Scandinavian Journal of Psychology, 2020, 61, 855–876 DOI: 10.1111/sjop.12668

Health and Disability

The relationship between self-harm and alexithymia: A systematic review and meta-analysis

HILARY NORMAN[1] ANDREA OSKIS,[1] LISA MARZANO[1] and MARK COULSON[2]

[1]*Faculty of Science and Technology, Middlesex University, London, UK*
[2]*School of Psychology, University of East Anglia, Norwich, UK*

Norman, H., Oskis, A., Marzano, L. & Coulson, M. (2020). The relationship between self-harm and alexithymia: A systematic review and meta-analysis. *Scandinavian Journal of Psychology, 61,* 855–876.

Self-harm, defined for the purpose of this review as any act of self-injury without explicit suicidal intent, is an increasing public health concern, with potential long-term implications for those who engage in it. Previous research has identified a correlational relationship between self-harm and alexithymia, an emotion processing deficit characterized by difficulties identifying and describing feelings, and an externally orientated thinking style. Through a systematic search of the literature, the current review examines the association between alexithymia and self-harm. A meta-analysis based on 23 studies found a significant, positive relationship between self-harm and alexithymia, with a medium effect size (g = 0.57, 95% CI 0.46–0.69). All 23 studies used the Toronto Alexithymia Scale (TAS20) to measure alexithymia. The alexithymia subcomponents difficulty identifying feelings and difficulty describing feelings were significantly associated with self-harm, but there was no significant association between self-harm and externally orientated thinking. The effect size of the relationship was significantly larger in adolescent samples compared with adult samples and in female compared with male samples. The definition of self-harm did not affect the effect size of the relationship between alexithymia and self-harm and the results are consistent with previous meta-analyses focused more narrowly on non-suicidal self-injury and, separately, suicidal behaviors. Heterogeneity between the included studies was high. The results support an affect regulation model of self-harm, in which self-harm is used to regulate an emotional experience that is poorly understood.

Key words: Self-harm, alexithymia, NSSI, emotion regulation, meta-analysis.

Hilary Norman, Faculty of Science and Technology, Middlesex University, Town Hall, The Burroughs, Hendon, London NW4 4BT, UK. Tel: 00 44 208 411 6998; e-mail: hn274@live.mdx.ac.uk

INTRODUCTION

Alexithymia is a deficit in emotion processing, meaning, literally, "no words for emotion" (Sifneos, 1973). It manifests itself in difficulties identifying and communicating emotions and in an externally orientated thinking style (Bagby, Parker & Taylor, 1994). The term alexithymia was first coined by psychotherapist Peter Sifneos to describe the apparent inability of some patients to recognize or describe their emotional experience (Sifneos, 1973). Taxometric analysis has shown that alexithymia is a dimensional trait, with a continuous distribution (Keefer, Taylor, Parker & Bagby, 2019; Parker, Keefer, Taylor & Bagby, 2008). Nevertheless, studies frequently report prevalence rates based on the proportion of participants scoring above a cut-off for high alexithymia proposed by the authors of the most commonly used measure, the Toronto Alexithymia Scale (TAS20; Bagby *et al.*, 1994; Taylor, Bagby & Parker, 1997). The proportion of people with high alexithymia scores ranges between 7 and 18% in community samples (Joukamaa, Kokkonen, Veijola, Läksy, Karvonen & Jokelainen, 2003; Mason, Tyson, Jones & Potts, 2005; Salminen, Saarijärvi, Äärelä, Toikka & Kauhanen, 1999) and between 30 and 60% in clinical samples (McGillivray, Becerra & Harms, 2017; Parker *et al.*, 2008; Taylor, 2000).

Alexithymia has been associated with psychological disorders, such as anxiety (Paniccia, Gaudio, Puddu *et al.*, 2017) and depression (Honkalampi, Hintikka, Tanskanen, Lehtonen & Viinamäki, 2000; Son, Jo, Rim *et al.*, 2013), and is generally conceived as a trans-diagnostic trait rather than a psychological condition in its own right. Significant correlations have been observed between alexithymia and behaviors such as alcohol dependence (Thorberg, Young, Sullivan, Lyvers, Tyssen & London, 2016), eating disorders (Westwood, Kerr-Gaffney, Stahl & Tchanturia, 2017), and gambling (Elmas, Cesur & Oral, 2017). It is usually assumed that alexithymia is a causal factor in these relationships, based on the conception of alexithymia as a trait arising from genetic and childhood environmental factors (Jørgensen, Zachariae, Skytthe & Kyvik, 2007; Lumley, Neely & Burger, 2007). However, it has also been observed that "secondary" alexithymia may develop in adulthood, as a result of stressful experiences such as illness or trauma (Messina, Beadle & Paradiso, 2014; Schimmenti & Caretti, 2018).

Alexithymia has also been found to be significantly higher among people with a history of self-harm (Greene, Boyes & Hasking, 2020; Norman & Borrill, 2015), defined for the purpose of this review as any act of self-injury without explicit suicidal intent. Self-harm is a major and growing public health concern (McManus, Gunnell, Cooper, Bebbington, Howard & Brugha, 2019; Pilling, Smith & Roth, 2018) and a significant risk factor for subsequent completed suicide (Carroll, Metcalfe & Gunnell, 2014; Hawton, Bergen, Cooper, Turnbull, Waters, Ness & Kapur, 2015). It has been estimated to account for over 200,000 hospital presentations per year in England alone, at a cost of £128m (Tsiachristas, Geulayov, Casey, Ness, Waters & Clements, 2020), with the number of incidences of self-harm in the community up to 10 times higher (Geulayov, Casey, McDonald, Foster, Pritchard & Wells, 2018). Estimates of the prevalence of self-harm vary because of differences in methodology and definition, but one review calculated pooled prevalence of non-suicidal self-injury as

17.2% in adolescent samples, 13.4% among young adults, and 5.5% among older adult samples (Swannell, Martin, Page, Hasking & St John, 2014). In psychiatric clinical samples, reported rates of non-suicidal self-injury range from 11 to 51% in adults and 45 to 81% in adolescents (Cipriano, Cella & Cotrufo, 2017).

People who self-harm have been found to have difficulties in emotion regulation (Wolff, Thompson, Thomas, Nesi, Bettis & Ransford, 2019) and the empirical and theoretical literature positions self-harm as a means of regulating unwelcome emotional experience (Chapman, Gratz & Brown, 2006; Klonsky, 2007; McKenzie & Gross, 2014). The association between self-harm and alexithymia may be due in part to a lack of recourse to more adaptive regulation strategies. People with high levels of alexithymia exhibit poor emotion regulation (Stasiewicz, Bradizza, Gudleski, Coffey, Schlauch & Bailey, 2012; Taylor, 2000; Venta, Hart & Sharp, 2013) and are more likely to use suppressive regulation strategies than reappraisal strategies (Swart, Kortekaas & Aleman, 2009). Using Gross (2015)'s process model, Preece, Becerra, Allan, Robinson, and Dandy (2017) have proposed that alexithymia consists of difficulties at the attention and appraisal stages of emotion regulation, driven by underdeveloped emotional schema (Lane & Schwartz, 1987) and a tendency toward avoidance of emotions (Panayiotou, Leonidou, Constantinou e*t al*., 2015). Understanding the relationship between alexithymia and self-harm, therefore, may help to inform clinical interventions based on improving emotion regulation strategies. Originally seen as a stable trait, the evidence now suggests that alexithymia can be modified through targeted interventions (Norman, Marzano, Coulson & Oskis, 2019) which makes it a worthwhile focus of study in the context of self-harm.

A narrative review of the literature found a significant relationship between self-harm and alexithymia, particularly among women (Norman & Borrill, 2015). The relationship appeared to be driven by the alexithymia subcomponents difficulty identifying and describing feelings, rather than externallyorientated thinking. Interest in the subject continues to grow and more relevant studies have been published during the subsequent years. A recent meta-analysis found significant associations between lifetime non-suicidal self-injury (NSSI) and alexithymia (r = 0.25, Greene *et al*., 2020). However, the authors only included studies meeting the International Society for the Study of Self-Injury's (2018) definition of NSSI as "deliberate damage to body tissue without suicidal intent for reasons not culturally or socially sanctioned." While this approach has the advantage of definitional clarity, relevant evidence may have been missed. Historically, a range of other terms for self-harm have been used, including, but not limited to, para-suicide, deliberate self-harm, auto-destructive behavior and self-mutilation, and motivation has not always been explicitly defined as non-suicidal. This reflects evidence that the reason for self-harm is not always clear, either to the individual or to a clinician (Grandclerc, De Labrouhe, Spodenkiewicz, Lachal & Moro, 2016). Motivations may change between incidences of self-harm by the same person, or even within a single incident of self-harm (Kapur, Cooper, O'Connor & Hawton, 2013). Muehlenkamp, Claes, Havertape, and Plener (2012) found that the term used to define self-harm (deliberate self-harm versus non-suicidal self-injury) did not affect reported prevalence rates and concluded that they were measuring similar phenomena. For this reason, the current review extends the search of the literature beyond a narrow focus on NSSI to include studies that have investigated deliberate self-harm, where the motivation for the behavior is not specified. Studies that are explicitly and exclusively focused on suicide, however, are excluded, to avoid duplication of a recent meta-analysis (Hemming, Taylor, Haddock, Shaw & Pratt, 2019), which identified an effect size of r = 0.25 in the relationship between alexithymia and suicidal behavior.

Aim of the study

The aim of this study, therefore, is to synthesize the evidence concerning the relationship between self-harm and alexithymia, including its subcomponents. Self-harm is defined, for the purpose of this review, as any act of self-injury, with the exception of those which are explicitly suicidal. It is hypothesized that there will be a significant, positive relationship between self-harm and alexithymia.

A planned subgroup analyses will investigate whether the effect size of the relationship is affected by the definition of self-harm (NSSI versus a broader definition of self-harm in which motivation is not specified, and lifetime versus current self-harm). It is expected that the definition of self-harm will not be a significant moderator (Muehlenkamp *et al*., 2012) but that recent self-harm may be more strongly associated with alexithymia than lifetime self-harm (Greene *et al*., 2020). Additional subgroup analyses will test the moderating effect of gender, age and clinical versus community samples. Norman and Borrill (2015) found stronger evidence for a significant relationship between alexithymia and self-harm among women than among men. It is therefore expected that gender will be a significant moderator. As noted above, prevalence rates of both self-harm and alexithymia tend to be higher in adolescent versus adult samples, and in clinical versus community samples. Greene *et al*. (2020) found age, but not the sample type (clinical versus non-clinical) to be a significant moderator of the relationship between NSSI and alexithymia. This review will test these findings using a broader definition of self-harm.

METHOD

Databases and search terms

The review was pre-registered with PROSPERO International prospective register of systematic reviews (CRD42018118305). Searches of six databases (PsycINFO; Medline; Web of Science; PubMed; CINAHL; and Cochrane Central Register of Controlled Trials [CENTRAL]) were conducted for the final time on 25 November 2019. Titles, abstracts and keywords were searched for alexithymia (alexithymi*) combined using the Boolean operator AND with synonyms for self-harm (suicid* OR "attempt* suicide" OR overdos* OR parasuicid* OR para-suicid* OR self-harm* OR selfharm* OR "deliberate self-harm" OR "DSH" OR self-injur* OR selfinjur* OR "non-suicidal self-injur*" OR NSSI OR self-mutilat* OR selfmutilat* OR self-destruct* OR selfdestruct* OR self-inflict* OR selfinflict* OR self-poison* OR selfpoison* OR self-immolat* OR selfimmolat* OR automutilat* or auto-mutilat* OR self-cut* or selfcut* OR autodestruct* or auto-destruct* OR "self-injurious behavio*" OR self-burn* OR selfburn).

Inclusion criteria and selection process

The following inclusion criteria were set:

- articles must be published in English;
- articles must be published in a peer-reviewed journal;

- a validated measure of alexithymia must be used;
- studies must include a measure of self-harm. No restriction was placed on the way in which self-harm was measured, other than to exclude any study which is explicitly and solely concerned with suicide. Studies which did not specify motivation, or which measured non-suicidal self-harm alongside (but separately from) suicide were included;
- studies must report a statistical assessment of the relationship between alexithymia and self-harm, or sufficient data to allow such an assessment to be made; and
- additionally, to be included in the meta-analysis, study authors needed to report or provide sufficient data to enable an effect size of the relationship between alexithymia and the presence or absence of self-harm to be calculated.

Abstracts were screened separately by two researchers and disagreements resolved through discussion.

Data extraction

Data were extracted by the lead researcher. Means and standard deviations for alexithymia, and any reported subscales, for participants with and without experience of self-harm were recorded. If these were not available, correlation statistics describing the relationship between alexithymia and self-harm were extracted. The extraction also included sample size and characteristics, and the scales used to measure alexithymia and self-harm.

Quality Assessment

The studies were checked for risk of bias using the AXIS Appraisal Tool for Cross-Sectional Studies (Downes, Brennan, Williams & Dean, 2016). The quality assessment was carried out by the lead reviewer. A second reviewer independently checked 20% of the studies and the results were compared. The tool does not provide a single, quantitative assessment of quality; rather it is designed to be used as a guide to inform interpretation of the results. It prompts the reviewer to consider, for each study, whether the aims are clear, whether the method is robust and described sufficiently to enable replication, and whether the results are complete and internally consistent. It also contains questions about ethics and conflicts of interest.

Data analysis

The meta-analyses for total alexithymia and each subscale were based on Borenstein, Hedges, Higgins, and Rothstein (2009) and calculations were made using the excel workbooks provided by Suurmond, van Rhee and Hak (2017). Because the studies reported different statistical tests, Hedges' *g* was used as the common effect size, with a 95% confidence interval (CI). A *P* value of less than 0.05 and a 95% CI that did not cross the line of no effect was interpreted as statistically significant. Effect sizes of 0.20, 0.50, and 0.80 were considered small, medium and large respectively (Cohen, 1992). For individual studies Hedges' *g* was derived from the mean difference in alexithymia using pooled standard deviation to account for differences in sample sizes. Where the means and standard deviations were not reported, Hedges' g was derived from the correlation statistic Pearson's *r*. The calculations of Hedges' *g* and standard errors were made using equations set out in Borenstein *et al*. (2009). To test whether the overall results were affected by the deriving of Hedges' *g* from a correlation statistic rather than the underlying means, a sensitivity analysis was conducted to test the effect of removing those studies reporting correlational data.

A random effect meta-analysis was conducted because it provides a more conservative estimate of the effect size, allowing for the fact that the effect size in samples with different characteristics (such as age or gender) might differ from the "true" effect size across the whole population (Borenstein *et al*., 2009). In a random effects meta-analysis, between-studies variance can affect statistical power (Borenstein *et al*., 2009) and thus, based on Jackson and Turner (2017), a minimum of five studies was set to ensure sufficient power was achieved. Heterogeneity was measured using the I^2 statistic, which describes the percentage of variation that can be attributed to differences between the studies. I^2 of less than 40% was interpreted as low heterogeneity, while I^2 of over 75% was taken to indicate considerable heterogeneity (Higgins & Green, 2011). Publication bias was checked visually using a funnel plot, and statistically using Rosenthal's fail-safe *N* (Rosenthal, 1979) and Begg and Muzumdar's test of bias (Begg & Mazumdar, 1994). If necessary, the trim and fill method was used to adjust for any bias (Duval & Tweedie, 2000).

Subgroup analyses were planned to examine differences in effect sizes according to: (1) adolescent (mean age ≤ 18), young adult (18–29), and adult samples (≥ 30); (2) male versus female samples; (3) clinical versus community samples; (4) lifetime versus recent self-harm; and (5) NSSI versus a broader definition of self-harm. Studies were included in the subgroup analysis if the number of participants per subgroup exceeded $n = 10$. Between-study variance ($\square^2$) was computed separately for each subgroup, or pooled if subgroups contained fewer than five studies (Borenstein *et al*., 2009).

RESULTS

The search returned 651 studies. Figure 1 sets out the results of the selection process. In 15 cases where insufficient data were reported, the corresponding authors were contacted. Additional data were received relating to five studies (Gatta, Rago, Dal Santo, Spoto & Battistella, 2016; Oskis & Borrill, 2019; Osuch, Ford, Wrath, Bartha & Neufeld, 2014; Sleuwaegen, Houben, Claes, Berens & Sabbe, 2017; Wester & King, 2018).

A total of 31 studies met the criteria for inclusion. Twenty-seven studies provided sufficient data to be included in the meta-analysis.

Quality assessment

The studies were found to be generally good quality. There were two areas of weakness, common to the majority of studies. First, it was rare for the studies to justify whether the sample size enabled the study to be sufficiently powered. Second, only a minority of studies analyzed non-responders or missing data. This may introduce bias if the participants choosing not to respond share certain characteristics. No study was excluded from the review on grounds of quality.

Measures

Although the inclusion criteria did not specify the measure of alexithymia, all studies except one used the Toronto Alexithymia Scale. Two studies (Lüdtke, In-Albon, Michel & Schmid, 2016; Zlotnick, Shea, Pearlstein, Simpson, Costello & Begin, 1996) used the original version, the TAS26 (Taylor, Ryan, & Bagby, 1985) while the rest used the more recent TAS20 (Bagby *et al*., 1994). The remaining study used the Alexithymia Questionnaire for Children (Rieffe, Oosterveld & Terwogt, 2006) which was derived from the TAS20 to be suitable for younger participants. Four studies only reported one or more TAS20 subscales (Difficulty Identifying Feelings [DIF], Difficulty Describing Feelings [DDF], and Externally Orientated Thinking [EOT]) rather than total TAS20 (Anderson & Crowther, 2012; Cerutti, Zuffianò & Spensieri, 2018; Greene, Hasking & Boyes, 2019; Hsu, Chen & Lung, 2013). The other studies all reported total TAS20, with (10 studies) or without (16 studies) the subscale scores.

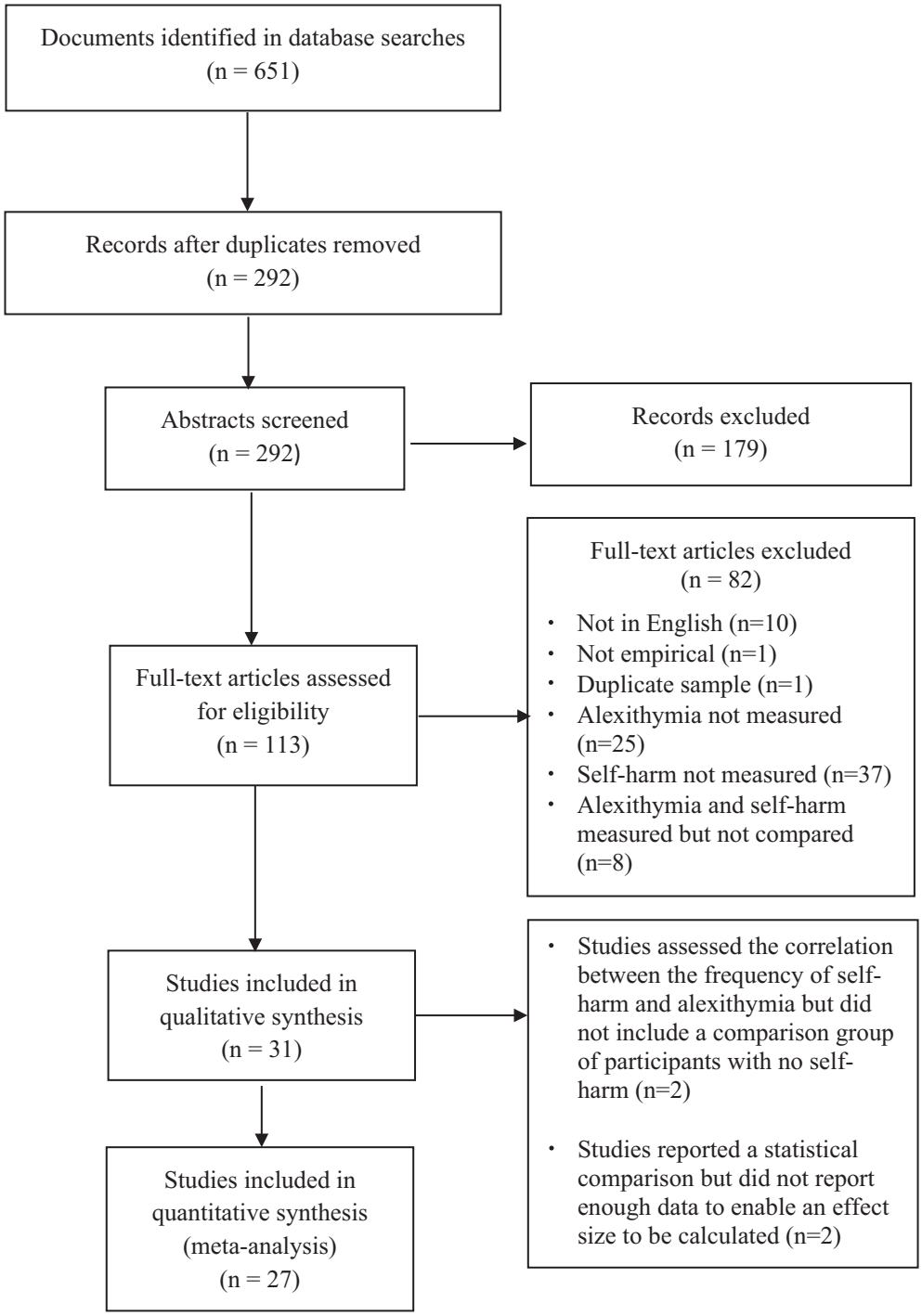


Fig. 1. PRISMA flow chart of the study selection process.

Twenty studies clearly defined self-harm in a manner consistent with the International Society for the Study of Self-Injury (2018). These studies defined self-harm as NSSI in the introduction and either used a validated and accepted measure of NSSI (most commonly the Deliberate Self-harm Inventory [Gratz, 2001], used in eight studies) or were explicit that their instructions to participants had defined self-harm as without suicidal intent. A further four studies measured self-harm as well as, and as distinct from, suicide attempts, for example, through clinical assessment. It was not apparent in the remaining seven studies that the definition of self-harm given to participants excluded suicidal intent. In addition, there were differences in the type of methods included in the definition of self-harm. Some studies restricted self-harm to superficial body tissue damage (excluding, e,g., taking an overdose of pills or swallowing dangerous substances), including two studies which focused only on self-cutting (Lambert & de Man, 2007; Laukkanen, Rissanen, Tolmunen, Kylmä & Hintikka, 2013).

Qualitative review

Table 1 provides a summary of the study characteristics. The studies may be grouped into four categories as follows: non-

Table 1. *Study characteristics*

Author (year)	Country	Sample type	Population	Age	Gender	Sample size SH/no SH	Measure of self-harm	Definition of self-harm*	Lifetime/ current SH	Measure of alexithymia	Results
Anderson and Crowther (2012)	United States	Community	University students	Adults M_{age} = 18.86 (SD = 1.97)	Mixed	95/119	Deliberate Self-Harm Inventory (DSHI, Gratz, 2001)	NSSI	Past (> 1 year) and current (< 1 year)	TAS20 DIF	ANOVA (TAS20 DIF for no SH/ past SH/current SH) F(2,211) =8.94, $p < 0.001$. No NSSI TAS20 DIF differed significantly from past and current NSSI (which were not significantly different from each other).
Bedi *et al.* (2014)	Canada	Clinical	Participants in an outpatient therapy program for women recovering from abuse.	Adults M_{age} = 39.85 (SD = 11.11)	Female	67/100	Structured interview based on the Dissociative Disorders Interview Schedule (DDIS, Ross *et al.*, 1989)	Deliberate self-harm measured separately from suicide attempts.	Lifetime	TAS20	Difference in TAS20 t(148) = 3.72, $p < 0.001$.
Bolognini *et al.* (2003)	Switzerland	Clinical and community	Individuals with drug abuse or eating disorders plus a control group from schools and the community	14-25 years old (M_{age} = 20.6)	Mixed	83/225	Semi-structured interview based on the Mini Neuropsychiatric Interview (Sheehan *et al.*, 1998).	Deliberate self-mutilation measured separately from suicide attempts.	Lifetime	TAS20	TAS20 significant difference ($p < 0.001$)
Borrill *et al.* (2009)†	United Kingdom	Community	University students	Adults M_{age} = 23.4	Mixed	46/123	Participants asked to endorse a list of methods of self-harm, including overdose	Motivation not specified.	Lifetime	TAS20 and subscales	TAS20 t(167) =2.54, $p = 0.012$, DIF t (167) = 3.57, $p < 0.0001$, DDF t(167) = 2.06, $p = 0.041$, EOT t(167) = 0.23, $p = 0.816$
Cerutti *et al.* (2014)††	Italy	Clinical	Adolescent girls recruited from therapeutic communities.	Adolescents M_{age} = 16.1, SD = 1.1	Female	10/0	DSHI (Gratz, 2001)	NSSI	Recent (<1 year)	TAS20	TAS20 and self-harm frequency significantly correlated r = 0.78, $p < 0.001$

(continued)

Table 1 (continued)

Author (year)	Country	Sample type	Population	Age	Gender	Sample size SH/no SH	Measure of self-harm	Definition of self-harm*	Lifetime/ current SH	Measure of alexithymia	Results
Cerutti *et al*. (2018)	Italy	Community	Middle school students	Adolescents M_{age} = 12.6 (SD = 1.06)	Mixed	204/505	DSHI (Gratz, 2001)	NSSI	Lifetime	Alexithymia Questionnaire for Children (AQC; Rieffe *et al*., 2006) subscales DIF and DDF	Correlations between DIF and NSSI frequency r = 0.26, p < 0.001, NSSI and DDF r = 0.21, p < 0.001
Evren and Evren (2005)	Turkey	Clinical	Inpatients receiving treatment for drug or alcohol addiction	Adults M_{age} = 36.42 (SD = 9.74)	Male	47/89	Clinical interview and Childhood Abuse and Neglect Questionnaire (CANQ, Yargic, Tutkun, & Sar, 1994)	NSSI	Lifetime	TAS20 and subscales	TAS20 t = 2.07, p = 0.04, DIF t = 2.22, p = 0.028, DDF t = 2.65, p = 0.009, EOT t=−0.21, p = 0.84
Garisch and Wilson (2010)	New Zealand	Community	Secondary school students	Adolescents M_{age} = 16.67	Mixed	49/276	Self-report self-harm questions (De Leo & Heller, 2004)	Deliberate self-harm, defined as non-fatal.	Lifetime	TAS20	TAS20 t = 2.82, p < 0.005
Garisch and Wilson (2015)	New Zealand	Community	Secondary school students	Adolescents T1: M_{age} = 16.35 (SD = 0.62)	Mixed	T1 566/596	DSHI (Gratz, 2001)	NSSI	Lifetime	TAS20	Correlation between TAS20 and lifetime self-harm r = 0.37, p < 0.10
				T2: M_{age} = 16.49 (SD = 0.71)		T2 286/544			Current	TAS20	Correlation between TAS20 and current self-harm r = 0.33, p < 0.10
Gatta, Rago, *et al*. (2016) ††††	Italy	Community	High school students	Adolescents M_{age} = 15.76 (SD = 1.35)	Mixed	35/241	Single question	Study focus is NSSI but motivation is not specified to participants.	Lifetime	TAS20	Mann Whitney U = 3.46, p < 0.05
Gatta, Dal Santo, *et al*. (2016)	Italy	Clinical vs community	Individuals attending a neuropsychiatry unit plus control group of local high school students.	Adolescents Clinical M_{age} = 15 (SD = 1.37) Control M_{age} = 15.37 (SD = 1.17)	Mixed	33/79	Patients presenting with self-harm, assessed through clinical interview	NSSI	Current	TAS20	TAS20 Z = 5.04, p < 0.05, DIF Z = 3.65, p < 0.05, DDF Z = 3.92, 0.05, EOT Z = 3.73, p < 0.05

(continued)

Table 1 (continued)

Author (year)	Country	Sample type	Population	Age	Gender	Sample size SH/no SH	Measure of self-harm	Definition of self-harm*	Lifetime/ current SH	Measure of alexithymia	Results
Greene *et al.* (2019)	Australia	Community	University students	Adults M_{age} = 22.27 (SD = 6.71)	Mixed	126/365	Inventory of Statements about Self-Injury (ISAS) (Klonsky & Glenn, 2009)	NSSI	Lifetime	TAS20 subscales	ANOVA between participants with history of NSSI, risky drinking, both or neither, DIF F = 24.62, p < 0.01, DDF F = 9.37, p < 0.01, EOT F = 2.17, NS.
Hasking and Claes (2019)	Australia	Community	University students	Adults M_{age} = 21.86 (SD = 6.05)	Mixed	255/696	ISAS (Klonsky & Glenn, 2009)	NSSI	Lifetime	TAS20	TAS20 and NSSI r = 0.20, p < 0.001
Howe-Martin *et al.* (2012)	United States	Community	High school students	Adolescents M_{age} = 16.22 (SD = 1.23)	Mixed	71/135	Adapted version of DSHI (Gratz, 2001)	NSSI	Lifetime	TAS20	TAS20 t = 2.76, p < 0.005
Hsu *et al.* (2013)	Taiwan	Clinical	Individuals presenting at a hospital emergency room plus control group of chronic pain outpatients.	Adults Self-harm group M_{age} = 43.25 (SD = 19.98) Suicidal M_{age} = 29.28 (SD = 11.17) Control M_{age} = 50.13 (SD = 18.54)	Mixed	69/66 Plus 36 participants with suicidal intent	Presented at casualty as self-harm patients assessed through clinical interview.	Deliberate self-harm with no suicidal intent (as distinguished from group with suicidal intent)	Current	TAS20 DIF	ANOVA between patients presenting with suicidal intent, self-harm and control F = 14.45, p < 0.001. Tukey post hoc tests between self-harm and control groups MD = 7.40, p < 0.001
Lambert and de Man (2007)	France	Clinical vs community =	Psychological health service users plus control group of girls from the community.	Adolescents Clinical M_{age} = 16.8 (SD = 0.4) Control M_{age} = 17.5 (SD = 0.4)	Female	15/18	Self-reported engagement in self-mutilation (defined as cutting) plus observed physical evidence	Self-cutting (distinguished from suicide attempts)	Current	TAS20 and subscales	TAS20 t = 2.33, p = 0.026, DIF t = 3.95, p = 0.0001, DDF t = 1.0, p = 0.32, EOT t = 0.08, p = 0.94

(continued)

Table 1 (continued)

Author (year)	Country	Sample type	Population	Age	Gender	Sample size SH/no SH	Measure of self-harm	Definition of self-harm*	Lifetime/ current SH	Measure of alexithymia	Results
Laukkanen *et al.* (2013)	Finland	Community	High school students	Adolescents Age range 13-18	Mixed	440/440	Self report questionnaire (based on Rissanen, Kylmä, & Laukkanen, 2009)	Motivation not specified. Method restricted to self-cutting	Lifetime	TAS20	Mann Whitney U tests of the difference between TAS20 scores in those with a history of self-cutting and those without such a history reported as significant ($p < 0.001$).
Lee (2016)	South Korea	Community	Middle school students	Adolescents M_{age} = 14.38 (SD = 1.68)	Mixed	97/687	Self-harm Questionnaire (Ougrin & Boege, 2013)	Motivation not specified.	Lifetime	TAS20	TAS20 $t = 7.56$, $p < 0.001$
Lin *et al.* (2017)	Taiwan	Community	High school students	Adolescents M_{age} = 15.83 (SD = 0.38)	Mixed	434/1688	Multiple item questionnaire (You, Leung, & Fu, 2012)	NSSI	Current	TAS20	TAS20 predictive of NSSI odds ratio (OR) = 1.02, $p < 0.05$
Lüdtke *et al.* (2016)	Germany and Switzerland	Clinical	Psychiatric inpatients	Adolescents M_{age} = 16.08 (SD = 1.29)	Female	46/26	Interview to assess NSSI disorder according to DSM-V criteria	NSSI	Current	TAS26	TAS26 $t = 3.52$, $p < 0.01$, DIF $t = 3.05$, $p < 0.01$, DDF $t = 3.36$, $p < 0.01$, EOT $t = 0.93$, $p = 0.35$
Mojahed *et al.* (2018) ††	Iran	Clinical	Psychiatric inpatients with borderline personality disorder	Adults M_{age} = 22.77 (SD = 2.83)	Male	94/0	DSHI (Gratz, 2001)	NSSI	Current	TAS20 and subscales	Frequency of NSSI correlated with TAS20 $r = 0.46$, $p < 0.001$, DIF $r = 0.42$, $p < 0.001$, DDF $r = 0.45$, $p < 0.001$ and EOT $r = 0.41$, $p < 0.001$.

(continued)

Table 1 (continued)

Author (year)	Country	Sample type	Population	Age	Gender	Sample size SH/no SH	Measure of self-harm	Definition of self-harm*	Lifetime/ current SH	Measure of alexithymia	Results
Moseley *et al.* (2019)	United Kingdom	Clinical (individuals have received a diagnosis)	Individuals with autism	Adults M_{age} = 43 (SD = 13.6)	Mixed	76/27	Non-suicidal self-injury assessment tool (NSSI-AT) (Whitlock, Exner-Cortens, & Purington, 2014)	NSSI	Historic (>1 year) and current (<1 year)	TAS20	Alexithymia predicted the categorisation of participants as historic, current or no self-harm (χ2 (2) = 10.78, p = 0.005). Alexithymia distinguished current and no self-harm (b = 0.062, p = 0.002) but not historic and no self-harm (p = 0.232)
Oskis and Borrill (2019)[†††]	United Kingdom	Community	University students	Adults NSSI group M_{age} = 21.08 (SD = 3.95) Controls M_{age} = 19.24 (SD = 5.98)	Mixed	26/29	DSHI (Gratz, 2001)	NSSI	Lifetime	TAS20 and subscales	TAS20 t = 2.06, p = 0.044, DIF t = 4.08, p < 0.0005, DDF t = 1.17, p = 0.249, EOT t = 1.91, p = 0.062
Osuch *et al.* (2014) [†††]	Canada	Clinical	Individuals with mood and/or anxiety disorders with and without NSSI	Adults (age range 16-24) NSSI group M_{age} = 20 (SD = 2.4) Controls M_{age} = 21 (SD = 1.8)	Mixed	13/15	Clinical interview to assess NSSI involving the epidermis. Self-Injury Motivation Scale v.2 (Osuch, Noll, & Putnam, 1999) Ottawa Self-Injury Inventory (Cloutier *et al.*, 2012)	NSSI	Lifetime	TAS20 and subscales	No significant differences in TAS20 between NSSI and no NSSI groups
Oyefeso *et al.* (2008) [††]	United Kingdom	Clinical	Opiate addicts admitted to an inpatient hospital treatment program	Adults M_{age} = 38.4 (SD = 9.4)	Mixed	39/41	Two items from the Schedule for Nonadaptive and Adaptive Personality (Clark, 1993) assessed through interview	Motivation not specified	Lifetime and current	TAS20 and subscales	TAS20 DIF t = 2.00, p < 0.05, but TAS20, DDF and EOT not significantly different

(continued)

Table 1 (continued)

Author (year)	Country	Sample type	Population	Age	Gender	Sample size SH/no SH	Measure of self-harm	Definition of self-harm*	Lifetime/ current SH	Measure of alexithymia	Results
Paivio and McCulloch (2004)	Canada	Community	University students	Adults M_{age} = 21 (SD = 1.66)	Female	41/59	Self report Self-Injurious Behaviors Questionnaire developed for this study.	Motivation not specified.	Lifetime	TAS20	Frequency of self-harm (never to often) correlated with TAS20 r = 0.45, p < 0.01
Polk and Liss (2007) ††	United States	Community	University students Internet users of a self-help website	Adults Students no self-harm M_{age} = 18.79 (SD = 1.17) Students self-harm M_{age} = 19.18 (SD = 2.71) Internet group M_{age} = 22.59 (SD = 6.31)	Mixed	259/155	Participants were asked whether they had self-harmed according to a definition from Winchel and Stanley (1991)	NSSI	Lifetime	TAS20 subscales	Discriminant function analysis found a significant difference between those with a history of self-harm recruited via the internet and those with no history. Correlations between the TAS20 subscales and the discriminant functions: TAS DIF r = 0.570, DDF r = 0.551, EOT r = 0.282
Sleuwaegen *et al.* (2017) †††	Belgium	Clinical	Inpatients with Borderline Personality Disorder	Adults M_{age} = 30.03 (SD = 8.62)	Mixed	153/32	Self-Injury Questionnaire-Treatment Related (SIQ-TR) (Claes & Vandereycken, 2007)	NSSI	Lifetime	TAS20 and subscales	Frequency of self-harm significantly correlated with DDF r = 0.16, p < 0.05 but not TAS20 (r = 0.08), DIF (r = 0.06) or EOT (r=−0.04)
Verrocchio *et al.* (2010)	Italy	Clinical and community	Substance-dependent inpatients plus a control group from the community.	Adults Clinical M_{age} = 29.32 (SD = 6.42) Control M_{age} = 28.12 (SD = 3.84)	Male	46/108	Self-Injury Inventory developed by the authors	NSSI	Lifetime	TAS20 and subscales	Across all participants correlation between self-harm and TAS20 r = 0.13 NS, DIF r = 0.22, p < 0.01, DDF

(continued)

Table 1 (continued)

Author (year)	Country	Sample type	Population	Age	Gender	Sample size SH/no SH	Measure of self-harm	Definition of self-harm*	Lifetime/ current SH	Measure of alexithymia	Results
Wester and King (2018)	United States	Community	First year university students	Adults Age not reported	Mixed	117/145	Deliberate Self-Harm Inventory - Adapted (Murray, Wester, & Paladino, 2008)	NSSI	Lifetime and current (< 90 days)	TAS20	r = 0.08 NS, EOT r = −0.04 NS ($p > 0.05$). Correlation between TAS20 and current NSSI r = 0.38, $p < 0.01$ and between TAS20 and lifetime NSSI r = 0.31, $p < 0.01$
Zlotnick *et al.* (1996)	United States	Clinical	Inpatients in a women's psychiatric unit	Adults $M_{age} = 33$ (SD = 9.23)	Female	103/45	Self-Injury Inventory, developed by authors.	NSSI	Current (<3 months)	TAS26	TAS26 t = 0.274, $p < 0.01$

*"NSSI" indicates a definition consistent with the International Society for the Study of Self-Injury (2018), "the deliberate damage to body tissue without suicidal intent, for reasons not culturally or socially sanctioned."

†In Borrill *et al.* (2009) only a subgroup of participants completed the TAS20 and it was not stated how many of these had self-harmed. Proportions have therefore been estimated using the proportion who had self-harmed in the whole sample.

††Studies not included in the meta-analysis.

†††Additional data was obtained from authors for inclusion in the meta-analysis.

clinical adolescent samples, clinical adolescent samples, university students, and clinical adult samples. All but three studies (Osuch *et al*., 2014; Oyefeso, Brown, Chiang & Clancy, 2008; Verrocchio, Conti & Fulcheri, 2010) found a significant association between total alexithymia and self-harm.

Non-clinical adolescent samples. Eight studies looked at adolescent participants recruited from school settings. Seven studies reported significant and positive associations between self-harm and total alexithymia (Garisch & Wilson, 2010, 2015; Gatta, Dal Santo, Rago, Spoto & Battistella, 2016; Howe-Martin, Murrell & Guarnaccia, 2012; Laukkanen *et al*., 2013; Lee, 2016; Lin, You, Ren, Wu, Hu, Yen & Zhang, 2017). The eighth study, by Cerutti *et al*. (2018), did not measure total alexithymia but reported significant correlations between self-harm and the TAS20 subcomponents DIF and DDF.

Garisch and Wilson (2015) was the only longitudinal study identified in this review. They reported that, not only was self-harm significantly correlated with alexithymia scores at baseline, but also that initial alexithymia scores predicted self-harm during the 5 months between baseline and follow-up.

Clinical adolescent samples. Four studies recruited adolescent participants from a clinical setting (Cerutti, Calabrese & Valastro, 2014; Gatta, Dal Santo, et al., 2016; Lambert & de Man, 2007; Lüdtke *et al*., 2016). All reported a significant relationship between total alexithymia and self-harm. While two of these studies used an exclusively clinical sample (Cerutti *et al*., 2014; Lüdtke *et al*., 2016), the other two studies compared a group of adolescents with a history of self-harm, recruited in clinical settings, with a control group of adolescents with no self-harm, recruited from the community (Gatta, Dal Santo, et al., 2016; Lambert & de Man, 2007). In both cases, alexithymia (total TAS20) was significantly higher among participants with a history of self-harm.

University student samples. Of the eight studies that were based on university student samples, all reported significant and positive associations between self-harm and alexithymia (total and/or subscales) (Anderson & Crowther, 2012; Borrill, Fox, Flynn & Roger, 2009; Greene *et al*., 2019; Hasking & Claes, 2019; Oskis & Borrill, 2019; Paivio & McCulloch, 2004; Polk & Liss, 2007; Wester & King, 2018). Among those that reported the subcomponents of alexithymia, all found DIF to be significantly higher in those with a history of self-harm (Anderson & Crowther, 2012; Borrill *et al*., 2009; Greene *et al*., 2019; Oskis & Borrill, 2019). The findings regarding DDF were more mixed with two studies finding a significant positive association (Borrill *et al*., 2009; Greene *et al*., 2019) and one reporting a non-significant result (Oskis & Borrill, 2019), while all those which measured EOT reported a non-significant relationship with self-harm. Polk and Liss (2007) found that DIF and DDF, together with anxiety, sleep disturbance and sexual and emotional abuse were strongly correlated with a discriminant function which distinguished between a group of university students with no history of self-harm and a group of internet users who had self-harmed.

Adult clinical samples. The remaining 11 studies with adult participants drew on clinical samples. Here, the results were more varied. Of the two studies with participants with Borderline Personality Disorder (BPD), one reported that total alexithymia and all three subscales were significantly correlated with the frequency of self-harm (Mojahed, Rajabi, Khanjani & Basharpoor, 2018), while Sleuwaegen *et al*. (2017) found that only DDF was correlated with self-harm frequency. A further four studies focused on participants with substance dependency. Bolognini, Plancherel, Laget, Stéphan, and Halfon (2003) and Evren and Evren (2005) reported significantly higher total alexithymia among those with a history of self-harm. In contrast, Oyefeso *et al*. (2008) compared treatment-seeking opiate addicts with and without a history of self-harm and reported a significant difference only in DIF and not in the total alexithymia score, DDF or EOT. Similarly, Verrocchio *et al*. (2010) found no significant relationship between self-harm and total alexithymia or any of the subscales among a group of substance dependent men.

Bedi, Muller, and Classen (2014) recruited women attending a day treatment program for survivors of abuse. They found total alexithymia to be significantly higher among those participants with a history of self-harm. These results are consistent with Zlotnick *et al*. (1996), which found significantly higher alexithymia in women psychiatric inpatients who had self-harmed, a high proportion of whom had suffered childhood sexual abuse. In contrast, Osuch *et al*. (2014) measured alexithymia and self-harm in a small (N = 32), sample of young adults with mood and/or anxiety disorders and reported no significant differences in total alexithymia or any of the subscales between those participants with and without a history of self-harm.

Of the remaining two studies, Hsu *et al.,* (2013) compared participants admitted to a hospital emergency room following a first-time incident of self-harm or suicide attempt (measured separately) with a control group of chronic pain outpatients. DIF was found to be significantly higher among those participants who had engaged in self-harm compared to the control group. The final study focused on adults with autism (Moseley, Gregory, Smith, Allison & Baron-Cohen, 2019). In a logistic regression model, alexithymia scores were able to differentiate significantly between people who had self-harmed within the past year and those who had never self-harmed, but not between those who had never self-harmed and those who last self-harmed over a year ago.

Quantitative analysis

Twenty-three studies with a combined sample of 8,724 were included in a meta-analysis to assess the scale of the difference in alexithymia between participants who had engaged in self-harm and people who had never self-harmed (Fig. 2). The combined studies had a medium effect size of g = 0.57 (95% CI 0.46–0.69). The overall effect was significant (Z = 10.57, $p < 0.001$) indicating that participants who had self-harmed had significantly higher alexithymia than participants who had never self-harmed. The heterogeneity was high (I^2 = 70.2%). A sensitivity analysis was conducted to test the effect of removing the four studies that reported the correlation between alexithymia and self-harm rather than the mean alexithymia score for those with and without a history of self-harm. Their removal made very little difference to the effect size (g = 0.58, 95% CI 0.45–0.71) although heterogeneity was reduced (I^2 = 61.6%).

#	Study name	Effect size	CI Lower limit	CI Upper limit	Weight
1	Bedi *et al.* (2010)	0.62	0.30	0.94	4.44%
2	Bolognini *et al.* (2003)	0.49	0.23	0.75	5.19%
3	Borrill *et al.* (2009)	0.43	0.09	0.77	4.21%
4	Evren & Evren (2005)	0.37	0.01	0.73	3.99%
5	Garisch & Wilson (2010)	0.72	0.41	1.03	4.44%
6	Garisch & Wilson (2015)	0.80	0.68	0.92	7.02%
7	Gatta et al. (2016b)	1.28	0.84	1.72	3.22%
8	Gatta et al. (2016a)	0.77	0.42	1.12	3.99%
9	Hasking & Claes (2019)	0.41	0.27	0.55	6.78%
10	Howe-Martin *et al.* (2012)	0.41	0.11	0.71	4.68%
11	Lambert & de Man (2007)	0.80	0.09	1.51	1.70%
12	Laukkanen *et al.* (2013)	0.43	0.29	0.57	6.78%
13	Lee (2015)	0.83	0.61	1.05	5.73%
14	Lin *et al.* (2017)	0.42	0.32	0.52	7.23%
15	Lüdtke *et al.* (2016)	0.86	0.36	1.36	2.75%
16	Moseley *et al.* (2019)	0.63	0.17	1.09	3.05%
17	Oskis & Borrill (2019)	0.55	0.01	1.09	2.48%
18	Osuch *et al.* (2014)	−0.02	−0.78	0.74	1.55%
19	Paivio & McCulloch (2004)	1.04	0.62	1.46	3.39%
20	Sleuwaegen *et al.* (2017)	0.10	−0.27	0.47	3.78%
21	Verrocchio *et al.* (2010)	0.25	−0.07	0.57	4.44%
22	Wester & King (2019)	0.65	0.39	0.91	5.19%
23	Zlotnick *et al.* (1996)	0.50	0.14	0.86	3.99%
24	**Total Effect (Hedges *g*) (SE = 0.05)**	**0.57**	**0.46**	**0.69**	
	Test of total effect size *Z* = 10.57, *p*<0.0001				
	Heterogeneity I^2 = 70.2%	**Total number of participants = 8,724**			

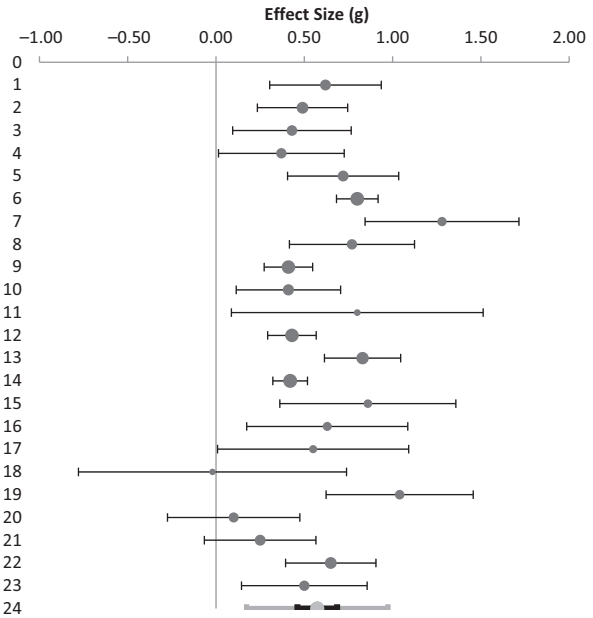


Fig. 2. Forest plot of combined effect size of the difference in alexithymia between those with and without a history of self-harm.

The funnel plot (Fig. 3), Rosenthal's fail-safe N test, and Begg and Mazumbar's test ($p = 0.206$) indicated that publication bias was not a concern. Applying the trim and fill method to impute hypothetically unpublished studies made no difference to the effect size or confidence intervals.

Planned subgroup analyses of the relationship between total alexithymia and self-harm were conducted based on the demographics of the sample and the definition of self-harm (Table 2). A significantly larger effect size was observed in adolescent samples ($M_{age} \leq 18$) compared with adult samples, although when the adults samples were further subdivided into young adults and older adults the variance in effect sizes was not significant. There was a significantly larger effect size in female samples compared to male samples. The relationship between alexithymia and self-harm was significant in both male and female samples, although the effect size for men was small. The result of the gender subgroup analysis should, however, be interpreted cautiously, because it is based on only the eight studies that reported, or provided, data disaggregated by gender.

The relationship between alexithymia and self-harm was significant in both clinical and community samples and the size of the effect was not significantly different between the two groups. There was no significant difference in the combined effect size of studies measuring lifetime self-harm, compared to those measuring recent self-harm. Similarly, there was no significant difference in the effect size between studies that defined self-harm as NSSI or clearly distinguished self-harm from suicide, compared with those which did not specify motivation.

Meta-analyses were conducted on the TAS20 subscales, where reported. Figures 4 and 5 illustrate that there was a significant relationship between self-harm and the subscales DIF and DDF with medium effect sizes (DIF $g = 0.61$, 95% CI 0.45–0.76, $SE = 0.07$, $I^2 = 50.8\%$; DDF $g = 0.41$, 95% CI 0.29–0.53, $I^2 = 25.7\%$, $SE = 0.06$). The confidence interval around the effect size for the subscale EOT crossed the line of no effect, indicating that it was not significant, and the effect size was small ($g = 0.10$, 95% CI −0.11–0.31, $I^2 = 64.2\%$, $SE = 0.10$ Fig. 6). Begg and Mazumbar's test and Rosenthal's fail-safe *N* test indicated that publication bias was not a concern for DIF and DDF. However, for EOT, Rosenthal's fail-safe *N* test suggested that there might be publication bias, although Begg and Mazumbar's test was not significant ($p = 0.225$). Subgroup analyses for each subscale are set out in Table 3, although the small numbers in some of the subsets mean that these results should be interpreted with caution. The effect size in the relationship between DIF and self-harm was significantly moderated by age, with higher effect sizes observed in adolescent and young adult samples than in older adults ($p = 0.021$). The effect size of the relationship between DIF and self-harm was also significantly higher in community samples compared with clinical samples ($p = 0.003$).

DISCUSSION

The current meta-analysis found an overall medium effect size of the relationship between alexithymia and self-harm, indicating that alexithymia is significantly higher in people who have engaged in self-harm than in people who have not. The relationship is driven by the DIF and DDF subscales, while the relationship between self-harm and EOT was not significant. Specifying the motivation for self-harm as non-suicidal did not significantly alter the effect size. Similarly, there was no significant difference in the effect size between those studies that measured lifetime self-harm and those that measured recent self-harm. The effect size was significantly larger in female than in male samples and in adolescent than in adult samples.

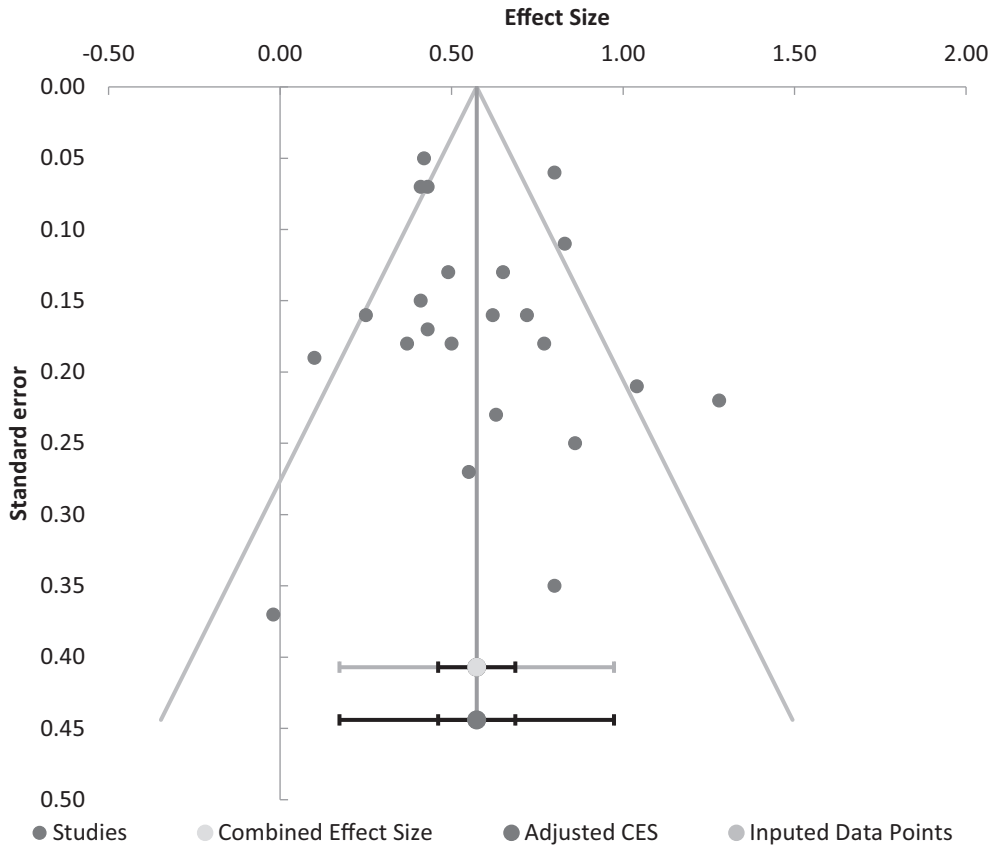


Fig. 3. Funnel plot of included studies to test for publication bias.

Table 2. *Subgroup random effect analyses of the difference in alexithymia between those with and without a history of self-harm by demographics and definition of self-harm*

Subgroup	N studies[c]	N sample	g	95% CI	I^2	Q* (between groups)	df	p
Adolescent (M_{age} < 18)	10	5972	0.69	0.50–0.87	81.35%	5.63	2	0.060
Young adult (M_{age} = 18–29)[a]	6	1759	0.46	0.33–0.58	0.0%			
Adult (M_{age} ≥ 30)[a]	7	993	0.49	0.21–0.76	59.31%			
Men	5	462	0.28	0.02–0.54	0.00%	5.72	1	0.017
Women	8	1014	0.60	0.38–0.83	41.50%			
Clinical	9	1224	0.44	0.25–0.63	32.58%	2.29	1	0.130
Community	13	7369	0.59	0.46–0.72	75.32%			
Lifetime self-harm[b]	19	6385	0.54	0.43–0.66	66.32%	1.69	1	0.193
Recent self-harm (<12 months)[b]	4	2339	0.75	0.12–1.37	83.15%			
NSSI	17	6190	0.53	0.40–0.67	71.06%	1.46	1	0.226
Motivation not specified	6	2534	0.68	0.43–0.92	70.77%			

Notes: [a]When the studies of adult samples were combined, the effect size of the relationship between alexithymia and self-harm was significantly larger in adolescent samples (g = 0.69, 95% CI 0.50–0.87, I^2 = 81.35%, N = 10) compared with adult samples (g = 0.48, 95% CI 0.34–0.61, I^2 = 37.83%, N = 13; Q^* = 4.43, p = 0.035).

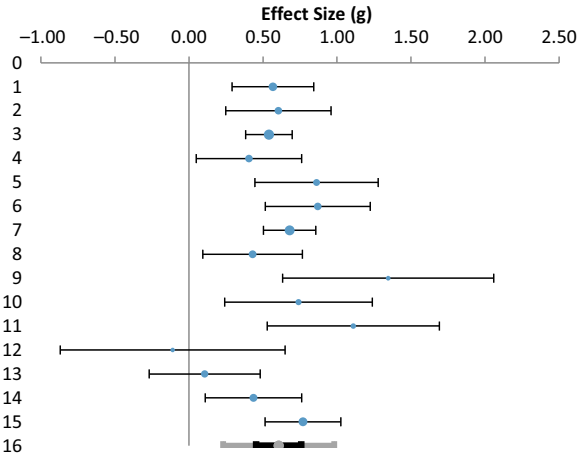
[b]Four studies (Garisch & Wilson, 2015; Moseley *et al*., 2019; Sleuwaegen *et al*., 2017; Wester & King, 2018) reported, or provided, separate data on lifetime and recent self-harm. The data reported here include these studies in the lifetime self-harm group. When their data were included in the recent self-harm subgroup, the difference in the effect size of the relationship between self-harm and alexithymia in studies measuring lifetime versus those measuring recent self-harm remained non-significant (p = 0.131).

[c]Between-study variance was calculated separately when there were at least five studies per subgroup and pooled where groups contained fewer than five studies (Borenstein *et al*., 2009).

Definition of self-harm

The effect size of the relationship between alexithymia and self-harm reported in the current review is similar to that derived by Greene *et al*. (2020) in their review of alexithymia and, specifically, NSSI (r = 0.25). Furthermore, the relationship between suicide and alexithymia has also been found to be of a similar effect size (r = 0.25; Hemming *et al*., 2019) although a separate, narrative review of alexithymia and suicidality highlighted conflicting findings between individual studies (Davey, Halberstadt, Bell & Collings, 2018). The lack of a clear

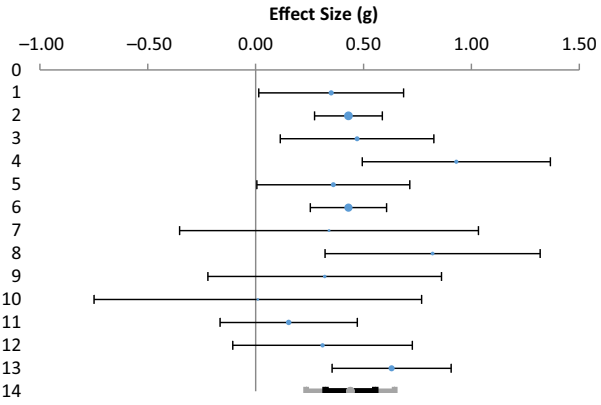
#	Study name	Effect size	CI Lower limit	CI Upper limit	Weight
1	Anderson & Crowther (2012)	0.57	0.29	0.84	8.53%
2	Borrill *et al.* (2009)	0.60	0.25	0.96	6.64%
3	Cerutti *et al.* (2018)	0.54	0.38	0.70	12.05%
4	Evren & Evren (2005)	0.41	0.05	0.76	6.64%
5	Gatta *et al.* (2016b)	0.86	0.45	1.28	5.53%
6	Gatta *et al.* (2016a)	0.87	0.52	1.22	6.64%
7	Greene *et al.* (2019)	0.68	0.50	0.86	11.44%
8	Hsu *et al.* (2013)	0.43	0.09	0.77	7.07%
9	Lambert & de Man (2007)	1.35	0.63	2.06	2.60%
10	Lüdtke *et al.* (2016)	0.74	0.24	1.24	4.37%
11	Oskis & Borrill (2019)	1.11	0.53	1.69	3.51%
12	Osuch *et al.*. (2014)	−0.11	−0.87	0.65	2.37%
13	Sleuwaegen *et al.* (2017)	0.11	−0.27	0.48	6.24%
14	Verrocchio *et al.* (2010)	0.44	0.11	0.76	7.30%
15	Wester & King (2018)	0.77	0.51	1.03	9.07%
16	**Total Effect Hedges *g***	**0.61**	**0.45**	**0.76**	
	(SE = 0.07)				
	Test of total effect size *Z* = 8.53, *p*<.0001				
	Heterogeneity I^2 = 50.81%				
	Total number of participants = 3,128				



* Data shown here relate to lifetime self-harm. Anderson and Crowther (2012), Sleuwaegen et al. (2017) and Wester and King (2018) also provided DIF scores for participants with recent (<12 months) self-harm. Using data from these studies relating instead to recent self-harm resulted in a slightly increased effect size of g=0.63, (95% CI 0.48 to 0.77), SE=0.07, I^2 = 42.97%.

Fig. 4. Forest plot of combined effect size of the difference in alexithymia subcomponent difficulty identifying feelings (DIF) between those with and without a history of self-harm. [Colour figure can be viewed at wileyonlinelibrary.com]

#	Study name	Effect size	CI Lower limit	CI Upper limit	Weight
1	Borrill *et al.* (2009)	0.35	0.01	0.69	7.59%
2	Cerutti *et al.* (2018)	0.43	0.27	0.59	18.96%
3	Evren & Evren (2005)	0.47	0.11	0.83	6.94%
4	Gatta *et al.* (2016b)	0.93	0.49	1.37	5.00%
5	Gatta *et al.* (2016a)	0.36	0.01	0.71	6.94%
6	Greene *et al.* (2019)	0.43	0.25	0.61	17.03%
7	Lambert & de Man (2007)	0.34	−0.35	1.03	2.29%
8	Lüdtke *et al.* (2016)	0.82	0.32	1.32	4.01%
9	Oskis & Borrill (2019)	0.32	−0.22	0.86	3.49%
10	Osuch *et al.*. (2014)	0.01	−0.75	0.77	1.96%
11	Sleuwaegen *et al.* (2017)	0.07	−0.30	0.44	6.37%
12	Verrocchio *et al.* (2010)	0.15	−0.17	0.47	8.25%
13	Wester & King (2018)	0.49	0.23	0.75	11.16%
14	**Total effect Hedges *g***	**0.41**	**0.29**	**0.53**	
	SE = 0.06				
	Test of overall effect size *Z* = 7.26, *p*<0.0001				
	Heterogeneity I^2 = 25.68%				
	Total number of participants = 2,779				



*Sleuwaegen et al. (2017) and Wester and King (2018) provided DDF scores for participants with lifetime self-harm and with current self-harm. Data shown here relate to lifetime self-harm. Using data from these studies relating instead to recent self-harm results in a slightly increased effect size of g=0.44 (95% CI 0.32 to 0.55) SE=0.05, I^2 = 19.13%.

Fig. 5. Forest plot of combined effect size of the difference in alexithymia subcomponent difficulty describing feelings (DDF) between those with and without a history of self-harm. [Colour figure can be viewed at wileyonlinelibrary.com]

distinction in the relationship between alexithymia and the range of self-harming behaviors may indicate that, to some extent, the studies are drawing on the same population. A recent study found the prevalence of suicide attempts among people with a history of NSSI to be 40% (O'Connor, Wetherall, Cleare, Eschle, Drummond & Ferguson, 2018). Only one of the studies in the current review which focused on engagement in NSSI explicitly excluded individuals who had also attempted suicide. In addition, it may not always be possible for participants clearly to distinguish their motivation for self-harm (Grandclerc *et al.*, 2016).

Gender

Although based only on eight studies, the result of the subgroup analysis provides strong support for a significant relationship

#	Study name	Effect size	CI Lower limit	CI Upper limit	Weight
1	Borrill *et al.* (2009)	−0.04	−0.38	0.30	9.48%
2	Evren & Evren (2005)	−0.04	−0.40	0.32	9.10%
3	Gatta *et al.* (2016b)	0.96	0.52	1.40	7.67%
4	Gatta *et al.* (2016a)	0.44	0.09	0.79	9.10%
5	Greene *et al.* (2019)	−0.07	−0.23	0.09	13.05%
6	Lambert & de Man (2007)	0.03	−0.66	0.72	4.62%
7	Lüdtke *et al.* (2016)	0.23	−0.25	0.71	7.03%
8	Oskis & Borrill (2019)	−0.51	−1.05	0.03	6.18%
9	Osuch *et al.*. (2014)	0.07	−0.69	0.83	4.10%
10	Sleuwaegen *et al.* (2017)	0.06	−0.31	0.43	8.72%
11	Verrocchio *et al.* (2010)	−0.07	−0.39	0.25	9.84%
12	Wester & King (2018)	0.16	−0.10	0.42	11.10%
13	**Total (95% CI) Hedges *g***	**0.10**	**−0.11**	**0.31**	
	Test of overall effect size *Z* = 1.06, *p* = 0.290				
	Heterogeneity I^2 = 64.17%				
	Total number of participants = 2,070				

*Sleuwaegen et al. (2017) and Wester and King (2018) provided EOT scores for participants with lifetime self-harm and with current self-harm. Data shown here relate to lifetime self-harm. Using data from these studies relating instead to recent self-harm results in a slightly increased effect size of g=0.13 (95% CI -0.09 to 0.35), SE=0.10, I^2 = 68.90%.

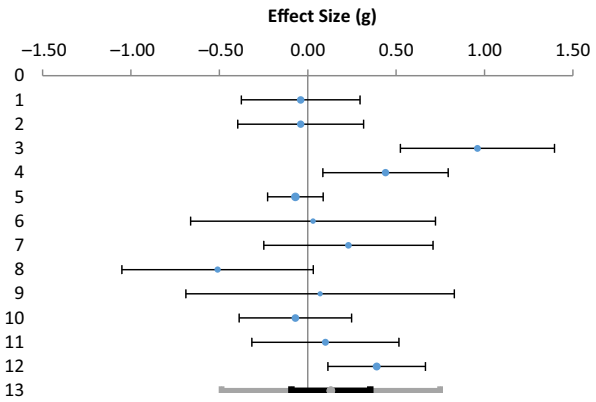


Fig. 6. Forest plot of combined effect size of the difference in alexithymia subcomponent externally orientated thinking (EOT) between those with and without a history of self-harm. [Colour figure can be viewed at wileyonlinelibrary.com]

between alexithymia and self-harm in women. A small effect size was also observed in male samples. This finding can only be taken as indicative, given the small combined sample size and the fact that the majority of studies with mixed samples did not report the results by gender and therefore were excluded from this analysis. Given the continuing uncertainty about the relationship between self-harm and alexithymia in men, it would be helpful if future studies ensured sufficient sample sizes to allow the reporting of the results by gender.

It may be, however, that the finding that the relationship between alexithymia and self-harm has a larger effect size in women than in men reflects genuine gender differences. A meta-analysis has shown that men score higher on average than women on measures of alexithymia (Levant, Hall, Williams & Hasan, 2009) but are less likely than women to self-harm (Bresin & Schoenleber, 2015; see also Hawton *et al*., 2015). Men tend to use different methods of self-harm compared to women (Bresin & Schoenleber, 2015) and to self-harm for different reasons (Laye-Gindhu & Schonert-Reichl, 2005; Scoliers, Portzky, Madge, Hewitt, Hawton & de Wilde, 2009). For example, Rasmussen, Hawton, Philpott-Morgan, and O'Connor (2016) found that adolescent girls were more like to endorse wanting to die, and boys more likely to say that they wanted to frighten someone. The authors take this as evidence to suggest that, in adolescents at least, boys are more likely to have external motivations for self-harm than girls, which are perhaps less related to the ability to understand what it is they are feeling, as measured by the TAS20.

Age

There was also a significant difference in the effect size between adult and adolescent samples, with the size of the effect of the relationship between self-harm and alexithymia larger among adolescents than among adults. These results may be confounded by the predominance of clinical settings for adult samples, compared with a majority of community settings for the adolescent studies, a comparison of which is discussed below. Alexithymia scores tend to be higher in adolescent samples (Honkalampi, Tolmunen, Hintikka, Rissanen, Kylmä & Laukkanen, 2009; Oskis, Clow, Hucklebridge, Bifulco, Jacobs & Loveday, 2013). The TAS20 has been shown to be less reliable in children and young teenagers, with reliability increasing with age (Parker, Eastabrook, Keefer & Wood, 2010). It is possible that the features of alexithymia are mimicked in adolescents, who have not yet developed emotional awareness abilities, and that it is only in early adulthood that alexithymia itself can be measured as a stable personality trait. The early teenage years are also a common time for the onset of self-harm (Griffin, McMahon, McNicholas, Corcoran, Perry & Arensman, 2018; Morgan, Webb, Carr, Kontopantelis, Green & Chew-Graham, 2017). It may be that for adolescents rather more than for adults, self-harm is related to the difficulty in understanding emotions and talking about feelings. Unfortunately a systematic review of self-reported, non-suicidal reasons for self-harm found that the heterogeneity of the literature precluded any meaningful analysis of function by demographic characteristics, including age, so this remains an interesting area for future research (Edmondson, Brennan & House, 2016).

Community and clinical samples

Subgroup analysis revealed a larger effect size in those studies of community samples compared with clinical samples. The difference between the two groups was statistically significant in the subscale DIF but not total TAS20. A smaller effect size in clinical samples is unsurprising, given the evidence that levels of alexithymia are generally higher in clinical populations than in the general population (McGillivray *et al*., 2017). Alexithymia has been found to be higher among people with psychological disorders, such as depression (Honkalampi *et al*., 2000; Son *et al*., 2013). Among the studies in the current review, two found that depression mediated, at least partially, the relationship between

Table 3. *Subgroup random effect analyses of the difference in alexithymia subscales between those with and without a history of self-harm by demographics and definition of self-harm*

Subgroup	DIF N studies[a]	DIF g (95% CI)	DIF I^2	DIF Q*	DIF p	DDF N studies[a]	DDF g (95% CI)	DDF I^2	DDF Q*	DDF p	EOT N studies[a]	EOT g (95% CI)	EOT I^2	EOT Q*	EOT p
Adolescent	5	0.74 (0.43–1.05)	52.8%	7.69	0.021	5	0.51 (0.24–0.78)	43.0%	4.28	0.118	4	0.48 (−0.12-1.07)	60.8%	11.24	0.004
Young Adult	6	0.66 (0.41–0.91)	37.7%			5	0.41 (0.27–0.54)	0.0%			5	-0.04 (−0.29-0.21)	28.8%		
Adult	4	0.35 (0.11–0.60)	0.0%			3	0.23 (−0.28-0.74)	26.4%			3	-0.02 (−0.19-0.15)	0.0%		
Men	4	0.44 (0.06–0.81)	0.0%	0.87	0.352	4	0.33 (−0.22-0.87)	44.2%	0.09	0.758	4	0.01 (−0.27-0.29)	0.0%	0.47	0.495
Women	4	0.66 (−0.05-1.38)	71.7%			4	0.39 (−0.06-0.84)	36.3%			4	0.11 (−0.05-0.27)	0.0%		
Clinical	6	0.33 (0.07-0.59)	20.3%	8.64	0.003	5	0.30 (−0.13-0.72)	53.2%	0.48	0.490	5	0.05 (−0.08-0.18)	0.0%	0.03	0.857
Community	8	0.65 (0.54-0.76)	4.2%			7	0.41 (0.33-0.49)	0.0%			6	0.02 (−0.26-0.31)	58.2%		
Lifetime self-harm	11	0.57 (0.40-0.75)	51.5%	1.18	0.278	11	0.38 (0.29-0.47)	0.0%	6.56	0.010	9	0.02 (−0.15-0.19)	35.1%	5.79	0.016
Recent self-harm	3	0.74 (0.20-1.29)	54.2%			3	0.78 (0.11-1.44)	7.63%			3	0.49 (−0.74-1.71)	73.5%		
NSSI	12	0.60 (0.41-0.79)	55.8%	0.03	0.852	11	0.42 (0.27-0.57)	37.1%	0.16	0.685	10	0.08 (−0.17-0.33)	65.0%	0.24	0.628
Motivation not specified	3	0.63 (0.08-1.18)	37.1%			2	0.35 (0.29-0.42)	0.0%			2	0.20 (−2.85-3.24)	73.4%		

[a]Between-study variance was calculated separately when there were at least five studies per subgroup and pooled where groups contained fewer than five studies (Borenstein *et al*., 2009).

alexithymia and self-harm (Garisch & Wilson, 2015; Lambert & de Man, 2007). In contrast, Lee, (2016) found that alexithymia was a significant predictor of self-harm, independent of depression, and Sleuwaegen *et al*. (2017) observed that in their sample of BPD patients the relationship between self-harm and DDF (although not DIF or total TAS20) held, even controlling for depression. The finding of the current review, of a significant relationship between alexithymia and self-harm even in clinical settings, suggests that this is a relationship that is at least partially independent of other clinical symptoms.

Lifetime and recent self-harm

Studies that measured lifetime self-harm had a smaller combined effect size than those studies that measured current self-harm, although the difference was not statistically significant. It is hard to draw conclusions about the nature of the relationship between alexithymia and self-harm over time from these almost exclusively correlational studies. Only two studies distinguished between participants who had never self-harmed, those who last self-harmed over a year ago ("historic") and those who had self-harmed within the past year ("recent"). Anderson and Crowther (2012) found that, in their undergraduate sample, DIF scores were significantly lower among those who had never self-harmed than among those with either recent or historic self-harm. There was no significant difference in the DIF scores between participants with recent or historic self-harm. Moseley *et al*. (2019) reported a marginal ($p = 0.53$) difference between participants with recent and those with historic self-harm, but in a logistic regression alexithymia could not distinguish between participants who had never self-harmed and those with historic self-harm. If alexithymia were a stable trait, it would be expected that the relationship between alexithymia and past self-harm would be similar to that between alexithymia and recent self-harm. However, it is generally accepted that alexithymia has relative, rather than absolute, stability (Porcelli, Tulipani, Di Micco, Spedicato & Maiello, 2011) and may change over time, for example in relation to depression (Honkalampi, Hintikka, Laukkanen & Viinamäki, 2001) or as a result of treatment (Cameron, Ogrodniczuk & Hadjipavlou, 2014). In addition, the studies may to some degree be capturing secondary alexithymia which, like self-harm, may have developed in response to stressful life circumstances (de Vente, Kamphuis & Emmelkamp, 2006). Future research could usefully distinguish between recent and past engagement in self-harm, in order to extend understanding about the longitudinal relationship between alexithymia and self-harm.

The shortage of longitudinal studies in the review also precludes conclusions from being drawn as to whether alexithymia is a significant risk factor of self-harm (Kraemer, Kazdin, Offord, Kessler, Jensen & Kupfer, 1997). Those studies that conducted regression analyses found that alexithymia was a significant predictor of self-harm (e.g., Lüdtke *et al*., 2016) but this cannot be interpreted as causation. The only longitudinal study found that high alexithymia scores significantly predicted self-harm three months later in a community sample of adolescents (Garisch & Wilson, 2015). The authors conclude that alexithymia, in combination with low mood, may increase the likelihood of recourse to self-harm. However, more longitudinal

research is needed to confirm alexithymia as a risk factor. Indeed, although difficulties in emotion regulation (Buckholdt, Parra, Anestis, Lavender, Jobe-Shields, Tull & Gratz, 2015), emotion reactivity (Nock, Wedig, Holmberg & Hooley, 2008), and negative affect (Victor & Klonsky, 2014) are significant correlates of self-harm, meta-analyses have not identified them as significant risk factors of either NSSI (Fox, Franklin, Ribeiro, Kleiman, Bentley & Nock, 2015) or suicide (Franklin, Ribeiro, Fox, Bentley, Kleiman & Huang, 2017). In considering the disparity in the results between cross-sectional and longitudinal studies, Fox *et al*. (2015) hypothesize that emotion dysregulation, though not a significant risk factor on its own, may combine with other risk factors to increase vulnerability to self-harm and may also shed light on the function of self-harm as a means of relieving emotional distress (McKenzie & Gross, 2014). The same may be true of alexithymia, although neither of the meta-analyses cited here explicitly examined alexithymia as a risk factor (Fox *et al*., 2015; Franklin *et al*., 2017).

Model of self-harm

Many of the studies included in the review interpreted the association between alexithymia and self-harm as consistent with an affect regulation model of self-harm. According to this model, self-harm is conceptualized as a means of regulating unwanted emotional experience (Chapman *et al*., 2006), either to manage overwhelming emotion (Klonsky, 2007), or to feel something instead of feeling numb (Tolmunen, Rissanen, Hintikka *et al*., 2008). Only one of the studies in the current review analyzed the functions of self-harm in relation to alexithymia. Moseley *et al*. (2019) found that alexithymia was a significant predictor of participants' endorsement of NSSI as a means of regulating high-energy states, such as to relieve stress or pressure, or of communicating to others. This would appear to be consistent with the general finding of this review and Greene *et al*. (2020) that the relationship between self-harm and alexithymia is driven by difficulties in identifying and describing feelings which may hamper use of more adaptive regulatory strategies.

Clinical implications

Although alexithymia may be a barrier to psychological treatment (Ogrodniczuk, Piper & Joyce, 2011), there is evidence that alexithymia is modifiable if the intervention is targeted appropriately (Cameron *et al*., 2014). Treatments for self-harm, such as Dialectical Behavioral Therapy (Linehan, 1993), often include emotion awareness training, which may be particularly important for people with high alexithymia who struggle to understand what it is they are feeling. It has been suggested that labeling internal emotional states can act as a form of implicit emotion regulation (Torre & Lieberman, 2018). This may be the first step toward giving people the vocabulary to recognize and talk about feelings.

Limitations

Searches for the current review were limited to published data and articles published in English, which may have led to the exclusion of other relevant research. Furthermore, of the 31 studies which were identified as meeting the original search criteria, only 23 provided sufficient data to include in the meta-analysis of total alexithymia and self-harm, with a further four contributing to the analysis of the TAS20 subscales. The availability of gender-specific data was also patchy, with the result that these results require further replication.

Heterogeneity between the studies was high. Although the review investigated whether specifying motivation for self-harm as non-suicidal affected the relationship between self-harm and alexithymia, there were other differences between the studies in the way in which self-harm was defined, which were too various to allow for further subgroup analyses. Definitions varied between single questions to multi-item lists, in which methods of self-harm are specified. Single question definitions have been shown to underestimate the prevalence of self-harm (Swannell *et al*., 2014), and therefore may not be comparable with validated measures of self-harm such as the DSHI (Gratz, 2001). In addition, while some studies used a continuous scale, taking into account the frequency of self-harm, most used a binary distinction between people who had never self-harmed, and people who had self-harmed at least once. There is evidence to suggest that frequency of self-harm is related to severity of psychological distress and that a single incident may not be comparable to habitual engagement in self-harm (Fox *et al*., 2015).

Alexithymia was consistently measured using the TAS20 or its predecessor the TAS26. This makes comparison between studies easier, but it relies on the scale adequately capturing the underlying trait. Other measures exist, reflecting alternative conceptions of alexithymia. For example, the Bermond-Vorst Alexithymia Questionnaire (BVAQ; Vorst & Bermond, 2001) distinguishes between a cognitive component, similar to that measured by the TAS20, and an affective component, comprising difficulties fantasizing and reduced ability to experience emotion. Both the TAS20 and the BVAQ are self-report scales, however, and, it has frequently been observed that asking people who struggle to identify their emotions to complete a questionnaire about their emotional experience is inherently problematic (Taylor, Bagby, Parker & James, 1997). It would be useful to test the findings of the current review using observer rated measures of alexithymia. Alternatively, building on evidence associating alexithymia with broader failures in interoception (awareness of bodily sensation), proxy measures, such as heartbeat detection tasks, may provide a more objective means of assessment (Brewer, Cook & Bird, 2016; Herbert, Herbert & Pollatos, 2011).

CONCLUSIONS

The current meta-analysis identified a medium effect size of the relationship between self-harm and alexithymia, particularly difficulty identifying and describing feelings, indicating that people with a history of self-harm score on average significantly higher on measures of alexithymia than people with no history of self-harm. The effect size of the relationship between self-harm and alexithymia was larger among women than men, and in adolescent than adult samples. Heterogeneity between studies was high, due perhaps to the disparity in the measures of self-harm. The results justify further investigation into why difficulty in identify and describing feelings should be associated with self-harm.

FUNDING

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

DATA AVAILABILITY STATEMENT

The data used in the meta-analysis were taken from published articles. In a few cases additional data were obtained from authors - these are listed in the results section. No new data were collected for this review study.

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Received 28 February 2020, accepted 2 June 2020