully another person…	… then I'll take deep breaths
If I get angry when I am criticised in front of other people for something that I have done…	… then I'll stay cool
If I get angry when people act like they know it all…	… then I'll avoid putting myself in that situation again in the future
If I get angry when someone looks through my things without my permission…	… then I'll walk away
If I get angry when someone pushes in front of me when I am queuing to get something…	… then I'll suggest discussing the problem another time
If I get angry when someone starts giving me a hard time…	… then I'll think of something else
If I get angry when people think that they are better than I am…	… then I'll speak about the problem to the person I have the conflict with
If I get angry when people think that they are always right…	… then I'll say something constructive

Plans:

_____

_____

_____

_____

F.2. Generic situation VHS with instructions

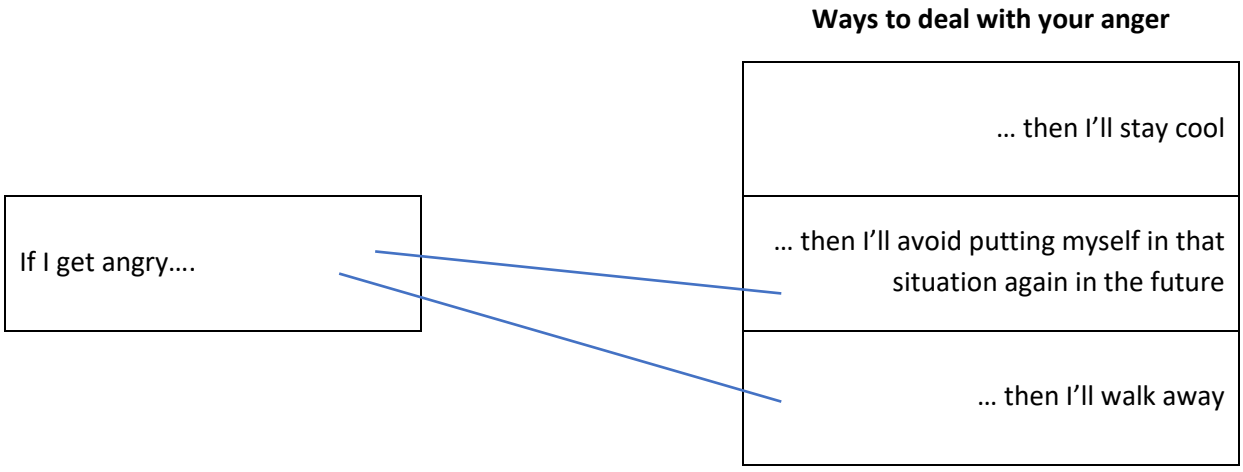
Everyone gets angry sometimes. However, some people find it harder to control their anger than others. We want you to plan how to control your anger. Research shows that if people can spot situations in which they get angry and link them with a way to deal with those situations, they are much more likely to be successful in controlling their anger.

On the back of the sheet you'll find a square on the left that says "If I get angry…" and a list on the right-hand side of **possible ways to control your anger**.

For times when you might get angry (left-hand side), please **draw a line** linking it to a way you would deal with it (right-hand side). Go through and do one link at a time but you can make as many or as few lines as you like.

When you finish drawing the lines, **write** your plans below.

Here is an **example** of how you could do it:



Plans:

If I get angry, then I'll avoid putting myself in that situation again in the future.

If I get angry, then I'll walk away.

If I get angry…	**Ways to deal with your anger**
	… then I'll calm myself down
	… then I'll make sure that I give myself some 'quiet time'
	… then I'll take deep breaths
	… then I'll stay cool
	… then I'll avoid putting myself in that situation again in the future
	… then I'll walk away
	… then I'll suggest discussing the problem another time
	… then I'll think of something else
	… then I'll speak about the problem to the person I have the conflict with
	… then I'll say something constructive

Plans:

_____

_____

_____

_____

F.3 Instructions and VHS for the active control condition

Everyone gets angry sometimes. However, some people find it harder to control their anger than others. We want you to identify the situations in which you might get angry. We also want you to identify some ways you could deal with your anger.

On the back of the sheet you'll find two columns: on the left-hand side of the sheet is a list of common **ways in which people get angry**; on the right-hand side of the sheet is a list of **possible ways to control your anger**.

Please, first circle each way you might get angry (left-hand side). Once you finish, circle each way you could deal with your anger (right-hand side).

When you finish, please tell us about any other ways in which you might get angry.

Here it is an **example** on how you could do it:

Ways you might get angry	**Ways to deal with your anger**
If I get angry when I am criticised in front of other people for something that I have done…	… then I'll stay cool
If I get angry when people act like they know it all…	… then I'll avoid putting myself in that situation again in the future
If I get angry when someone looks through my things without my permission…	… then I'll walk away

Other ways you might get angry:

I get angry when my father yells at me.

I get angry when someone takes something that is mine without my permission.

Ways you might get angry	Ways to deal with your anger
If I get angry when I am accused of something that I didn't do…	… then I'll calm myself down
If I get angry when I am told off, while someone else doing the same thing is not…	… then I'll make sure that I give myself some 'quiet time'
If I get angry when I see someone bully another person…	… then I'll take deep breaths
If I get angry when I am criticised in front of other people for something that I have done…	… then I'll stay cool
If I get angry when people act like they know it all…	… then I'll avoid putting myself in that situation again in the future
If I get angry when someone looks through my things without my permission…	… then I'll walk away
If I get angry when someone pushes in front of me when I am queuing to get something…	… then I'll suggest discussing the problem another time
If I get angry when someone starts giving me a hard time…	… then I'll think of something else
If I get angry when people think that they are better than I am…	… then I'll speak about the problem to the person I have the conflict with
If I get angry when people think that they are always right…	… then I'll say something constructive

Other ways you might get angry:

_____

_____

_____

_____

Appendix G. Moderation analyses on the effect of action planning

Table G1

Moderation Effects of Callousness

Outcome	Dummy variable[a]	Interaction	
		t-value	Degrees of freedom
1-month follow-up			
Anger	Active Control	0.57	50
	Generic Situation	0.03	50
Total aggression	Active Control	1.68	46
	Generic Situation	1.48	46
Reactive overt aggression	Active Control	1.07	50
	Generic Situation	2.52*	50
Proactive overt aggression	Active Control	1.58	51
	Generic Situation	1.11	51
Reactive relational aggression	Active Control	1.15	50
	Generic Situation	0.75	50
Proactive relational aggression	Active Control	3.87*	50
	Generic Situation	0.20	50
6-months follow-up			
Anger	Active Control	0.30	30
	Generic Situation	0.76	30
Total aggression	Active Control	1.46	28
	Generic Situation	0.30	28
Reactive overt aggression	Active Control	0.14	30
	Generic Situation	0.22	30
Proactive overt aggression	Active Control	3.12*	30
	Generic Situation	0.89	30
Reactive relational aggression	Active Control	1.52	29
	Generic Situation	1.55	29
Proactive relational aggression	Active Control	1.24	31
	Generic Situation	0.27	31

Note. Analyses were controlled by baseline scores.

[a] Specific situations was used as the reference category.

* $p < .05$

Table G2

Moderation Effects of Uncaring

Outcome	Dummy variable[a]	Interaction	
		t-value	Degrees of freedom
1-month follow-up			
Anger	Active Control	0.81	53
	Generic Situation	0.32	53
Total aggression	Active Control	1.18	48
	Generic Situation	1.76	48
Reactive overt aggression	Active Control	0.93	52
	Generic Situation	1.74	52
Proactive overt aggression	Active Control	1.17	54
	Generic Situation	1.18	54
Reactive relational aggression	Active Control	2.51*	54
	Generic Situation	1.60	54
Proactive relational aggression	Active Control	0.55	54
	Generic Situation	0.53	54
6-months follow-up			
Anger	Active Control	2.48*	30
	Generic Situation	1.76	30
Total aggression	Active Control	0.13	28
	Generic Situation	0.24	28
Reactive overt aggression	Active Control	0.51	30
	Generic Situation	0.76	30
Proactive overt aggression	Active Control	0.23	30
	Generic Situation	0.07	30
Reactive relational aggression	Active Control	0.02	29
	Generic Situation	0.14	29
Proactive relational aggression	Active Control	0.07	31
	Generic Situation	0.47	31

Note. Analyses were controlled by baseline scores

[a] Specific situations was used as the reference category.

* $p < .05$

Table G3

Moderation Effects of Negative Urgency

Outcome	Dummy variable[a]	Interaction	
		t-value	Degrees of freedom
1-month follow-up			
Anger	Active Control	0.35	52
	Generic Situation	0.26	52
Total aggression	Active Control	1.14	47
	Generic Situation	0.90	47
Reactive overt aggression	Active Control	0.42	53
	Generic Situation	1.46	53
Proactive overt aggression	Active Control	0.42	53
	Generic Situation	1.46	53
Reactive relational aggression	Active Control	2.76*	53
	Generic Situation	0.89	53
Proactive relational aggression	Active Control	1.09	53
	Generic Situation	0.49	53
6-months follow-up			
Anger	Active Control	3.48*	28
	Generic Situation	3.38*	28
Total aggression	Active Control	0.89	26
	Generic Situation	1.20	26
Reactive overt aggression	Active Control	1.24	28
	Generic Situation	1.63	28
Proactive overt aggression	Active Control	0.38	28
	Generic Situation	0.45	28
Reactive relational aggression	Active Control	0.67	27
	Generic Situation	0.78	27
Proactive relational aggression	Active Control	0.27	29
	Generic Situation	1.33	29

Note. Analyses were controlled by baseline scores

[a] Specific situations was used as the reference category.

* $p < .05$

Table G4

Moderation Effects of Aggressive Intentions

Outcome	Dummy variable[a]	Interaction	
		t-value	Degrees of freedom
1-month follow-up			
Anger	Active Control	1.83	52
	Generic Situation	0.99	52
Total aggression	Active Control	0.60	49
	Generic Situation	0.71	49
Reactive overt aggression	Active Control	0.89	53
	Generic Situation	0.98	53
Proactive overt aggression	Active Control	0.66	54
	Generic Situation	0.57	54
Reactive relational aggression	Active Control	0.28	54
	Generic Situation	0.68	54
Proactive relational aggression	Active Control	0.82	54
	Generic Situation	0.14	54
6-months follow-up			
Anger	Active Control	0.99	39
	Generic Situation	1.31	39
Total aggression	Active Control	0.35	37
	Generic Situation	0.33	37
Reactive overt aggression	Active Control	0.79	40
	Generic Situation	1.08	40
Proactive overt aggression	Active Control	0.43	39
	Generic Situation	0.80	39
Reactive relational aggression	Active Control	0.16	39
	Generic Situation	0.81	39
Proactive relational aggression	Active Control	0.16	41
	Generic Situation	0.11	41

Note. Analyses were controlled by baseline scores.

[a] Specific situations was used as the reference category.

* $p < .05$

Appendix H. Problem solving intervention

Screen 1

Social problem-solving can help you to deal with the problems and conflicts that you encounter in your daily life. It consists of the following steps:

1. Identifying that a problem exists
2. Defining the problem
3. Generating solutions
4. Evaluating the proposed solutions and choose one
5. Enacting the chosen solution
6. Assessing the outcome

You will now be shown a hypothetical situation and asked to work through these problem-solving steps to come to a solution.

Screen 2

You make plans with one of your friends to go on a short trip for the weekend. You're very excited about these plans and have been looking forward to the trip. However, at the last minute, your friend says that he (or she) no longer wants to go on the trip and has made plans with another friend for the weekend.

1. What is the problem in this situation? What creates the conflict? Describe it in as much detail as possible.
2. How can the problem be solved? This is brainstorming time. Write all the possible reactions and solutions that come to your mind (and at least two). Don't worry if they sound crazy or not plausible; the idea is to have as many options as possible.

3. Which is the best solution? Of all the options that you have generated in question 2, select the solution that you think is best for this situation and describe why.

Screen 3

Imagine that you go to the first meeting of a club you want to join. You would like to make friends with the other people in the club. You walk up to some of the other club members and say, "Hi!" but they don't say anything back.

1. What is the problem in this situation? What creates the conflict? Describe it in as much detail as possible.
2. How can the problem be solved? This is brainstorming time. Write all the possible reactions and solutions that come to your mind (and at least two). Don't worry if they sound crazy or not plausible; the idea is to have as many options as possible.
3. Which is the best solution? Of all the options that you have generated in question 2, select the solution that you think is best for this situation and describe why.

Screen 4

Now, think of a problem you have had with another person in the last month. It can be a conflict, an argument or just a situation that did not make you feel right. It could have happened with a friend, a relative, a partner or a stranger. Describe the situation in as much detail as possible following the example of the vignettes in the previous screens.

1. What is the problem in this situation? What creates the conflict? Describe it in as much detail as possible.

2. How can the problem be solved? This is brainstorming time. Write all the possible reactions and solutions that come to your mind (and at least two). Don't worry if they sound crazy or not plausible; the idea is to have as many options as possible.
3. Which is the best solution? Of all the options that you have generated in question 2, select the solution that you think is best for this situation and describe why.

Screen 5

Now that you know how to use social problem-solving, we encourage you to use it in your daily problems.

A good start is analysing the factors that influence your arguments or conflicts with other people and select strategies that help you avoid them or solve them better when they are not avoidable like you have done in the previous examples.

As a reminder, these are the social problem-solving steps:

1. Identifying that a problem exists
2. Defining the problem
3. Generating solutions
4. Evaluating the proposed solutions and choose one
5. Enacting the chosen solution
6. Assessing the outcome

List of abbreviations

AQ-SF	Aggression Questionnaire – Short Form
BCT	Behaviour Change Technique
CI	Confidence Interval
DSM5	Diagnostic and Statistical Manual of Mental Disorders
ICU-12	Inventory of Callous-Unemotional Traits – 12 item version
M	Mean
MAI	Multidimensional Anger Inventory
NAS	Novaco Anger Scale
PCS-20-Y	Peer Conflict scale – 20 Item version for Youth
PCS-T	Peer Conflict Scale for Teachers
PI	Provocation Inventory
PRA	Physical – Relational Aggression Scale
PSI	Problem Solving Inventory
SD	Standard Deviation
SEIP-Q	Social-Emotional Information Processing Questionnaire
VHS	Volitional Help Sheet

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