Compassion and complex interpersonal trauma in adolescence:

An early systematic review

Nicola Amari[1]and Adam Mahoney[2]

1 - Department of Psychology, Glasgow Caledonian University

2 - School of Applied Sciences, Edinburgh Napier University, Edinburgh, UK

Correspondence concerning this article should be addressed to Nicola Amari, Department of Psychology, School of Health & Life Sciences, Glasgow Caledonian University, Cowcaddens Road, Glasgow G4 0BA. Email: namari200@caledonian.ac.uk. As a systematic review, this study did not require ethical approval.

Conflict of Interest Statement

We have no known conflict of interest to disclose. All work for this submission was conducted in line with professional and ethical guidelines

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Abstract

Background: Whilst childhood trauma has been identified as a transdiagnostic risk factor for poly-psychopathology, compassion-focused interventions have emerged as transdiagnostic treatment modality. However, no previous systematic review has specifically explored the relationship between complex interpersonal trauma and compassion in adolescence. The aim of this early systematic review was to evaluate the existing evidence on the role of compassion in adolescents with complex interpersonal trauma. Methods: A systematic search of electronic databases was undertaken to identify cross-sectional and intervention studies that examined the role of compassion in the amelioration of psychopathology in adolescence. Results: Nine studies, including three intervention studies and six cross-sectional studies, met the inclusion criteria. The findings suggested a mediating role of compassion in trauma-specific and overall psychopathology. Conclusion: Despite the dearth of research, this review suggests that integrating compassion might mediate the relationship between complex trauma and psychopathology in adolescents.

Key Practitioner Message

- What is known? Compassion appears to be a protective factor against the development of trauma-related symptomatology.
- What is new? This review evaluates the current evidence base on the relationship between compassion and complex interpersonal trauma in an adolescent sample.
- What is significant for clinical practice? More research is needed to ascertain whether adolescents may benefit from developing compassion to mitigate the effects of the exposure to repeated interpersonal trauma.

Keywords: compassion, self-compassion, complex trauma, CPTSD, adolescence

The World Health Organisation (WHO, 2015) defines adolescence as the phase of human development between the age of ten and nineteen. In their transition from childhood to adulthood, adolescents experience a multi-dimensional change, encompassing biological, physical, cognitive, ethical, social, and behavioural patterns that can enhance their health or expose their vulnerabilities (Curtis, 2015). However, despite comprising the sixteen percent of the world's population, adolescents remain often excluded from paediatric support and unreached by adult services (Clark et al., 2020). Thus, the investment on early interventions risks being squandered if adolescents' needs are not addressed through developmentally sensitive programmes (WHO, 2019). Consequently, mental health research is trying to fill the gap caused by the dearth of empirical data for adolescents to substantiate assessment tools and interventions that would inform evidence-based practice (Erskine et al., 2017), whilst acknowledging adolescents' preferences and active role in improving their own wellbeing (WHO, 2019).

Due to the societal repercussions (Cook et al., 2003; Kliethermes, Schacht, & Drewry, 2014; WHO, 2019) and transgenerational impact (Isobel et al., 2019), adverse childhood experiences are recognised as a health priority on an international scale (Felitti et al., 1998; Smith et al., 2016; Karatzias et al., 2017). For instance, childhood trauma exposure has been identified as a transdiagnostic risk factor for the development of poly-psychopathology across biological, cognitive, social, and emotional processing and mechanisms (Heleniak et al., 2016; McLaughlin et al., 2020; Rinne-Albers et al., 2020; Weissman et al., 2019) in addition to dissociation, and disruptions in attachment and self-concept (Cook et al., 2005). Following its introduction in the eleventh edition of the International Classification of Diseases (ICD-11), the diagnosis of complex post-traumatic stress disorder (CPTSD) attempts to acknowledge the pervasive impact of repeated interpersonal developmental trauma on emotional regulation and the person's sense of shame

and worthlessness impairing connectedness (Brewin, 2020). Nevertheless, research is only starting to explore the validity of CPTSD in adolescence (Kazlauskas et al., 2020). Accordingly, understanding the developmental pathway of the response to complex trauma might enable practitioners to facilitate adolescents' recovery process (Cook et al., 2017), thus preventing the formation of entrenched traumatic reactions in adulthood (Herman & van der Kolk, 2020).

Reflecting the extensive impact of complex trauma on psychopathology, the emergence of compassion-focused interventions as transdiagnostic therapeutic modality (Craig, Hiskey, & Spector, 2020) could arguably contribute to the amelioration of the multitude psychological sequelae of repeated interpersonal trauma. Specifically, compassion-focused therapy conceptualises compassion as motivation which requires the three affect regulation functions of threat, drive and soothing, evolved in humans due to mammalian caregiving strategies linked to early attachment experiences, thus promoting a sense of safety and connectedness (Gilbert, 2020). Accordingly, compassion-focused interventions aim to enhance the ability to experience compassion both for and from others and oneself in addition to reducing distress intolerance by fostering a sense of meaningfulness and conducive ways to deal with human suffering (Gilbert, 2020; Neff, 2003). As an example, a pioneering study looking at adolescents in a vulnerable setting examined how Cognitively-Based Compassion Training (CBCT) could be an acceptable wellness intervention with which participants were willing to engage (Reddy et al., 2013). As international guidelines recommend practitioners to expand the repertoire of evidence-based treatments to address complex interpersonal trauma in children and adolescents (van der Kolk, 2017), compassion can be explored as therapeutic target to address negative cognitions about the self, shame, attachment disturbances and connectedness that are specific to the symptomatology in CPTSD (Irons & Lad, 2017; Karatzias et al., 2018; Karatzias et al., 2019).

Although systematic reviews have explored trauma-focused interventions for children and adolescents (Leenarts et al., 2013) and trauma assessment tools (Denton et al., 2017), research has disregarded developmental stages, type and frequency of trauma. Despite focusing on an adult population, a review on self-compassion and trauma also revealed ambiguity on the definition of trauma exposure whilst suggesting the positive role of self-compassion in reducing trauma-related symptomatology (Winders et al., 2020). The psychotherapeutic benefits of compassion for a variety of mental health presentations (Leaviss & Uttley, 2015) have been further confirmed by a review of the effectiveness and acceptability of compassion-focused therapy (Craig et al., 2020). Similarly, a meta-analysis on adolescents' psychopathology suggested that self-compassion can foster wellbeing and counteract the maintenance of psychological distress (Marsh, Chan, & MacBeth, 2018).

However, a systematic review ought to corroborate whether a focus on compassion is relevant to young people who have experienced repeated interpersonal trauma. This question can be relevant for adolescents to foster their recovery and self-management as they transition to adulthood, for practitioners to enhance their interventions with compassion and for services to integrate a trauma-informed approach within a compassionate framework. Consequently, by addressing the aforementioned question, the proposed systematic review will contribute to current evidence-based practice with a fourfold focus on complex interpersonal trauma, development stage, CPTSD symptomatology, and compassion. Specifically, this review will build on Winders et al. (2020) and bring together studies on compassion towards self and others (Strauss et al., 2016) to examine the relationship between complex interpersonal trauma and compassion in adolescents.

Objectives

The aims of this review are as follows: (I) what is the current evidence available on the association between complex interpersonal trauma, compassion towards self and others

and psychological outcomes (i.e. reduction of both trauma-related and general psychological distress) in adolescents in cross-sectional and (II) intervention studies?

Methods

Protocol

A protocol for the review was outlined to orientate the reviewers' work and track progress. However, due to the novelty of the research field of compassion, adolescence, and trauma, and time constraint, the protocol was not registered to allow the ongoing refinement of search strategy. Nonetheless, PRISMA guidelines were followed to complete the systematic review.

Eligibility criteria

The systematic review was developed drawing from previous reviews on CFT (Craig et al., 2020), CPTSD (Mahoney, Karatzias, & Hutton, 2019), self-compassion and trauma (Winders et al., 2020), self-compassion in adolescents (Marsh et al., 2018), and evidence-based treatments for children with psychopathology related to childhood maltreatment (Leenarts et al., 2013). Accordingly, the inclusion criteria were as follows. (I) *Population*: adolescents, defined as young people between the age of 10 and 19 (WHO, 2015), with history or self-reported history of complex interpersonal trauma or developmental trauma (van der Kolk, 2017). Further, due to the limited literature on compassion-focused interventions on young people (Leaviss & Uttley, 2015), adolescents with or without a diagnosis or self-reported symptoms of psychological disorders were included. (II) *Intervention*: studies evaluating the effectiveness of compassion-focused interventions in the amelioration of trauma-related psychopathology and correlational studies of self-compassion, trauma, and psychological outcomes were included. (III) *Comparator*: any comparator was included (e.g. pharmacological, treatment as usual; no comparator). (IV) *Outcomes*: psychological and trauma-related outcomes with validated measures to assess trauma and/or compassion/self-

compassion. (V) *Study types*: empirical, quantitative design published since the establishment of CFT (2000) until 2020. Qualitative studies, editorials, opinion pieces were excluded. The language restriction was English.

Information sources

Studies were located by searching electronic databases, reference lists of identified articles, relevant journals and systematic reviews. The literature search was completed on June 16, 2020. The following databases were included from inception: APAPsycInfo®, APAPSycArticles®, CINAHL, MEDLINE, Child Development and Adolescent Studies, Sociological Abstracts, Social Services Abstracts, PTSDpubs, PubMed Databases, and Web of Science. Attempts were made to include grey literature by searching Open Grey and Grey Source Index.

Search

Terms indicative of adolescence, complex interpersonal trauma, compassion, and therapy were combined. A full search strategy for APAPsycInfo® is reported in Appendix 1. References were exported to a web-based reference manager software and duplicates were removed.

Study selection

Titles and abstracts were screened against the inclusion criteria, whereas the full manuscript was accessed if necessary. Two reviewers determined eligibility of the studies and disagreements were resolved by consensus.

Data collection process and items

A data extraction sheet was developed based on the aims of the review. Data was extracted by one reviewer and checked by another reviewer. Data extracted included information about: (I) participants' demographic information, sample size, context, details on trauma; (II)

characteristics of intervention, definition of compassion; (III) comparators and outcome measures; (IV) study type, limitations, recommendations.

Risk of bias in individual studies

All eligible studies were blindly appraised by two reviewers and discrepancies were resolved through discussion. Following Winders et al.'s review (2020), risk of bias was assessed with the Newcastle–Ottawa Scale (NOS; Modesti et al., 2016; Wells et al., 2013) for cross-sectional studies and a modified version of the Downs and Black Checklist (D&B; Downs & Black, 1998) for empirical studies. The NOS Scale evaluates sample selection, comparability and outcome with a maximum score of 10 and 5 indicating satisfactory study quality. The average score was 6.6. The D&B checklist evaluates reporting, internal and external validity. The 27th item on power was removed as not applicable to the intervention studies extracted. Accordingly, the maximum possible score was 27 with 14 indicating satisfactory methodological quality. The average score was 17.3. Quality ratings were used to discuss the evidence in the synthesis of results and are detailed in Appendix 2.

Data synthesis method

The limited number of studies retrieved and their heterogeneity prevented a statistical synthesis and meta-analysis. Consequently, the outcomes were discussed within a descriptive synthesis (Leaviss & Uttley, 2015).

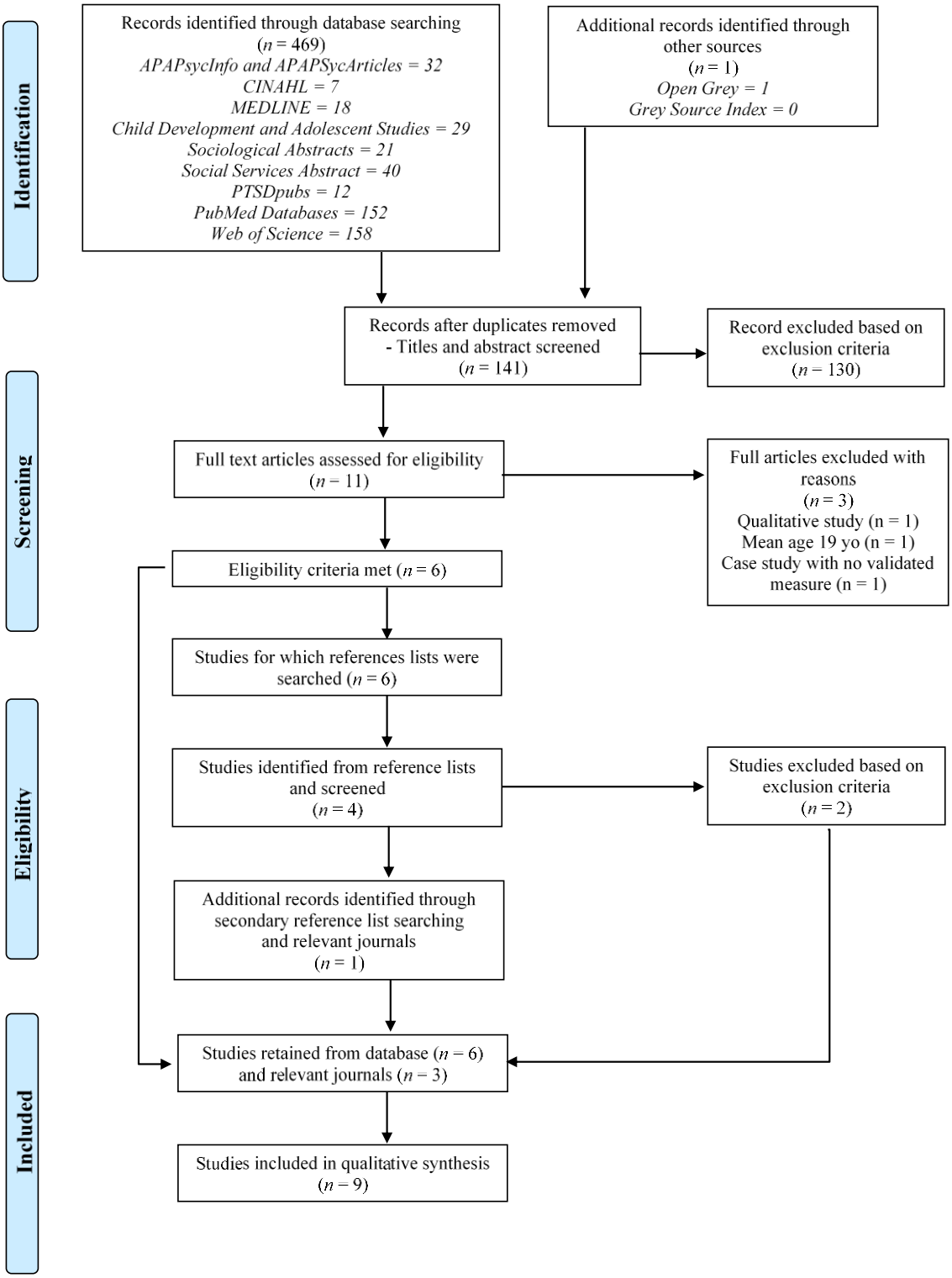
Results

Study selection

Nine studies, including three intervention studies and six cross-sectional studies, were identified for inclusion in this review. The database search provided 466 initial citations, comprising 140 duplicates. From the remaining 326, 317 studies could be discarded at the title and abstract screening as not meeting the inclusion criteria. Eleven studies were fully

examined and only six met the inclusion criteria were included in this systematic review. Four additional studies were identified by searching through the references of the selected studies and specialist child and adolescent and/or trauma journals. Only three met the inclusion criteria and were thus included in this systematic review. No unpublished studies were located. As per PRISMA recommendations, the flow diagram in Figure 1 illustrates the study selection process.

Figure 1. PRISMA Flow Diagram of study selection



Study characteristics

The studies were published between 2011 and 2020, covering Asia/Middle East (*n* = 3; China and Turkey), Europe (n = 2; UK and Spain), and North America (*n* = 4; Canada, Georgia and Missouri – USA). The studies were heterogeneous in terms of design, participants, and interventions.

Participants

Five studies recruited a student population and four studies selected adolescents in foster care or receiving child protective services. Despite the absence of a specific definition of trauma exposure in the recruitment, all participants had experienced interpersonal trauma, such as childhood emotional and physical abuse/neglect (Zhang, Liu, & Long, 2020), including more recent traumatic events, such as bullying (Zhang, Chi, Long, & Ren, 2019) and sexual assault (Bowyer, Wallis, & Lee, 2014). Only two studies reported exclusion criteria due to health reasons or failure to complete the procedure (Pace et al., 2013) and/or missing data (Zhang et al., 2019) though there was no reported significant difference between included and excluded participants. The sample size ranged from one to 1845, the mean age from 13.3 years (Zhang et al., 2020) to 18.1 years (Tanaka et al., 2011). As two studies (Pace et al., 2013; Reddy et al., 2013) were based on the same population, the nine studies included eight participant samples with a combined sample size of *n* = 4140.

Intervention

Amongst the cross-sectional studies (*n* = 6), three collected data through a survey (Yakup & Besra, 2018; Zhang et al., 2019; Zhang et al., 2020) and one through questionnaires (Játiva & Angeles Cerezo, 2014) two were longitudinal with one-year follow up (Valdez, Lim, & Parker, 2015) and two-year follow up (Tanaka et al., 2011). Amongst the intervention studies (*n* = 3), there was one randomised control trial, which looked at psychosocial (Reddy et al., 2013) and physiological outcomes (Pace et al., 2013) in two

different studies, and one case study (Bowyer et al., 2014). The duration of the intervention was six weeks with twelve sessions in the randomised trial and thirty-two weeks with twenty sessions in the case study. Specifically, the trial provided Cognitively Based Compassion Training (CBCT; Ozawa-de Silva & Dodson-Lavelle, 2011), including teaching, discussion (e.g. compassionate concepts, such as equanimity towards others), mindfulness components, as well as home practice (e.g. writing a daily practice diary). The case study examined trauma-focused CBT (Ehlers et al., 2005; Smith et al., 2007) enhanced by compassionate mind training (CMT; Gilbert, 2010; Lee & James, 2012), which included psychoeducation, the development of concrete metaphors, imagery work, and compassionate scripts to promote self-soothing as emotional regulation strategy.

Outcomes

Primary. Psychosocial (e.g. depression/anxiety; psychological maladjustment) and physiological (i.e. salivary C-reactive protein) measures.

Secondary. Alcohol and substance misuse, suicidality, psychological distress, treatment acceptability, and levels of shame and disgust.

Measurement of compassion

The studies used four different self-reported measures for compassion towards self or others: the Self-Compassion Scale (SCS; Neff, 2003; $n = 6$) for compassion towards self; the Forms of Self-Criticizing/Attacking and Self-Reassuring Scale (FCSRS; Gilbert et al., 2004; $n = 1$), which specifically looks at the ability to reassure one's self; selected items from the Perceived Benefits Scale (PBS; McMillen & Fisher, 1998; $n = 1$) to detect enhanced compassion for others; and the Self-Other Four Immeasurables Scale (SOFI; Kraus & Sears, 2009; $n = 1$), which considers compassion both towards self and others

Measurement of interpersonal trauma

The studies utilised four different self-report measures to detect trauma symptomatology: the Childhood Trauma Questionnaire (CTQ; Bernstein et al., 1994; *n* = 5) or its short form (CTQ-SF; Bernstein et al., 2003; *n* = 1) to measure retrospectively childhood trauma; an enhanced version of the Juvenile Victimization Questionnaire (JVQ; Finkelhor et al., 2005; *n* = 1) to measure childhood maltreatment, peer, sibling, sexual, internet, and indirect victimisation in addition to generic offenses; the Post Traumatic Diagnostic Scale (PDS; Foa, 1995; *n* = 1) to measure the severity of PTSD symptoms; and selected items of the Illinois Bullying Scale (IBS; Espelage & Holt, 2001; n = 1) to measure bullying victimisation.

Syntheses of Results

Aim 1 – To examine the evidence about the relationship between compassion, interpersonal trauma, and psychological outcomes in adolescents. The review revealed a twofold focus in current research that examines the relationship between compassion and interpersonal trauma and the role of compassion in the association between psychological outcomes and trauma. Firstly, studies explored the relationship between compassion and interpersonal trauma in adolescents and a summary of main findings is illustrated in Table 1.

Table 1. Summary of correlational studies results

	Population			Outcome				Type of Study		
First author, year, and country	**Participants**			**Outcome measures**		**Trauma-compassion relationship**	**Compassion-wellbeing relationship**	**Design**	**Recommendations**	**Quality (D&B)**
	N **(% female)** **Mean Age (SD)** **Ethnicity**	**Sample, setting & experience of trauma**	**Trauma**	**Compassion**	**Psychological wellbeing**					
Tanaka et al., 2011, Canada	117 (-) 18.1 (1.0) 31.3% Blacks 27.8% dual/ multiple ethnicity 27.0% Whites	receiving services from child protective services repeated maltreatment (e.g. parental dysfunction; multiple caregivers; physical/emotional abuse and/or neglect)	CTQ	SCS	OSDUHS CESD GHQ Suicide attempts in the past year	Moderate correlations between self-compassion and emotional abuse ($r = -.35$), emotional neglect ($r = -.33$), and physical abuse ($r = -.30$); self-compassion accounted for 10.7% of a maltreatment-related impairment risk score. Reduced self-compassion associated with increased positive maltreatment-	Youth with low SCS were more likely to have anxiety/depression, psychological distress, alcohol use problems, and report a serious suicide attempt Self-compassion associated with male gender ($r = .23$, $p < .012$)	Cross-sectional (longitudinal)	Consider whether improved self-compassion would translate into improved self-care and help-seeking behaviours. Self-compassion as a potential mediator of resilience from historical maltreatment.	8

						related impairment screening (β = −.36, p < 001).				
Játiva et al., 2014 Spain	109 (28.4%) 16.74 (0.94) 71.6% born in Spain; 28.4% were immigrant	adolescents with poor school performance both direct and indirect exposure to violence (47.7% child maltreatment)	JVQ	SCS	YSR	subjects who reported more types of victimization had lower levels of self-compassion (β = −.239; p < .005).	participants with low levels of self-compassion obtained higher mean values in psychological maladjustment (Ms = 60.5 and 42.7; SDs = 21.5 and 17, respectively)	Cross-sectional	explore development of self-compassion in adolescence as emotional regulation strategy include practice of self-compassion in adolescent intervention and prevention programs	7
Valdez et al., 2016 (Spain)	373 (55%) 16.35 (0.78) 50.1% African American, 44.8% Caucasian	residing in foster care childhood trauma history (i.e. physical, emotional, and sexual abuse)	CTQ	PBS	D-ARK	Participants reported experiencing positive change (i.e. increased compassion for others and enhanced self-efficacy) as a result of adversity. Mean scores on enhanced self-efficacy and increased compassion for others were 11.55 (SD = 3.36) and 11.57 (SD = 3.74), respectively.	enhanced self-efficacy was associated with less depression (γ = −.236, p < .001). Compassion for others was not related to initial levels of depression.	Cross-sectional (longitudinal)	engaging foster youth in community-based leadership activities develop interventions to foster self-efficacy explore post-trauma positive change in the context of depression	7

Zhang et al., 2019 China	1845 (42.9%) 13.07 (1.23) born in China	school-aged left-behind children across China. Bullying and neglect	IBS (9 selected items)	SCS	CESD CHS	The indirect effect of bullying victimization on depression through self-compassion was significant (β = .151, p < .001, 95% CI [0.106, 0.198]).	Self-compassion and hope were positively associated (r = .35, p < .01) Self-compassion and hope were negatively associated with depression (r = -.55, p < .01; r = -.38, p < .01)	Cross-sectional (survey model)	Interventions to foster compassion to cope with adverse childhood experiences.	7
Zhang et al., 2020 China	1167 (52.2%) 13.34 (0.95) From China	Adolescents from rural schools in China. Childhood maltreatment Emotional (43.2%), physical (33.6), sexual abuse (33.4%); emotional (87%) and physical neglect (81.1%)	CTQ-SF	SCS	ASIQ	Self-compassion had a mediating effect on the relationship between emotional abuse and suicidality (β = 0.054, p < .001, 95% CI [0.035, 0.078]); between emotional neglect and suicidality (β = 0.012, p < .001, 95% CI [0.004, 0.025]), and between physical neglect and suicidality (β = 0.015,	Self-compassion was negatively associated with suicidality (r = −.37, p < .01	Cross-sectional (survey model)	Development of programs to foster self-compassion to tackle suicidality	7

						$p < .001$, 95% CI [0.003, 0.031]). Males reported a higher self-compassion (F = 11.50, $p < .01$)				
Yakup et al., 2018 Turkey	457 (31.5%) 17 (100%) Turkish (otherwise not specified)	12th grade high-school students from different schools of Istanbul. -	CTQ	SCS	N/A	significant negative relationships: physical abuse and self-compassion (*r* = -.201, p< .01); between emotional abuse and self-compassion (*r* = -.273, p< .01); between sexual abuse and self-compassion (*r* = -.112, p< .05). Males (X = 76.12, ss = 14.00) have higher self-compassion than females (X = 71.78, ss = 15.45)	N/A	Cross-sectional (survey model)	Early interventions for students and families to promote social support. Group practice to enhance adolescents' self-compassion.	4

First author, year, and country						**Key findings on trauma-compassion relationship and**	Type of Study **Design**	**Recommendations**	**Quality (D&B)**

	intervention outcomes			
Reddy et al., 2013, Georgia (USA)	no improvement in psychosocial outcomes; positive evaluation of intervention; depressive symptoms as measured by the QIDS were significantly lower after 6 weeks in both CBCT (mean difference = 2.47, SD = 5.00, $p <$ .01) and wait-list (mean difference = 2.32, SD = 5.50, $p <$ .05).	RCT Blocked randomization	Gradual lengthening of meditation exercises; Use of concrete metaphors; Identification of influential peers; Physically active practice	22
Pace et al., 2013	QIDS scores decreased	RCT Blocked randomizat	Long term follow up to ascertain if CBCT-related	21

Georgia (USA)	across the study period in all participants (baseline: 10.33 [SEM = 0.83]; 6-week follow-up: 8.26 [SEM = 0.97]; F[1,53] = 8.36, *p* = 0.01,), but no group main effect (F[1,53] = 0.006, *p* = 0.94,) or group × time interaction (F[1,53] = 0.28, *p* = 0.60,) was observed. STAI total scores tended to be lower in the CBCT group (16.76 [SEM = 1.39]) compared to the control group (20.78	ion	reductions in inflammatory tone translate into improved health outcomes

		[SEM = 1.47]) (F[1,53] = 3.96, *p* = 0.052,).			
Bowyer et al., 2014 (UK)		decline from severe to mild PTSD symptoms; decline from moderate-severe to normal depressive symptoms; enhanced self-soothing; decreased self-hatred; no reported deliberate self-harm	Case study	Develop measures for shame and self-soothing in adolescents	9

Abbreviations: - not reported; CTQ, Childhood Trauma Questionnaire (Fink et al. 1995); CTQ-SF, Childhood Trauma Questionnaire Short Form (Bernstein et al., 2003); SCS, Self-Compassion Scale (Neff, 2003); OSDUHS, Ontario Student Drug Use and Mental Health Survey; CESD, Centre for Epidemiologic Studies Depression Scale (Radloff, 1977); GHQ, General Health Questionnaire (Goldberg & Blackwell, 1970); JVQ, Juvenile Victimization Questionnaire (Finkelhor et al., 2005; Hamby et al., 2004); YSR, Youth Self-Report (Achenbach & Rescorla, 2001); PBS, Perceived Benefit Scale (McMillen & Fisher, 1998); D-ARK, Depression-Arkansas Scale (Smith et al., 2002; Walter et al., 2003); IBS, Illinois Bullying Scale (Espelage & Holt, 2001); CHS, Children's Hope Scale (Snyder et al., 1997); ASIQ, Adult Suicidal Ideation Questionnaire (Reynolds, 1991).

Tanaka et al. (2011) tested the baseline of childhood maltreatment in adolescents receiving services from childhood protective services and a two-year follow up whereby youth completed measures of self-compassion in addition to mental, physical health and risky behaviours. The study revealed moderate negative correlations between self-compassion scores and emotional abuse, emotional neglect, and physical abuse. Specifically, through a regression, Tanaka et al. (2011) identified that emotional abuse was the only significant predictor of reduced self-compassion score. Similarly, Yakup & Besra, 2018 (2018) found moderate negative correlations between self-compassion levels and reported emotional abuse, emotional neglect and physical abuse. Furthermore, Zhang et al. (2020) observed how male adolescents' self-compassion scores were higher than their female counterparts, thus confirming the association between self-compassion score and male gender reported by Tanaka et al. (2011) and Yakup & Besra, 2018 (2018). In the study conducted by Játiva & Angeles Cerezo (2014) with adolescents with poor school performance, a regression highlighted that adolescents with lower scores of self-compassion reported more types of victimisation, thus corroborating the significant negative relationship between self-compassion and various forms of childhood interpersonal trauma.

Secondly, studies explored how the relationship between compassion and interpersonal trauma intertwined with psychological outcomes. For instance, Tanaka et al. (2011) found that reduced self-compassion scores in adolescents with childhood maltreatment were associated with an increased positive screening of risky behaviours, mental and physical health issues. Accordingly, youth with low self-compassion scores had a higher likelihood to present with anxiety/depression, alcohol misuse, psychological distress and suicidality. However, there was no relationship between self-compassion and substance misuse. Correspondingly, Zhang et al. (2020) found that self-compassion mediated the relationship between childhood maltreatment (i.e. emotional abuse, emotional neglect, and physical

neglect) and suicidal ideation, exposing a negative association between self-compassion and childhood maltreatment. Játiva & Angeles Cerezo (2014) also revealed a significant negative relationship between reported self-compassion and psychological maladjustment, including internalising (i.e. somatic complaints and anxiety/depression) and externalising factors (i.e. antisocial and offensive behaviours). Despite acknowledging that there might be other interplaying factors, Játiva & Angeles Cerezo (2014) found self-compassion to moderately mediate the relationship between victimisation and psychological maladjustment so that the correlation between victimisation and psychological maladjustment weakens when self-compassion is considered. Similarly, Zhang et al. (2019) reported that self-compassion significantly mediated the association between bullying victimisation and depression, whilst specifying that self-compassion was negatively correlated with depression. Finally, the only study that looked at compassion for others in abused adolescents residing in foster care (Valdez et al., 2015) explored components of positive change as a result of adversity due to childhood traumatic experiences, finding that adolescents experienced increased compassion. Nevertheless, compassion for others was not related to initial depression levels nor changes in depression (Valdez et al., 2015).

Aim 2 – To evaluate the early evidence about compassion-focused interventions for adolescents with interpersonal trauma. The review located three intervention studies whose outcomes are summarised in Table 2, thus preventing from drawing definite conclusions.

Table 2. Summary of intervention studies results

	Population		Intervention	Comparator	Outcome				Type of Study		
First author, year, and country	**Participants**		**Treatment (sessions)**	**Control**	**Outcome measures**			**Key findings on trauma-compassion relationship and intervention outcomes**	**Design**	**Recommendations**	**Quality (D&B)**
	N (% female) Mean Age (SD) Ethnicity	**Sample & setting Definition of trauma (% with PTSD)**			**Trauma**	**Compassion**	**Psychological wellbeing**				
Reddy et al., 2013, Georgia (USA)	71 (56%) 14.7 (1.14) 78.8% African American	foster care; adverse life experiences, maltreatment (10%)	CBCT (60mins biweekly sessions over 6 weeks) Pre-measures assessment at week 1; post-measures assessment at week 6	waitlist	CTQ	SOFI (Subscales about self and others)	CBCL QIDS-SR STAI-T CHS DERS ICU-y ICU-p Practice diaries Qualitative post-treatment feedback	no improvement in psychosocial outcomes; positive evaluation of intervention; depressive symptoms as measured by the QIDS were significantly lower after 6 weeks in	RCT Blocked randomization	Gradual lengthening of meditation exercises; Use of concrete metaphors; Identification of influential peers; Physically active practice	22

								both CBCT (mean difference = 2.47, SD = 5.00, p < .01) and wait-list (mean difference = 2.32, SD = 5.50, p < .05).			
Pace et al., 2013 Georgia (USA)	55 (43.6%) 14.55 (1.21) African American 75.86% Caucasian 17.24% Multiracial 6.89%	foster care; adverse life experiences, maltreatment (10%)	CBCT (12 sessions - 60mins biweekly over 6 weeks) Pre-measures assessment at week 1; post-measures assessment at week 6	waitlist	nil	nil	Salivary C-reactive protein concentration (ng/ml)	QIDS scores decreased across the study period in all participants (baseline: 10.33 [SEM = 0.83]; 6-week follow-up: 8.26 [SEM = 0.97]; F[1,53] = 8.36, p = 0.01,), but no group main effect (F[1,53] = 0.006, p = 0.94,) or group × time interaction	RCT Blocked randomization	Long term follow up to ascertain if CBCT-related reductions in inflammatory tone translate into improved health outcomes	21

								(F[1,53] = 0.28, *p* = 0.60,) was observed. STAI total scores tended to be lower in the CBCT group (16.76 [SEM = 1.39]) compared to the control group (20.78 [SEM = 1.47]) (F[1,53] = 3.96, *p* = 0.052,).			
Bowyer et al., 2014 (UK)	1 female 17 British not otherwise specified	referred to CAMHS, with PTSD and depression symptoms, history of emotional neglect	TF-CBT enhanced by CMT (20 sessions - 14x 1h + 4x 1.5h over 32 weeks) No specific timescale provided on pre-post measures assessment.	nil	PDS	FSCRS (Subscales about self)	BDI-II OAS	decline from severe to mild PTSD symptoms; decline from moderate-severe to normal depressive symptoms; enhanced self-soothing;	Case study	Develop measures for shame and self-soothing in adolescents	9

		decreased self-hatred; no reported deliberate self-harm

Abbreviations: CBCT, Cognitively-Based Compassion Training (Ozawa-de Silva & Dodson-Lavelle, 2011); TF-CBT, Trauma-focused cognitive therapy (Smith et al., 2007); CMT, Compassionate Mind Training (Gilbert, 2010); CTQ, Childhood Trauma Questionnaire (Fink et al. 1995); SOFI, Self-Other Four Immeasurables Scale (Kraus & Sears 2009); CBCL, Child Behavior Checklist—Parent Version (Achenbach & Rescorla, 2001); QIDS, Quick Inventory of Depressive Symptomatology–Self Report (Rush et al., 2003); STAI-T, State-Trait Anxiety Inventory-Trait Subscale (Spielberger et al., 1983); CHS, Children's Hope Scale (Snyder et al., 1991); DERS, Difficulties with Emotion Regulation Scale (Gratz & Roemer, 2004); ICU-y, Inventory of Callous and Unemotional Traits - Youth Self Report (Essau et al., 2006); ICU-p, Inventory of Callous and Unemotional Traits–Parent Report (Essau, et al., 2006); PDS, Post Traumatic Diagnostic Scale (Foa, 1995); FSCRS, Forms of Self-Criticizing/Attacking and Self-Reassuring Scale (Gilbert et al., 2004); BDI-II, Beck Depression Inventory (Beck et al., 1996); OAS, Other as Shamer Scale (Goss et al., 1994)

A case study examined a trauma-focused CBT intervention enhanced by compassion-focused, and more specifically skills from compassionate-mind training. Bowyer et al. (2014) reported that the adolescent, who assessed to have a history of emotional neglect in addition to a more recent sexual abuse, experienced a significant reduction of PTSD symptoms, thus no longer meeting the diagnostic criteria as outlined in the fourth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV). Similarly, there was a change from moderate-severe to normal symptomatology of depression. accompanied by the discontinuance of self-harming behaviour. The specific contribution of the compassion-focused intervention targeted the adolescent's self-hatred and shame and became evident in the display of depressive symptoms through the replacement of self-harming behaviours with compassionate self-soothing.

The two RCTs (Pace et al., 2013; Reddy et al., 2013) considered CBCT in adolescents in foster care, considering the same population but reporting results from different sample sizes, due to their focus on physiological and psychological outcomes, respectively. Both RCTs found that depressive symptoms lowered significantly in both the CBCT and control group (Pace et al., 2013; Reddy et al., 2013). Additionally, whilst reporting a reduction in anxiety symptoms in both groups, Pace et al. (2013) detected a correlation between reduced salivary C-reactive protein C (CRP) and number of CBCT practice sessions ($r_s = 0.58$, $p = 0.002$). Similarly, Reddy et al. (2013) reported a trend association, though non-significant ($r = -0.35$, $p = .059$), between lower anxiety levels and the frequency of the completion of CBCT practice diaries to record their home practice which included meditation tracks. Finally, Reddy et al. (2013) gathered qualitative feedback on the intervention acceptance, with most of the participants (62%) agreeing on its helpfulness.

Consequently, current evidence provides mixed results regarding the effectiveness and acceptability of compassion-enhanced interventions on traumatised adolescents, with

some positive psychological outcomes and others not changing, thus reflecting the heterogeneity in the populations targeted and measures used.

Discussion

Summary of evidence

This review aimed to evaluate the evidence about the relationship between compassion, interpersonal trauma and psychological outcomes in adolescents and assess the efficacy of compassion-focused interventions. Despite both compassion (Marsh et al., 2018) and trauma (Leenarts et al., 2013) have been explored in child and adolescent research, the paucity of the studies retrieved indicates that the role of compassion in young people with complex trauma is in its early stages. Accordingly, findings might be valuable for pointing towards further research.

Correlational studies reported that childhood maltreatment, and specifically emotional abuse, undermines adolescents' self-compassion, suggesting that interpersonal trauma might impair the development of compassion towards one's self (Yakup & Besra, 2018; Tanaka et al., 2011). Additionally, as opposed to compassion for others (Valdez et al., 2015), self-compassion appears to buffer the impact of repeated interpersonal trauma on psychological outcomes (Játiva & Angeles Cerezo, 2014; Zhang et al., 2019; Zhang et al., 2020). Thus, the development of self-compassion during adolescence might arguably be a protective factor to enhance young people's resilience.

However, empirical studies, with only two randomised control studies (Pace et al., 2013; Reddy et al., 2013) and one case study (Bowyer et al., 2014) do not provide satisfactory evidence to corroborate the effectiveness of a compassion-focused intervention. Nevertheless, a compassion-focused approach appeared to be acceptable (Reddy et al., 2013) and transdiagnostic, with applications on depressive, anxiety, self-injurious, and

physiological symptoms (Bowyer et al., 2014; Pace et al., 2013; Reddy et al., 2013). Thus, compassion-focused interventions might arguably have the potential to address the diversified symptomatology that is associated with complex interpersonal trauma, as it affects self-concept, connectedness, and emotional and behavioural regulation (Cloitre et al., 2018).

Consequently, the following recommendations can be suggested. Firstly, research would require larger sample sizes with case series (Bowyer et al., 2014) or RCTs that compare compassion-enhanced interventions against trauma-focused interventions (Reddy et al., 2013), whilst detailing the procedural aspects of delivery, such as structure, content and number of sessions. Secondly, adolescents would benefit from developmental adaptations of compassion-enhanced interventions, such as the integration of physical activities (Reddy et al., 2013), and active participation (Valdez et al., 2015). Lastly, policy makers could invest in prevention programmes to foster compassion and mitigate the ripple effect of complex trauma into adulthood (Yakup & Besra, 2018, 2018; Tanaka et al., 2011; Zhang et al., 2019).

Limitations

At study and outcome level, the review identified heterogenous studies showing methodological inconsistency. First, the samples varied, including adolescents from school or a foster care setting, with diverse demographics and clinical backgrounds. Although most adolescents had experienced childhood trauma (Yakup & Besra, 2018, 2018; Tanaka et al., 2011; Valdez et al., 2015), limited information about these traumatic experiences, with some reference to abuse and neglect (Bowyer et al., 2014; Pace et al., 2013; Reddy et al., 2013). Furthermore, adverse childhood experiences, such as bullying (Zhang et al., 2019) and sibling and peer victimisation (Játiva & Angeles Cerezo, 2014), were also clustered into the symptomatology associated with complex interpersonal trauma, thus challenging the generalisability of the findings.

Second, there were inconsistencies in the definitions of compassion. Most studies (Yakup & Besra, 2018, 2018; Játiva & Angeles Cerezo, 2014; Tanaka et al., 2011; Valdez et al., 2015; Zhang et al., 2019) referred to Neff's (2003) conceptualisation of self-compassion as kindness towards one's self, acknowledgement of a shared humanity, and awareness of suffering with no identification. One study considered compassion towards others and increased sensitivity to the needs of others (Valdez et al., 2015). Similarly, CMT (Bowyer et al., 2014) and CBCT (Pace et al., 2013; Reddy et al., 2013) appeared to emphasise self-compassion and compassion towards others, respectively.

Third, compassion, trauma, and psychological outcomes measures were self-reports, questioning their validity against the gold standard of a clinician administered interview (Weathers et al., 2004) and their vulnerability to recall (Bell et al, 2019) or social desirability bias (Krumpal, 2013). Additionally, some of the outcome measures, such as the SOFI (Kraus & Sears, 2009) and the PDS (Foa, 1995), were not developmentally sensitive (Denton et al., 2017).

Fourth, non-significant results were reported in cross-sectional studies, which detected correlation, and no causal relationships, between compassion and interpersonal trauma. Similarly, intervention studies had limited statistical power due to their small sample sizes and did not have an active control condition. Thus, findings provide weak clinical evidence.

At review-level, the heterogeneity of the studies retrieved reflected in the challenges posed by the search strategy to locate all relevant studies. Despite the endeavour to enhance comprehensiveness drawing from existing systematic reviews (Craig et al., 2020; Marsh et al., 2018; Winders et al., 2020), the variety of the definitions of complex trauma might explain why an additional study (Yakup & Besra, 2018) had not been detected through database search, suggesting that there might be more relevant studies. Additional time

constraints prevented the inclusion of unpublished studies, multilingual databases and contact with experts in the field, thus increasing risk of publication bias. Nevertheless, this review remains, to the authors' knowledge, the first attempt to explore the role of compassion in adolescents' interpersonal trauma.

Conclusions

This review calls for more research on compassion and complex trauma in adolescence. Whilst adult literature is starting to gather transdiagnostic evidence on the effectiveness and acceptability of compassion-focused interventions (Craig et al., 2020), whilst exploring compassion and trauma (Winders et al., 2020), corresponding adolescent research is dawning. However, the impact of repeated interpersonal trauma on development (Winters & Beerbower, 2017) makes compassion a worthwhile therapeutic target (Brill & Nahmani, 2017; Karatzias et al., 2019) in adolescents if contextualised in the development of a positive sense of self towards adulthood, connectedness as response to suffering, and emotional regulation strategy (Maercker et al., 2013).

Future adolescent trauma research needs to be developmentally sensitive (Denton et al., 2017) and both compassion and trauma measures need to be accordingly validated, whilst challenging the overreliance on self-reports (Pace et al., 2013; Reddy et al., 2013). Studies might explore gender differences (Boykin et al., 2018; Kang et al., 2018) in sensitivity to compassion and potential societal influences (Yakup & Besra, 2018, 2018; Tanaka et al., 2011). Additionally, compassion-focused interventions appear to be versatile (Donovan et al., 2016) and could equip practitioners with the flexibility to provide positive coping mechanisms (Bowyer et al., 2014) and foster adolescents' resilience. Accordingly, on a practice level, research is needed to ascertain whether the development of compassion buffers the psychological sequelae of complex trauma (Játiva & Angeles Cerezo, 2014; Tanaka et al., 2011; Zhang et al., 2019), thus encouraging policy makers to promote a compassionate-

informed response to trauma and human suffering (Burkey et al., 2020; Presnell, 2018). Therefore, by assessing current evidence, this review highlights both the difficulties and the potential for research to converge and contributes to traumatised adolescents' psychological wellbeing.

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Appendix 1 – Literature Search Strategy

Search Strategy for APAPsycInfo and APAPsycArticles

Date undertaken: 10 May 2020

The search combined the key terms detailed below as follows.

[Population: Adolescence] AND [Population: CPTSD] AND [Intervention] AND [Compassion]

Filters applied: Adolescence 13-17; Childhood birth-12; School Age 6-12; 2000-2020; peer reviewed; English language.

Population: Adolescence

"early adolescence" OR adolescen* OR "young people" OR "young person" OR "youth" OR "minor*" OR "young*" OR "child*" OR youngster* OR "adolescent psychopathology" OR "adolescent psychology" OR "adolescent psychiatry" OR "adolescent psychotherapy" OR “teenager”

MAINSUBJECT.EXACT("Early Adolescence") OR MAINSUBJECT.EXACT("Adolescent Psychopathology") OR MAINSUBJECT.EXACT("Adolescent Psychology") OR MAINSUBJECT.EXACT("Adolescent Psychiatry") OR MAINSUBJECT.EXACT("Adolescent Psychotherapy")

Population: CPTSD

"Post?traumatic Stress Disorder" OR "Stress and Trauma Related Disorders" OR "Complex PTSD" OR "Trauma" OR "Stress and Trauma Related Disorders" OR "Posttraumatic Growth" OR "Emotional Trauma" OR "Child Abuse" OR "Intimate Partner Violence" OR "Domestic Violence" OR "Childhood Adversity" OR "Child Neglect" OR "Physical Abuse"

OR "Sexual Abuse" OR "Emotional Abuse" OR "Post?traumatic Stress Disorder" OR "Stress and Trauma Related Disorders" OR "Complex PTSD" OR CPTSD OR "complex?trauma" OR abuse OR neglect OR CSA OR DESNOS OR "Acute stress disorder" OR "Interpersonal Trauma" OR "Relational trauma" OR "Repeated trauma" OR "Developmental Trauma" OR Maltreatment OR "Developmental post?traumatic adaptation"

MAINSUBJECT.EXACT("Posttraumatic Stress Disorder") OR MAINSUBJECT.EXACT("Stress and Trauma Related Disorders") OR MAINSUBJECT.EXACT("Complex PTSD") OR MAINSUBJECT.EXACT("Trauma") OR MAINSUBJECT.EXACT("Stress and Trauma Related Disorders") OR MAINSUBJECT.EXACT("Posttraumatic Growth") OR MAINSUBJECT.EXACT("Emotional Trauma") OR MAINSUBJECT.EXACT("Child Abuse") OR MAINSUBJECT.EXACT("Intimate Partner Violence") OR MAINSUBJECT.EXACT("Domestic Violence") OR MAINSUBJECT.EXACT("Childhood Adversity") OR MAINSUBJECT.EXACT("Child Neglect") OR MAINSUBJECT.EXACT("Physical Abuse") OR MAINSUBJECT.EXACT("Sexual Abuse") OR MAINSUBJECT.EXACT("Emotional Abuse")

Intervention

MAINSUBJECT.EXACT("Self-Compassion")

"self-compassion" OR "self compassion" OR compassion*

Compassion

MAINSUBJECT.EXACT("Treatment") OR MAINSUBJECT.EXACT("Intervention") OR MAINSUBJECT.EXACT("Training")

“treatment” OR “therapy” OR “training” OR “therap*” OR “intervention”

Appendix 2 – Quality Assessment Tools

Qualitative assessment tool for intervention studies

Downs and Black Quality Assessment Tool

	Reporting *(max = 11)*		**Bowyer et al. (2014)**	**Pace et al. (2013)**	**Reddy et al. (2013)**
1	Is the hypothesis/aim/objective of the study clearly described?	Yes = 1 No = 0	Yes	Yes	Yes
2	Are the main outcomes to be measured clearly described in the Introduction or Methods section? *If the main outcomes are first mentioned in the Results section, the question should be answered no.*	Yes = 1 No = 0	Yes	Yes	Yes
3	Are the characteristics of the patients included in the study clearly described ? *In cohort studies and trials, inclusion and/or exclusion criteria should be given. In case-control studies, a case-definition and the source for controls should be given.*	Yes = 1 No = 0	Yes	Yes	Yes
4	Are the interventions of interest clearly described? *Treatments and placebo (where relevant) that are to be compared should be clearly described*	Yes = 1 No = 0	Yes	Yes	Yes
5	Are the distributions of principal confounders in each group of subjects to be compared clearly described? *A list of principal confounders is provided.*	Yes = 2 Partially = 1 No = 0	No	Yes	Yes

6	Are the main findings of the study clearly described? *Simple outcome data (including denominators and numerators) should be reported for all major findings so that the reader can check the major analyses and conclusions. (This question does not cover statistical tests which are considered below)*	Yes = 1 No = 0	Yes	Yes	Yes
7	Does the study provide estimates of the random variability in the data for the main outcomes? *In non normally distributed data the inter-quartile range of results should be reported. In normally distributed data the standard error, standard deviation or confidence intervals should be reported. If the distribution of the data is not described, it must be assumed that the estimates used were appropriate and the question should be answered yes.*	Yes = 1 No = 0	Yes	No	Yes
8	Have all important adverse events that may be a consequence of the intervention been reported? *This should be answered yes if the study demonstrates that there was a comprehensive attempt to measure adverse events. (A list of possible adverse events is provided).*	Yes = 1 No = 0	No	No	No
9	Have the characteristics of patients lost to follow-up been described? *This should be answered yes where there were no losses to follow-up or where losses to follow-up were so small that findings would be unaffected by their inclusion. This should be answered no where a study does not report the number of patients lost to follow-up*	Yes = 1 No = 0	No	Yes	No
10	Have actual probability values been reported(e.g. 0.035 rather than < 0.05) for the main outcomes except where the probability value is less than 0.001?	Yes = 1 No = 0	No	Yes	Yes
	External validity (max = 3) *All the following criteria attempt to address the representativeness of the findings of the study and whether they may be*				

	generalised to the population from which the study subjects were derived.				
11	Were the subjects asked to participate in the study representative of the entire population from which they were recruited? *The study must identify the source population for patients and describe how the patients were selected. Patients would be representative if they comprised the entire source population, an unselected sample of consecutive patients, or a random sample. Random sampling is only feasible where a list of all members of the relevant population exists. Where a study does not report the proportion of the source population from which the patients are derived, the question should be answered as unable to determine.*	Yes = 1 No = 0 Unable to determine = 0	No	Unable to determine	Yes
12	Were those subjects who were prepared to participate representative of the entire population from which they were recruited? *The proportion of those asked who agreed should be stated. Validation that the sample was representative would include demonstrating that the distribution of the main confounding factors was the same in the study sample and the source population.*	Yes = 1 No = 0 Unable to determine = 0	No	Yes	Yes
13	Were the staff, places, and facilities where the patients were treated, representative of the treatment the majority of patients receive? *For the question to be answered yes the study should demonstrate that the intervention was representative of that in use in the source population. The question should be answered no if, for example, the intervention was undertaken in a specialist centre unrepresentative of the hospitals most of the source population would attend.*	Yes = 1 No = 0 Unable to determine = 0	No	Yes	Yes

	Internal validity – bias (max= 7)				
14	Was an attempt made to blind study subjects to the intervention they have received? *For studies where the patients would have no way of knowing which intervention they received, this should be answered yes.*	Yes = 1 No = 0 Unable to determine = 0	No	No	No
15	Was an attempt made to blind those measuring the main outcomes of the intervention?	Yes = 1 No = 0 Unable to determine = 0	No	No	No
16	If any of the results of the study were based on “data dredging”, was this made clear? *Any analyses that had not been planned at the outset of the study should be clearly indicated. If no retrospective unplanned subgroup analyses were reported, then answer yes.*	Yes = 1 No = 0 Unable to determine = 0	No	Yes	Yes

17	In trials and cohort studies, do the analyses adjust for different lengths of follow-up of patients, or in case-control studies, is the time period between the intervention and outcome the same for cases and controls ? *Where follow-up was the same for all study patients the answer should yes. If different lengths of follow-up were adjusted for by, for example, survival analysis the answer should be yes. Studies where differences in follow-up are ignored should be answered no.*	Yes = 1 No = 0 Unable to determine = 0	No	Yes	Yes
18	Were the statistical tests used to assess the main outcomes appropriate? *The statistical techniques used must be appropriate to the data. For example nonparametric methods should be used for small sample sizes. Where little statistical analysis has been undertaken but where there is no evidence of bias, the question should be answered yes. If the distribution of the data (normal or not) is not described it must be assumed that the estimates used were appropriate and the question should be answered yes.*	Yes = 1 No = 0 Unable to determine = 0	Yes	Yes	Yes
19	Was compliance with the intervention/s reliable? *Where there was non compliance with the allocated treatment or where there was contamination of one group, the question should be answered no. For studies where the effect of any misclassification was likely to bias any association to the null, the question should be answered yes.*	Yes = 1 No = 0 Unable to determine = 0	Yes	No	Unable to determine
20	Were the main outcome measures used accurate (valid and reliable)?	Yes = 1	Yes		

	For studies where the outcome measures are clearly described, the question should be answered yes. For studies which refer to other work or that demonstrates the outcome measures are accurate, the question should be answered as yes.	No = 0 Unable to determine = 0		Yes	Yes
	Internal validity - confounding (max = 6)				
21	Were the patients in different intervention groups (trials and cohort studies) or were the cases and controls (case-control studies) recruited from the same population? *For example, patients for all comparison groups should be selected from the same hospital. The question should be answered unable to determine for cohort and case-control studies where there is no information concerning the source of patients included in the study*	Yes = 1 No = 0 Unable to determine = 0	Unable to determine	Yes	Yes
22	Were study subjects in different intervention groups (trials and cohort studies) or were the cases and controls (case-control studies) recruited over the same period of time? *For a study which does not specify the time period over which patients were recruited, the question should be answered as unable to determine.*	Yes = 1 No = 0 Unable to determine = 0	No	Yes	Yes
23	Were study subjects randomised to intervention groups?	Yes = 1 No = 0 Unable to determine = 0	No	Yes	Yes

	Studies which state that subjects were randomised should be answered yes except where method of randomisation would not ensure random allocation. For example alternate allocation would score no because it is predictable.				
24	Was the randomised intervention assignment concealed from both patients and health care staff until recruitment was complete and irrevocable? *All non-randomised studies should be answered no. If assignment was concealed from patients but not from staff, it should be answered no.*	Yes = 1 No = 0 Unable to determine = 0	No	Yes	Yes
25	Was there adequate adjustment for confounding in the analyses from which the main findings were drawn? *This question should be answered no for trials if: the main conclusions of the study were based on analyses of treatment rather than intention to treat; the distribution of known confounders in the different treatment groups was not described; or the distribution of known confounders differed between the treatment groups but was not taken into account in the analyses. In nonrandomised studies if the effect of the main confounders was not investigated or confounding was demonstrated but no adjustment was made in the final analyses the question should be answered as no.*	Yes = 1 No = 0 Unable to determine = 0	No	Yes	Yes
26	Were losses of patients to follow-up taken into account? *If the numbers of patients lost to follow-up are not reported, the question should be answered as unable to determine. If the proportion lost to follow-up was too small to affect the main findings, the question should be answered yes.*	Yes = 1 No = 0 Unable to determine = 0	No	Yes	Yes

FINAL SCORE	14	21	22

Maximum possible score = 27
Excellent (25–27), Good (19–24), Fair (14–18), Poor (⩽13)

Adapted from Downs, S.H. & Black, N. (1998). The feasibility of creating a checklist for the assessment of the methodological quality both of randomised and non-randomised studies of health care interventions. *Journal of Epidemiology & Community Health, 52,* 377-384.
*Item 27 was removed

Qualitative assessment tool for correlational studies

The Newcastle-Ottawa Scale (NOS) for assessing the quality of nonrandomised studies in meta-analyses

Selection: (Maximum 5 stars)	Játiva et al., (2014)	Tanaka et al. (2011)	Valdez et al. (2016)	Yakup et al. (2018)	Zhang et al. (2019)	Zhang et al. (2020)
1) Representativeness of the sample: a) Truly representative of the average in the target population. * (all subjects or random sampling) b) Somewhat representative of the average in the target population. * (nonrandom sampling) c) Selected group of users. d) No description of the sampling strategy.	B	A	B	D	B	C
2) Sample size: a) Justified and satisfactory. *	B	A	A	B	A	A

b) Not justified.						
3) Non-respondents: a) Comparability between respondents and non-respondents characteristics is established, and the response rate is satisfactory. * b) The response rate is unsatisfactory, or the comparability between respondents and non-respondents is unsatisfactory. c) No description of the response rate or the characteristics of the responders and the non-responders.	A	A	B	C	B	C
4) Ascertainment of the exposure (risk factor): a) Validated measurement tool. ** b) Non-validated measurement tool, but the	A	A	A	A	A	A

tool is available or described.* c) No description of the measurement tool.						
Comparability: (Maximum 2 stars)						
1) The subjects in different outcome groups are comparable, based on the study design or analysis. Confounding factors are controlled. a) The study controls for the most important factor (select one). * b) The study control for any additional factor. *	A	A	A	A	A	A
Outcome: (Maximum 3 stars)						
1) Assessment of the	C	C	C	C	C	C

outcome: a) Independent blind assessment. ** b) Record linkage. ** c) Self report. * d) No description.						
2) Statistical test: a) The statistical test used to analyze the data is clearly described and appropriate, and the measurement of the association is presented, including confidence intervals and the probability level (p value). * b) The statistical test is not appropriate, not described or incomplete.	A	A	A	B	A	B
FINAL SCORE	7	8	7	4	7	7

Appendix 3 – PRISMA Checklist

PRISMA Checklist

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	4
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	5
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	6
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	9
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	9
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	9
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	10
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	10
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	11

Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	11
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	11
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	11
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	11
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	12
Section/topic	**#**	**Checklist item**	**Reported on page #**
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	12
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	N/A
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	12
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	17 & 23
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	17 & 23
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	17 & 23
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	N/A
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	N/A
DISCUSSION			

Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	29
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	30
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	32
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	33