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How effective are expressive writing interventions for adolescents? A meta-analytic review

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HIGHLIGHTS

- A meta-analysis of expressive writing (EW) among adolescents was conducted.
- EW produced small improvements in well-being across multiple domains.
- Increasing the number of sessions and spacing between sessions enhanced the EW effect on physical health.
- EW produced larger effects on school achievement for youth with emotional problems than for those without emotional problems.

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ABSTRACT

This meta-analysis evaluated the effects of the expressive writing intervention (EW; Pennebaker & Beall, 1986) among adolescents. Twenty-one independent studies that assessed the efficacy of expressive writing on youth samples aged 10–18 years were collected and analyzed. Results indicated an overall mean *g*-effect size that was positive in direction but relatively small (0.127), as well as significant *g*-effect sizes ranging from 0.107 to 0.246 for the outcome domains of Emotional Distress, Problem Behavior, Social Adjustment, and School Participation. Few significant effects were found within specific outcome domains for putative moderator variables that included characteristics of the participants, intervention instructions, or research design. Studies involving adolescents with high levels of emotional problems at baseline reported larger effects on school performance. Studies that implemented a higher dosage intervention (i.e., greater number and, to some extent, greater spacing of sessions) reported larger effects on somatic complaints. Overall, the findings suggest that expressive writing tends to produce small yet significant improvements on adolescents' well-being. The findings highlight the importance of modifying the traditional expressive writing protocol to enhance its efficacy and reduce potential detrimental effects. At this stage of research the evidence on expressive writing as a viable intervention for adolescents is promising but not decisive.

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1. Introduction

Nearly a quarter-century of research has suggested that attempts to think about negative life experiences in a reflective way, in a written format, may result in enhanced psychological adjustment (e.g., Klein & Boals, 2010; Pennebaker & Seagal, 1999). Based on these findings, a brief psychosocial intervention called *expressive writing* (EW), also known as written emotional disclosure, was developed (Pennebaker & Beall, 1986). EW is an individually focused intervention designed to improve emotional expression and processing during adaptation to stressful situations and, as a consequence, improve psychological and physical health (Pennebaker, 2004). In the standard EW intervention protocol (Pennebaker, 1997), participants are randomly assigned either to an EW group, where they write for 15–20 min for several sessions spaced over a few days focusing on their "deepest thoughts and feelings" about a negative life experience of their own choosing, or to a control group, where they write factually about a non-emotional topic. Pre- and post-writing assessments are obtained and the group comparison of change aims to isolate the effect of writing about emotions from that of writing per se.

Since the first study by Pennebaker and Beall (1986) was conducted with a sample of university students, hundreds of studies have implemented the EW intervention. This research has been synthesized in several meta-analyses (Frattaroli, 2006; Frisina, Borod, & Lepore, 2004, 2005; Harris, 2006; Meads & Nouwen, 2005; Smyth, 1998). Several of the meta-analyses review the same studies, whereas others focus on particular populations (e.g., those with chronic illness) or outcomes (e.g., health care utilization). Although the evidence is not consistent, findings suggest that EW may slightly improve participants' physical and psychological health.

The earliest meta-analysis (Smyth, 1998) included 14 studies of healthy university students and community samples and showed significant effects for self-reported physical health, psychological well-being, physiological functioning, and general functioning, with an average effect size of $d = 0.47$. Frisina et al. (2004) partially corroborated and extended these findings in a meta-analysis of nine studies of people who had physical or psychiatric disorders. They reported a smaller, yet significant, effect size of $d = 0.21$ for physical health outcomes. The effect size for psychological health outcomes was inconsistent, perhaps because of the inclusion of studies with participants suffering from serious disordered cognition (e.g., posttraumatic stress disorder, severe depression, suicidal ideation). However, in updating their meta-analysis, the authors warned that many of the studies included were small pilot studies and that the findings should be considered as preliminary (Frisina et al., 2005). In contrast, in an analysis of 61 studies, including most of the studies meta-analyzed in the two previous reviews, Meads and Nouwen (2005) did not find a significant effect of EW on physical health compared to the control condition, both for healthy and at-risk samples. Summarizing the results of 30 randomized trials with samples defined by different inclusion criteria (medical conditions vs. psychological criteria vs. healthy participants), Harris (2006) showed that EW significantly reduced health care utilization among healthy people, with an effect size of $d = 0.16$, but did not do so in samples with preexisting medical conditions or stress- and psychological-related problems.

The largest and most recent meta-analysis by Frattaroli (2006) included 146 studies of EW trials with community, clinical, and medical samples. The overall effect size of $d = 0.15$ was small yet statistically significant, with valuable effects for a number of subsets of outcomes, including psychological problems (e.g., distress, depression, anxiety), immune parameters (e.g., Interleukin 8, CD-8 cells) and immune-related variables (e.g., HIV viral load, liver function, dopamine), self-reported physical health (e.g., reported disease and illness behaviors), and general functioning (e.g., work- and school-related outcomes, social adjustment). Further, this meta-analysis demonstrated that particular subgroups experienced greater benefits of EW, with larger effects among those who had higher stress, poorer physical health, and lower optimism before writing. Interpreting these results, Frattaroli suggested that improvements in emotional health and positive changes in immune system, perceived health and general functioning were evident

after emotional disclosure. The moderator effects suggested participants who were facing upsetting emotional issues, such as traumatic experiences or recurring health problems, may benefit even more from written emotional disclosure. Frattaroli concluded that although the effects were quite small, EW should be considered a useful intervention for fostering emotional regulation and well-being in vulnerable populations, especially in light of its cost-effectiveness. However, the wide variability in effect sizes depending on the outcome measure or population studied suggests the need to investigate potential moderators and define the boundary conditions under which EW should take place (Smyth & Pennebaker, 2008).

1.1. Overview of mechanisms

Several theories have been proposed to explain how EW works (see Baikie & Wilhelm, 2005; Frattaroli, 2006; Lepore, Greenberg, Bruno, & Smyth, 2002; Pennebaker, 2004; Sloan & Marx, 2004, for overviews on the mechanisms). EW may initiate emotion regulation in several ways.

1.1.1. Attentional processing

It is proposed that EW guides people to focus their attention to details of memories that are inhibited or undervalued, or induce people to label and acknowledge emotional experiences that have previously been avoided (Pennebaker & Beall, 1986). High levels of cognitive and emotional inhibition may require a great deal of psycho-physiological work, resulting in chronic and unhealthy physiological arousal (Traue & Pennebaker, 1993). EW may redirect attention toward more positive aspects of the situation that are likely to be disregarded. In fact, a number of studies show that asking people to write about positive as well as negative aspects of traumatic experiences had comparable or superior effects (Burton & King, 2008; King, 2001, 2002; King & Miner, 2000; Stanton et al., 2002).

1.1.2. Habituation

EW may be considered an analog of exposure-based procedures fostering habituation by confronting individuals with negative memories in a secure environment. Habituation consists of the diminishing of the magnitude of a response to a specific stimulus with the repeated exposure to that stimulus (Grissom & Bhatnagar, 2009). Writing repeatedly about the same traumatic event may produce the reactivation, the habituation and, hence, the extinction of the stress-related physiological and emotional states (Bootzin, 1997; Konig, Eonta, Dyal, & Vrana, 2014; Sloan, Marx, & Epstein, 2005).

1.1.3. Cognitive processing

EW may launch cognitive processing in terms of searching of a coherent meaning for the traumatic event and reappraising the situation. Several studies have shown that written emotional disclosure elicits meaning-making processes such as searching for causal explanations and interpretation of the events (Boals, 2012; Greenberg, Wortman, & Stone, 1996; Klein & Boals, 2010; Park & Blumberg, 2002; Pennebaker, Colder, & Sharp, 1990; Pennebaker & Seagal, 1999; Suedfeld & Pennebaker, 1997).

Frattaroli (2006) provides partial support for all three theoretical mechanisms. Individual studies have yielded mixed evidence and indicated a degree of overlap among mechanisms (Guastella & Dadds, 2006; Lu & Stanton, 2010; Nazarian & Smyth, 2013; Sloan, Marx, Epstein, & Lexington, 2007; Ullrich & Lutgendorf, 2002). Additional mechanisms have been offered, some speculative yet with intuitive appeal, and others that confound underlying processes (i.e., mediators) and effects (i.e., outcomes). For example, an explanatory model based on *social integration and engagement* has been proposed (Heffner-Johnson, 2002), but it seems to be more an explanation of outcomes rather than a discussion of a potential EW mechanism, and has received mixed empirical support (Frattaroli, 2006). The data supporting it analyze the way participants—including young participants—write to others via social media such as Facebook, Instant Messaging, and e-mails. However, this is a different type of writing than that used in the traditional EW protocol in which one should not be thinking of the audience (Pennebaker, Facchin, & Margola, 2010). In short, written emotional disclosure should be considered as a multidimensional process consisting of different mutually influential mechanisms rather than a one-dimensional process (Pennebaker, 2004; Smyth & Pennebaker, 2008). Providing a theoretical framework, Lepore et al. (2002) hypothesized that, in particular, *attention*, *habituation*, and *cognitive processing* (not social processing) may be viewed as components of a general self-regulation process that mediates the relationship between EW and psychological and physical health outcomes.

1.2. EW with adolescents

Almost all of the research on written emotional disclosure has been conducted with adults. However, it may be a cost-effective and simple-to-use intervention for adolescents as well. Despite this, no meta-analysis has systematically included studies of adolescents. The meta-analyses by Smyth (1998) and Frattaroli (2006) examined age as a moderator, but included, respectively, only one (O'Heeron, 1993) and six studies with youth samples (Evans, 2000; Gallant & Lafreniere, 2003; Haraway, 2003; O'Heeron, 1993; Reynolds, Brewin, & Saxton, 2000; Warner et al., 2006). Further they did not provide data on age range necessary to reach conclusions about EW's effectiveness with adolescents.

Despite the potential benefits of EW for adolescents, several developmental issues arise from this kind of application. First, written emotional disclosure involves self-regulation abilities that are still developing during adolescence. Core executive functions underlying self-regulation activities such as the ability to hold and manipulate information in working memory, to focus, maintain and shift attention, and to inhibit thoughts and actions to regulate emotions meet adult levels only in middle to late adolescence (ages 15 to 22; Huizinga, 2006; Luna, Garver, Urban, Lazar, & Sweeney, 2004). Second, recent reviews about fear extinction in youth reveal a diminished ability to maintain extinction learning after exposure-habituation processes in adolescents compared with adults, likely due to neurobiological changes in the functional connectivity between prefrontal cortical regions and the amygdala (Baker, Den, Graham, & Richardson, 2014; Drysdale et al., 2014; Pattwell, Lee, & Casey, 2013). Third, although late adolescents are able to cope with negative emotional experiences by reasoning about them and re-appraising their meaning (McLean, Breen, & Fournier, 2010; Vashchenko, Lambidoni, & Brody, 2007), early and, to a lesser extent, middle adolescents may be less efficient in making meaning of them (Fivush, Marin, Crawford, Reynolds, & Brewin, 2007; McLean et al., 2010). A variety of complex cognitive abilities related to meaning-making arise in adolescence but evidence suggests that they develop at different rates (Habermas & Bluck, 2000; Harter, 2006). Late adolescents are more efficient than early or middle adolescents in creating a coherent sense of self across multiple domains (Harter, 2006). Thus, from late childhood to early adolescence an integrated person-concept begins to provide a frame that can be used to select and arrange life events into coherent narratives. The ability to summarize memories and provide personal interpretations, instead of simply organizing the events temporally, may not develop fully until later in adolescence (Habermas & Bluck, 2000).

Taken together, the research evidence suggests that adolescents may vary considerably in their ability to regulate emotions when writing expressively. At different development points in adolescence, exposure to emotional memories and subsequent efforts to regulate attention, employ cognitive processing to construct a coherent meaning, or reappraisal of stressful events in a positive manner may result in adaptive vs. maladaptive self-reflection (Kross, Duckworth, Ayduk, Tsukayama, & Mischel, 2011). This leads to the questions of whether EW is an effective and age-appropriate intervention for adolescents, whether it is

more effective for particular subgroups of adolescents, and whether essential aspects of the writing process, for example, intervention dosage and type of instructions, may lead to a more conclusive self-regulation process and better adjustment. These are the central questions of the current study.

1.3. Moderators of the EW effect

We examined a number of putative moderators that include characteristics of participants and of the intervention itself.

1.3.1. Participant characteristics

Participant characteristics such as age, gender, and risk status may affect findings. Although late adolescents and, to a lesser extent, middle adolescents use narrative to process negative events, children and early adolescents benefit less from disclosing negative experiences (McLean et al., 2010). Thus, as described above, the effect of EW may depend on the level of cognitive and emotional development, which increases with age (Fivush et al., 2007; Reynolds et al., 2000; Soliday, Garofalo, & Rogers, 2004).

Gender norms surrounding emotional expression may lead to differential effects of EW among females and males (Smyth, 1998; see also, Range & Jenkins, 2010). EW studies have mostly been conducted in Western cultures, where gender norms reinforce "other"-oriented behaviors such as help-seeking and emotional disclosure among girls more than boys (Brown, 2009; Cardella-Filaski, 2011). Similarly, adolescent boys are not encouraged to express emotions such as sadness and anxiety, which may indicate dependency and weakness (Wong, Pituch, & Rochlen, 2006). As a result, boys may display more constrained emotional experience and expression (Twenge, 1999). It is also possible that boys perceive that expressing emotions is unhelpful (Rose et al., 2012). As there is some evidence EW may be more effective when there are social constraints on emotional expression (Páez, Velasco, & González, 1999; Swanbon, Boyce, & Greenberg, 2008; see also, Lepore, Revenson, Roberts, Pranikoff, & Davey, 2014), we hypothesized that adolescent boys may benefit more from EW than girls.

Whether EW is effective for children and adolescents who have psychological, medical or familial problems – labeled "at risk" in this study – is an open question. Findings from EW studies conducted with adolescents at risk for psychological problems (Evans, 2000; Muris, Meesters, & van Melick, 2002; O'Heeron, 1993; Stice, Burton, Bearman, & Rohde, 2006; Stice, Shaw, Burton, & Wade, 2006), physical illness (McElligott, 2006; Warner et al., 2006; Weits, 2006), or familial stressors such as parental alcoholism (Gallant & Lafreniere, 2003), domestic violence (Parker, Stewart, & Gantt, 2006), or traumatic loss (Margola, Facchin, Molgora, & Revenson, 2010) have yielded mixed results. Thus, it is not possible to advance a clear hypothesis about the differential effects of EW based on risk status. However, it is plausibly assumed that the level and type of risk may have different effects. We examine this hypothesis in exploratory analyses.

1.3.2. Intervention characteristics

An essential aspect of EW is the characteristics of the writing task itself. Studies often vary aspects of the writing task such as its focus and the number and length of writing sessions. The standard EW instructions ask participants to write about a topic that may be broad (e.g., a self-named event) or specific (e.g., an ongoing physical illness). Frattaroli's (2006) meta-analysis found that studies with specific writing topics and clear instructions yielded larger effect sizes. Recent studies examining altered instruction to elicit specific mechanisms (i.e., writing about perceived benefits) found mixed results (Facchin, Margola, Molgora, & Revenson, 2014; Guastella & Dadds, 2006; Lu & Stanton, 2010; Nazarian & Smyth, 2013; Sloan et al., 2007; Ullrich & Lutgendorf, 2002). Although the manipulation of writing instructions did not point to a single mechanism for these effects, these findings provide preliminary evidence that more focused instructions enhance emotional regulation processes to a greater extent than the traditional instructions.

The "dosage" of the EW intervention may be considered in terms of number, length, and spacing of writing sessions. Usually, EW studies include three or four 15–20 min sessions spaced one to seven days apart. Frattaroli's (2006) meta-analysis found that increasing the number or length of sessions increased the strength of the effects, whereas altering the days between writing sessions did not. An early hypothesis was that very brief writing interventions (less than 15-minute and/or less than three sessions) would be unhelpful or even detrimental because participants would become distressed without the time to regulate their emotions. A related hypothesis was that increasing the time interval between sessions would provide participants with more time to gain insight and reduce fatigue arising from the intensive emotional and cognitive energy spent in writing. A few of studies provide evidence in favor of brief EW interventions. Comparing the effects of EW with a sample of 44 patients with breast cancer who wrote for one vs. three sessions, Walker, Nail, and Croyle (1999) failed to find differential improvements based on the number of sessions. In a study of 49 undergraduate psychology students (Burton & King, 2008) some positive effects accrued after only two writing sessions of 2 min each. Hoyt (2011) reported a significant reduction in posttraumatic symptoms among 120 individuals with high-trait negative emotionality after two 30-min writing sessions. As regards the spacing of sessions, two studies with adult samples failed to find evidence of differences between long- and short-interval treatments, supporting the hypothesis that the time lag between sessions does not affect the strength of effects (Chung & Pennebaker, 2008; Sheese, Brown, & Graziano, 2004).

Despite these inconsistent results, the writing instructions and dosage of intervention may be salient for youth. Although cognitive abilities, such as perspective-taking and summarizing disparate information into coherent abstractions emerge in late childhood and adolescence, the ability to create a coherent narrative about events may still occur because of the complex demands made on memory and reasoning (Habermas & Bluck, 2000; McLean et al., 2010). Further, the intensive self-immersion in narrative about stressful memories during writing may interfere with an adaptive self-distancing mechanism (Kross et al., 2011) resulting in a seeming detrimental effect of EW. As suggested by Fivush et al. (2007), a more focused writing assignment (instead of a general emotional disclosure task) and a greater dosage (in terms of number, length, and spacing of sessions) could yield greater benefits by reducing cognitive burden and providing youth with a sufficient time to elaborate their experiences and still achieve a psychological distance from them.

1.4. The current study

The current study presents a meta-analysis of the literature on expressive writing interventions for adolescent populations. First, we examine whether EW has positive effects on well-being and physical health. To answer this question, we systematically review the body of experimental studies with youth samples, and use meta-analysis statistics to estimate the overall effect size of the EW condition compared to the control condition. Second, we investigate whether the beneficial effects of EW are stronger for particular subgroups of adolescents. We examine the variability in effect size across studies as a function of specific characteristics of the participants (age, gender, and risk status) and of the intervention (focus of the writing instructions and dosage of writing task). Third, we investigate whether effect size is related to elements of the research design (type of control condition, timing of follow-assessments, and attrition rates). Finally, we assess the potential impact of biases or artifacts that are common in meta-analysis on effect size (computational choices, missing effect sizes, and outliers).

2. Method

2.1. Search and selection of studies

A systematic literature search was conducted using a four-phase strategy (Sutton, Abrams, Jones, Sheldon, & Song, 1998):

(1) *Keyword search*. Four electronic databases (PsycINFO, Medline, Proquest Digital Dissertations, and Education Resources Information Center [ERIC]) were searched for the period August 1986 (publication year of the first EW study by Pennebaker and Beall) to July 2012. Twenty-two search terms were used individually and in combination using the Boolean 'AND' function: *adolescent(s)*, *child*, *children*, *creative writing*, *diary keeping*, *disclosure*, *emotional disclosure*, *expressive writing*, *intervention(s)*, *narrative(s)*, *Pennebaker*, *preadolescent(s)*, *prevention*, *school*, *self-disclosure*, *student(s)*, *teenager(s)*, *trauma*, *writing*, *written communication*, *written emotional disclosure,* and *youth.*
(2) *Reference search*. The reference sections of all publications collected through the keyword search were examined for publications that did not emerge during the keyword search.
(3) *Citation search*. All publications citing the studies obtained in keyword and reference searches were examined.
(4) *Expert search*. Several scholars who have done work in the area of written emotional disclosure were emailed and asked to identify unpublished manuscripts and conference presentations that might not appear using the previous three search modes.

The eligibility of each article was evaluated from the title and abstract. If there was uncertainty, the first and second authors read the full publication. The following inclusion criteria were used:

(1) The study had to be original research of one or more studies of EW.
(2) The study had to use an experimental design with at least one post-treatment assessment of the outcome variable(s).
(3) The study had to include a neutral (non-emotional) writing control condition and/or assessment-only control condition.
(4) The instructions for participants in the treatment condition had to follow some variation of the instructions of the original EW paradigm (Pennebaker, 1997).
(5) The sample had to be between the ages of 8 and 18.

2.2. Coding

Each study was coded by two independent reviewers, the first author and a trained coder (an advanced graduate student). In order to reduce potential coding errors, an electronic codebook was developed using principles specified by Lipsey and Wilson (2001). The codebook contained a description of data items to be extracted from the primary studies accompanied by examples. The following information was extracted from each study (Table 1):

(1) *Participant variables*: Age, gender, and risk status.
(2) *Intervention variables*: Writing instructions (general vs. focused) and intensity-dosage of the writing task (number, length, and spacing of writing sessions).
(3) *Research design variables*: Type of assignment (random vs. non-random assignment), type of control condition (assessment-only vs. neutral writing), timing of the final follow-up assessment, and attrition rate from pre- to post-test.

2.2.1. Outcome variables

EW studies have examined the effects of the writing intervention on many types of outcomes, from psychological well-being to academic achievement. For this meta-analysis, we classified the outcome variables a priori into eight categories, drawing on Frattaroli's (2006) meta-analysis on emotional disclosure and Wilson and Lipsey's (2007) meta-analysis of school-based interventions. Each outcome category contained at least five independent studies. *Problem Behavior* includes a variety of behavioral problems, typically externalizing-conduct problems or problems related to aggression. Typical measures used are the Externalizing Symptoms of the Child Behavior Checklist (Achenbach, 1991) and the Conduct Problems of the Strengths and Difficulties Questionnaire (Goodman, 1997). *Internalizing Problems* include symptoms such as depression, anxiety, and other general measures of emotional distress (e.g., Children's Depression Inventory [Kovacs, 1985]; Revised Children's Manifest Anxiety Scale [Reynolds & Richmond, 1978]). *Personal Adjustment* is assessed by measures such as the Beck Self-Concept Inventory (Beck, Beck, & Jolly, 2001) and the Children's Coping Strategies Checklist (Ayers, Sandler, West, & Roosa, 1996). *Social Adjustment* includes evaluations of one's social life, which was often measured by the Social Adjustment Scale (Weissman & Bothwell, 1976) or the Social Experience Questionnaire (Crick & Grotpeter, 1995). *School Performance* includes indicators of academic achievement such as exam results and school grades. *School Participation* includes school absences and tardiness; in some cases these were assessed through records and other times self-report. *Somatic Complaints* include self-report measures of symptoms such as the Children's Somatization Inventory (Walker, Garber, & Greene, 1991) and the Somatization Scale of the Child Behavior Checklist (Achenbach, 1991). *Medical Visits* include the frequency of doctor or nurse visits, assessed through objective sources of information and/or self-report.

Interrater reliability was assessed for each coded variable using Cohen's Kappa (Cohen, 1960) for categorical data and the Intraclass Correlation Coefficient (ICC; Shrout & Fleiss, 1979) for interval data. Acceptable agreement was an average Cohen's Kappa or an average ICC $\geq$ .80. Disagreements were resolved through rereading the studies and discussing the discrepancies until agreement between the two independent coders was reached.

2.3. Meta-analysis procedures

2.3.1. Calculation of effect sizes

Analyses were performed using the algorithms implemented in the computer program Comprehensive Meta-Analysis (CMA, Version 2.2.055; Borenstein, Hedges, Higgins, & Rothstein, 2005). The Hedges' *g* effect size was estimated as the difference between the standardized mean change for the treatment and control conditions, using the pooled pre-test standard deviation (Morris, 2008). The value of each effect size was scaled so that positive values represent a positive effect, that is, EW improved the targeted outcome.

A mean effect size for each outcome category was calculated. An overall effect size was calculated by averaging the effect sizes across all studies. The effect size distribution was inspected to find extreme effect sizes with potential to distort the analyses. An effect size was considered extreme if its value fell outside the 95% confidence interval around the overall mean effect size. These extreme effect sizes ($n = 4$) were recoded to the next largest value in the distribution that fell within the 95% confidence limits (Lipsey & Wilson, 2001). Because of the inclusion of potential moderator variables in analyses, true effect size would vary as a function both of the within-study variance and between-study variance. Thus, for significance testing, a random-effects model that assumes the variability in the true effect size from study to study was adopted (Borenstein, Hedges, Higgins, & Rothstein, 2009).

2.3.2. Incomplete or missing data

Two publications reported only post-test data. In these cases it was possible to calculate the Hedges' *g* effect size (Hedges, 1981) from the post-test standardized mean difference, without the adjustment for

Table 1
Operationalization and values of moderators.

Moderator	Coding description	Values
Participant variables		
Age[a]	Categorical variable representing the age range that includes the mean age of the sample.	0 = 10–13 years 1 = 14–18 years
Gender[a]	Categorical variable representing the proportion of males in the sample.	0 = males less than or equal to 50% 1 = males more than 50%
Risk status	Categorical variable representing the targeted population of the study.	0 = healthy participants 1 = participants at risk for psychological problems 2 = participants at risk for physical illness 3 = participants at risk for contextual factors (e.g. children of alcoholics)
Intervention variables		
Focus of writing	Categorical variables representing the level of specificity of the topic assigned in EW sessions.	0 = generic topic (e.g. an upsetting event) 1 = focused topic (e.g. the trauma of death, an ongoing physical illness)
Number of sessions[a]	Categorical variable representing the timing of intervention in terms of number of EW sessions.	0 = less or equal to 3 sessions 1 = more than 3 sessions
Length of sessions[a]	Categorical variable representing the timing of intervention in terms of duration of each EW session.	0 = less or equal to 20 min 1 = more than 20 min
Spacing of sessions	Categorical variable representing the timing of the intervention in terms of the interval of time between EW sessions.	0 = 1 day 1 = more than 1 day
Research design variables		
Random vs. non-random assignment	Categorical variable representing whether or not participants were randomly assigned to conditions.	0 = not random assignment 1 = random assignment[b]
Type of control condition	Categorical variable representing whether the study used an assessment-only control condition or a neutral writing control condition.	0 = assessment-only control condition 1 = neutral writing control condition
Short- vs. longer-term effects[a]	Categorical variable representing the timing of the farthest follow-up.	0 = follow-up less than or equal to 1 month 1 = follow-up between 1 month and 2 months 2 = follow-up more than 2 months
Attrition rate[a]	Categorical variable representing the ratio between the number of participants who left the studies before the last follow-up and the total number of participants who initially began the study.	0 = less than or equal to 10% 1 = more than 10%

[a] These variables that were originally continuous were coded as categorical for subgroup comparison and then as continuous for meta-regression.
[b] Only randomized studies (1) were included in the present meta-analysis.

the pre-test differences. Four publications indicated that the post-test differences were statistically significant or non-significant without providing data for the effect size calculation. Following the same procedures adopted by Frattaroli (2006), the effect size was derived from the *p* value, if available. When *p* values were not reported, yet the post-test contrast was defined as significant, *p* values were assumed to be .049. If the result was described as non-significant but the *p* value was not provided, the effect size was conservatively set as equal to zero. One dissertation reported results only in graphical form (i.e., histograms; see Joncas, 2006) without providing the values necessary to calculate the effect size. In this case the effect size was derived from the graph.

2.3.3. Selection of effect sizes

Some studies have multiple effect sizes because of the inclusion of multiple EW conditions, multiple control conditions, multiple follow-up assessments, or multiple measures for the same outcome variable. In these cases, a number of rules were used to determine effect sizes for each study.

(1) If a study contained multiple EW conditions with different writing instructions, only the data from the condition with the most traditional EW instructions was used in the meta-analysis.
(2) If a study reported data both for a neutral writing control condition and an assessment-only control condition, only the comparison between the EW and neutral writing control was included in the meta-analysis. This decision was made because it is more likely to ensure equal involvement of the participants across conditions, allowing us to discern if the effects are due to expressive writing vs. neutral writing.
(3) If a study included multiple follow-up assessments, the data from the farthest follow-up were used in analyses. Thus, only one post-intervention assessment was used for each study. This is a conservative approach because it provides the clearest view of the lasting effects of the intervention and also makes the number of follow-up assessments across studies equivalent.
(4) If a study used several measures of the same outcome variable, a single effect size was obtained averaging the effect sizes for the different measures. Similarly, if a study reported data for the same outcome measure both from the adolescent participants and an adult (parent or teacher), the data from the adolescent was used in analyses. However, when the data were available only from adults, those data were used in analyses.

2.3.4. Heterogeneity and moderator analyses

The examination of heterogeneity of the effect size distributions within each outcome category was conducted using the *Q* statistic and the I^2 statistic (Borenstein et al., 2009). Due to the substantive variability within the studies, even in the case of a non-significant *Q* test, when I^2 was different from zero, moderational analyses were carried out through subgroup analysis and meta-regression analyses (Ioannidis, 2008; Johnson & Turco, 1992; Wilson & Lipsey, 2007). As all hypothesized moderators were operationalized as categorical variables, these analyses were performed primarily through subgroup analyses, using a mixed-effects model. For the moderators that were originally continuous and then categorized (e.g., age), meta-regressions were computed on the continuous scores. Because of the small number of studies included in the meta-analysis, it was not possible to test multiple moderators together. Thus, the effects of moderators were examined in separate univariate models.

2.3.5. Publication bias and sensitivity analyses

Publication bias was tested within each outcome category by funnel plot (Sterne, Becker, & Egger, 2005), which allows a visual inspection of the effect size distribution, and by Duval and Tweedie's (2000) trim and fill procedure, which adjusts the effect size for publication bias. Sensitivity analyses for the main effect calculations and moderator analyses were performed by comparing the original results with results obtained from different computational models using the fixed-effects model instead of the random-effects model, excluding those effect sizes considered as a possible source of bias instead of including all studies (e.g., if the effect size was not adjusted for pre-test differences; analyzing original continuous moderators through meta-regression instead of subgroup analysis; examining the effect sizes of subset of studies based on methodological differences).

2.3.6. Power calculations

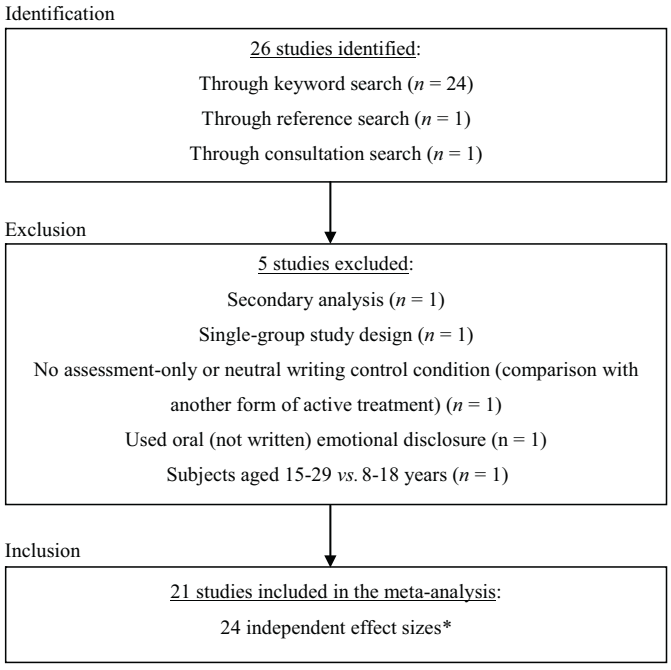
A power analysis was conducted to establish how many studies would be needed to identify a significant main effect and heterogeneity (Borenstein et al., 2009). For main effects of the writing intervention on an outcome, imposing a random-effects model and assuming moderate between-study variance, statistical power of .80, and a less conservative significance level of .10 (see Wilson & Lipsey, 2007), the number of studies sufficient to detect a small effect size ($d = 0.151$, derived from Frattaroli, 2006) would be 20, with a mean sample size of 90 participants in each study (45 per condition). With regard to heterogeneity, at least 30 studies would be needed under a random-effects model, assuming a moderate dispersion and, again, a p value of .10 (instead of .05), and power set equal to .80. Because less than 30 studies were included in this meta-analysis, the heterogeneity analyses may be underpowered. For these reasons, even when Q was non-significant but I^2 was significantly different from zero, moderational analyses were still conducted, given the importance of the moderator variables (Johnson & Turco, 1992).

3. Results

3.1. Selection of the studies

The flowchart in Fig. 1 describes how the studies were selected. In all, 26 studies were identified through the literature search, but only 21 met inclusion criteria. Research designs varied widely. Twelve studies used the traditional paradigm with EW as the only experimental writing condition compared to a control group. Three studies (Facchin, 2010; Kliewer et al., 2011; Winslett, 2007) included a second comparison writing condition but these comparisons are not included in the meta-analysis, as described above (see "Selection of effect sizes"). Six studies compared the EW condition to a control writing or no writing condition and, additionally, to some other form of treatment (e.g., a cognitive-behavioral program or psychoeducational intervention; Haraway, 2003; Muris et al., 2002; Pössel, Horn, & Hautzinger, 2006; Stice, Burton, Bearman, & Rohde, 2006; Stice, Shaw, Burton, & Wade, 2006; Wisinger, 2011). In these cases only the comparison of the control writing or no writing condition with the EW condition was analyzed.

Three studies provided data for subgroups of adolescents at risk: Students with low and high peer victimization (Giannotta, Settanni, Kliewer, & Ciairano, 2009); low and subclinical depression (Pössel et al., 2006); or low and high test anxiety (Ramirez & Beilock, 2011). Because subgroups may be considered as independent samples (Borenstein et al., 2009), the final meta-analysis analyzed 24 effect sizes extracted from 21 studies. Table 2 lists the 21 studies, their main characteristics, the overall effect size across outcome categories, and the effect size of each outcome category.



* Three studies provided separate effect sizes for independent subgroups of participants resulting in a final sample of 24 effect sizes.

Fig. 1. Flow chart of the study selection process.

3.2. Study characteristics

Each study was coded by two raters. Inter-rater reliability was extremely high, with a mean Kappa of .91 (range .85–1.00) for categorical variables and a mean Intraclass Correlation Coefficient (ICC) of .96 (range .90–1.00) for continuous variables.

3.2.1. Participant variables

3.2.1.1. Age. The age of participants in the studies ranged approximately from 10 to 18 years. Seven studies included participants with a mean age of 10–13 years (early to middle adolescence) and 14 studies had participants with a mean age of 14–18 years (middle to late adolescence). Three studies reported only the age range and, thus, the mean age was inferred: The age range was between 10 and 13 years in one (Haraway, 2003) and 14 and 15 years in another (Ramirez & Beilock, 2011), allowing them to be included in the meta-analysis. The third study (Gallant & Lafreniere, 2003) reported an age range of 10–17, so age was considered missing. The mean age in one study (Stice, Burton, Bearman, & Rohde, 2006) was 18, with a maximum of 22. However, as sensitivity analysis did not detect a significant influence of age on effect sizes, this study also was included in the meta-analysis.

3.2.1.2. Gender. Most of the studies contained mixed gender samples. Fourteen studies were predominantly female (>51%; range: 52%–70%), five studies were predominantly male (≥51%; range: 51%–85%), and two studies were 100% female.

3.2.1.3. Risk status. As anticipated, the final sample of 21 studies provided data for 24 independent groups (i.e., 24 independent effect sizes). In particular, 11 studies involved healthy adolescents, seven involved adolescents with a psychological problem (e.g., depression), three involved adolescents with a physical illness (e.g., asthma), two targeted adolescents at risk for physical victimization, and in one the parents were alcoholics.

Table 2
Studies, sample size, overall effect size, effect sizes of outcome categories, targeted population, and topic of writing.

Study		N	Overall effect size	Effect sizes of outcome categories								Targeted population	Topic of writing
				A	B	C	D	E	F	G	H		
1)	Evans (2000)	31	0.360		0.544			0.294	0.243			Emotionally disturbed students	Upsetting experience
2)	Facchin (2010)	179	0.007			−0.179	0.193					Students incoming middle school	Transition to middle school
3)	Gallant and Lafreniere (2003)	34	0.000	0.000	0.000					0.000		Children of alcoholics	Upsetting experience
4a)	Giannotta et al. (2009)	98	0.025		−0.049	−0.001						Low-victimized students	Peer problem
4b)	Giannotta et al. (2009)	47	0.031		−0.098	0.161						High-victimized students	Peer problem
5)	Haraway (2003)	49	0.245		0.414	0.075	0.064					Students incoming middle school	Transition to middle school
6)	Horn, Pössel, and Hautzinger (2010)	359	0.159		0.215				0.314**			Students	Upsetting experience
7)	Joncas (2006)	61	0.258	0.247	0.269			−0.052				Students	School/Friends/ Negative experiences/ Positive experiences
8)	Kliewer et al. (2011)	174	−0.053	−0.053								Students living in high-violence urban neighborhoods	Violence
9)	McElligott (2006)	36	0.306	0.234	0.174	0.504			0.706*		−0.087	Sickle cell disease patients	Illness
10)	Muris, Meesters, and van Melick (2002)	20	0.056		0.056							High-anxious students	Upsetting experience
11)	O'Heeron (1993)	56	0.072	0.000	0.000	0.068		0.000	0.000	0.445	0.000	At risk students	Upsetting experience
12a)	Pössel et al. (2006)	120	0.395 (0.670**) [a]		−0.148					0.938** (1.488***) [a]		Low-depressed students	Upsetting experience
12b)	Pössel et al. (2006)	171	0.475* (0.649**) [a]		0.359					0.591** (0.938***) [a]		Subclinical-depressed students	Upsetting experience
13a)	Ramirez and Beilock (2011)	52	0.024					0.024				Low-test anxious students	Upcoming exam
13b)	Ramirez and Beilock (2011)	54	0.561					0.561				High-test anxious students	Upcoming exam
14)	Reynolds et al. (2000)	123	0.185	0.312**	0.123		0.217		0.000	0.090		Students	Upsetting experience
15)	Soliday et al. (2004)	106	0.099		0.228	0.043				0.004	0.121	Students	Upsetting experience
16)	Stice, Burton, Bearman, and Rohde (2006)	94	−0.027		−0.027							High-depressed students	Upsetting experience
17)	Stice, Shaw, Burton, and Wade (2006)	144	0.047		0.000		0.000				0.141	Students with body image concerns	Upsetting experience
18)	Wallander, Madan-Swain, Klapow, and Saeed (2011)	56								0.277	0.366** (0.653***)[a]	Recurrent abdominal pain patients	Upsetting experience
19)	Warner et al. (2006)	50	0.310		0.317					0.302		Asthma patients	Upsetting experience
20)	Winslett (2007)	28	0.455		0.232		0.679*					Students	Upsetting experience
21)	Wisinger (2011)	40	0.127		−0.020			−0.278	0.394	0.412		Students attending math exams	Hobbies/Spring break/Vacation

Note 1. Positive value of effect size represents a positive effect in favor of the EW condition.
Note 2. The expression "Upsetting experience" summarizes the following different conditions: "bothering experience"; "emotional experience"; "threatening or frightening experience"; "stressful experience"; "upsetting experience". A = Problem Behavior; B = Internalizing Problems; C = Personal Adjustment; D = Social Adjustment; E = School Performance; F = School Participation; G = Somatic Complaints; H = Medical Visits.
[a] Effect size before the adjustment due to extreme value.
* $p < .05$.
** $p < .01$.
*** $p < .001$.

3.2.2. Intervention variables

3.2.2.1. Number, length, and spacing of writing sessions. The number of writing sessions ranged from 1 to 12 ($M = 4.48$; $SD = 2.94$). Thirteen studies included 3 or less sessions and eight studies had more than 3 sessions. The length of the writing sessions ranged from 10 to 45 min ($M = 23.33$; $SD = 9.13$), with the length being 20 min or less in 14 studies and more than 20 min in the other seven. Seven studies administered the

writing sessions on consecutive days and 13 on non-consecutive days; in the non-consecutive studies the interval between sessions did not exceed one week. One study (Ramirez & Beilock, 2011) had a single writing session and was considered missing for this analysis.

3.2.2.2. Focus of writing. Nineteen studies used the traditional EW paradigm (Pennebaker & Beall, 1986), asking the adolescent to write about a stressful or upsetting experience of their choosing (13 studies) or about a specified negative topic such as an experienced peer problem or ongoing physical illness (6 studies). The remaining two studies used other writing instructions that did not focus solely on negative experiences: One study asked students to write about both positive and negative aspects of school participation (Joncas, 2006) and the other asked students to write about hobbies or a vacation, which could be either positive or negative (Wisinger, 2011). Sensitivity analyses indicated that these studies did not significantly influence average effect sizes, and they were included in the meta-analysis.

3.2.3. Research design variables

3.2.3.1. Type of assignment and control condition. All 21 studies were randomized controlled trials. Fourteen studies used neutral writing as the control condition and seven studies used a no-writing control condition (i.e., assessment-only).

3.2.3.2. Timing of final follow-up assessments. Post-writing assessments were obtained one month or less following the writing in eight studies, 1–2 months following the writing in six studies, and more than two months post-writing in seven studies.

3.2.3.3. Sample attrition. The attrition rate from pre- to post-test was 0–22% across studies; ≤10% in nearly half the studies (11 studies) and between 11 and 22% in the other half (10 studies).

3.3. Effects of EW on well-being, school achievement, and health outcomes

As described above, the effects of EW were examined for eight outcome domains: Problem Behavior, Internalizing Problems, Personal Adjustment, Social Adjustment, School Performance, School Participation, Somatic Complaints, and Medical Visits. Effect sizes and heterogeneity scores were calculated within each outcome domain and across outcome domains (i.e., the overall effect) (see Table 3). In seven studies the effect size was missing and assumed as equal to zero; these studies were considered as potential outliers to be tested through sensitivity analysis (Evans, 2000; Gallant & Lafreniere, 2003; Joncas, 2006; O'Heeron, 1993; Ramirez & Beilock, 2011; Reynolds et al., 2000; Stice, Shaw, Burton, & Wade, 2006).

The overall adjusted effect size was positive in direction but relatively small ($g = 0.127$, $p < .01$). The effects for the individual domains of Problem Behavior, Internalizing Problems, Social Adjustment, and School Participation were significant but small (g's were 0.131, 0.107, 0.154, and 0.246, respectively). The funnel plot showed that the overall effect and the effects for Internalizing Problems had a potential publication bias; however, the trim and fill procedure indicated that this bias should not have affected the magnitude or direction of the effects. The effects for Problem Behavior, Social Adjustment, and School Participation showed a little heterogeneity ($I^2 > 0\%$), but sensitivity analysis revealed that this heterogeneity derived from two studies with missing effect sizes that were assumed as zero (Reynolds et al., 2000; Stice, Shaw, Burton, & Wade, 2006), as well as from the single study that found the EW group had a slightly poorer adjustment than the control group (Kliewer et al., 2011). The effects of EW on the domains of School Performance, Somatic Complaints, and Medical Visits had meaningful heterogeneity. Even after sensitivity analysis, the effects for these outcomes remained heterogeneous, suggesting that they may be influenced by moderator variables. The effects of EW on Personal Adjustment were inconsistent across studies and likely to be influenced by a publication bias as suggested by the funnel plot and the trim and fill procedure (adjusted $g = -0.044$). In sum, the overall effect and the effects for half of the outcome domains showed a significant benefit of EW, although the effect sizes were small.

3.4. Moderator analyses

Because the effects for the domains of School Performance, Somatic Complaints, and Medical Visits remained heterogeneous after sensitivity analyses, we conducted more in-depth analyses testing moderational effects. The potential moderators included the three sets of participant, intervention, and research design variables. Because there were few studies (6–9) within each outcome domain and, in some cases, the moderator variables overlapped (that is the categories of one moderator variables were confounded with those of another one), it was impossible to discriminate the moderational effect of each variable individually. In those cases, analyses of individual moderators were not performed. Significant results for moderator variables were found for the outcome variables of School Performance and Somatic Complaints. These moderator effects will be detailed next. For the outcome of Medical Visits, no putative moderator variable showed a significant moderational effect.

Table 3
Outcome categories, number of studies, mean effect sizes, and heterogeneity (Q_{df}, I^2).

Outcome category	Number of studies [a]	Mean effect size	95% CI	Q_{df}	I^2
Overall effect	24	0.127***	0.051–0.203	$Q_{23} = 16.165$	0.000
		(0.152****)[b]	(0.071–0.234)[b]	($Q_{24} = 25.057$)[b]	(8.210)[b]
Problem Behavior	7	0.131*	−0.012–0.273	$Q_5 = 5.655$	11.585
Internalizing Problems	20	0.107**	0.024–0.191	$Q_{18} = 12.660$	0.000
Personal Adjustment	7	0.019	−0.141–0.179	$Q_6 = 4.374$	0.000
Social Adjustment	5	0.154**	0.003–0.305	$Q_4 = 4.301$	7.000
School Performance	6	0.024	−0.156–0.203	$Q_5 = 5.346$	6.467
School Participation	6	0.246***	0.083–0.408	$Q_5 = 5.098$	1.927
Somatic Complaints	9	0.320***	0.124–0.517	$Q_8 = 13.794$*	42.005
		(0.436***)[b]	(0.128–0.743)[b]	($Q_8 = 34.102$)****[b]	(76.541)[b]
Medical Visits	5	0.134*	−0.008–0.275	$Q_4 = 5.622$	28.845
		(0.183)[b]	(−0.071–0.437)[b]	($Q_4 = 17.313$)**[b]	(76.896)[b]

[a] Independent subgroups within the same study were counted as different studies.
[b] Values before the adjustment of extreme effect sizes.
* $p < .10$.
** $p < .05$.
*** $p < .01$.
**** $p < .001$.

Table 4
Moderator analyses of participant variables.

Moderators and categories	School performance		Somatic complaints		Medical visits	
	$Q_{df\ between}$	Hedges' g	$Q_{df\ between}$	Hedges' g	$Q_{df\ between}$	Hedges' g
Age (as categorical)	–	–	–	–	–	–
0 = 10–13 years	–	–	–	–	–	–
1 = 14–18 years	–	–	–	–	–	–
Age (as continuous)	$Q_1 = 0.109$	$\beta = -0.038$	$Q_1 = 2.524$	$\beta = 0.072$	$Q_1 = 0.460$	$\beta = -0.028$
Gender	$Q_1 = 0.074$		$Q_1 = 1.023$		–	–
0 = males less than or equal to 50%	n = 4	0.060	n = 6	0.399***	–	–
1 = males more than 50%	n = 2	−0.017	n = 3	0.186	–	–
Gender (as continuous)	$Q_1 = 0.173$	$\beta = 0.005$	$Q_1 = 0.179$	$\beta = -0.005$	$Q_1 = 0.467$	$\beta = -0.002$
Risk status	$Q_1 = 2.789$*		$Q_2 = 0.816$		$Q_1 = 0.043$	
0 = healthy participants	n = 3	−0.063	n = 4	0.293**	n = 2	0.092
1 = participants at risk for psychological problems	n = 3	0.267	n = 2	0.528**	n = 2	0.149*
2 = participants at risk for physical illness	–	–	n = 2	0.288	–	–
3 = participants at risk for contextual factors (e.g. children of alcoholics)	–	–	–	–	–	–

Note. Q values indicate whether the comparison of subgroups is statistically significant.
* $p < .10$.
** $p < .05$.
*** $p < .01$.

3.4.1. Participant variables

As shown in Table 4, the risk status of participants was modestly related to the effects of the intervention on School Performance ($p < .10$). Studies with participants at risk for psychological problems had a positive mean effect size ($g = 0.267$, $n = 3$), whereas studies with healthy participants had a negative mean effect size ($g = -0.063$, $n = 3$). Participants' age showed a positive trend on one outcome: The effects of EW on Somatic Complaints slightly improved as age increased ($\beta = 0.072$, $p = .11$, $n = 9$).

3.4.2. Intervention variables

As shown in Table 5, two intervention variables, i.e., number of sessions and spacing of sessions, had significant effects in the outcome domain of Somatic Complaints. Interventions with more than three sessions had a larger mean effect size ($g = 0.722$, $n = 2$) than interventions with a maximum of three sessions ($g = 0.181$, $n = 7$). Further, interventions with writing sessions spaced more than one day apart had a larger mean effect size ($g = 0.589$, $n = 3$) than interventions with sessions on consecutive days ($g = 0.172$, $n = 6$).

3.4.3. Research design variables

As shown in Table 6, the type of control condition, the timing of follow-up, and the attrition rate had significant moderational effects on the outcome domain of Somatic Complaints. Studies that provided an assessment-only control condition had a larger mean effect size ($g = 0.535$, $n = 4$) than studies with a neutral writing control condition ($g = 0.122$, $n = 5$). Studies with a longer-term follow-up (more than 2 months) had a larger mean effect size ($g = 0.590$, $n = 3$) than studies with a shorter follow-up (1–2 months) ($g = 0.191$, $n = 5$). However, sensitivity analysis with meta-regression failed to detect a significant relation between the timing of the follow-up in a continuous format and the effect sizes. Finally, studies with a low attrition rate (≤10%) had a larger mean effect size ($g = 0.374$, $n = 5$) than studies with a higher attrition rate (11–20%) ($g = 0.115$, $n = 4$); in this case as well, however, meta-regression with the continuous variable did not replicate this finding.

4. Discussion

This meta-analysis examined whether written emotional disclosure is an effective treatment for adolescents, whether particular subgroups of adolescents benefit more, and whether there are particular characteristics of the intervention that lead to better outcomes. Overall, according to Cohen's (1988) conventions, the effect of EW for adolescents was small, with an overall mean g-effect size adjusted for publication bias of 0.127 and significant and positive g-effect sizes ranging from 0.107 to 0.246 for half of the individual outcome domains (Internalizing Problems, Problem Behavior, Social Adjustment, and, to a greater extent,

Table 5
Moderator analyses of intervention variables.

Moderators and categories	School performance		Somatic complaints		Medical visits	
	$Q_{df\ between}$	Hedges' g	$Q_{df\ between}$	Hedges' g	$Q_{df\ between}$	Hedges' g
Focus of writing	$Q_1 = 0.254$		–	–	–	–
0 = generic topic	n = 3	0.002	–	–	–	–
1 = focused topic	n = 3	0.115	–	–	–	–
Number of sessions (as categorical)	–	–	$Q_1 = 8.609$***		–	–
0 = less or equal to 3 sessions	–	–	n = 7	0.181**	–	–
1 = more than 3 sessions	–	–	n = 2	0.722***	–	–
Number of sessions (as continuous)	$Q_1 = 1.948$	$\beta = -0.073$	$Q_1 = 8.609$***	$\beta = 0.271$***	–	–
Length of sessions (as categorical)	$Q_1 = 0.119$		$Q_1 = 0.008$		$Q_1 = 0.044$	
0 = less or equal to 20 min	n = 4	0.023	n = 7	0.335***	n = 3	0.142
1 = more than 20 min	n = 2	0.115	n = 2	0.267	n = 2	0.103
Length of sessions (as continuous)	$Q_1 = 0.038$	$\beta = -0.002$	$Q_1 = 0.769$	$\beta = -0.014$	$Q_1 = 0.016$	$\beta = -0.001$
Spacing of sessions	$Q_1 = 0.167$		$Q_1 = 3.046$**		$Q_1 = 0.099$	
0 = 1 day	n = 2	−0.117	n = 6	0.172**	n = 2	0.094
1 = more than 1 day	n = 2	−0.023	n = 3	0.589***	n = 3	0.151

Note. Q values indicate whether the comparison of subgroups is statistically significant.
* $p < .10$.
** $p < .05$.
*** $p < .01$.

Table 6
Moderator analyses of research design variables.

Moderators and categories	School performance		Somatic complaints		Medical visits	
	$Q_{df\ between}$	Hedges' *g*	$Q_{df\ between}$	Hedges' *g*	$Q_{df\ between}$	Hedges' *g*
Type of control condition	$Q_1 = 2.328$		$Q_1 = 7.716^{***}$		$Q_1 = 0.642$	
0 = assessment-only control condition	n = 2	−0.075	n = 4	0.535***	n = 2	0.254**
1 = neutral writing control condition	n = 4	0.196	n = 5	0.122	n = 4	0.128
Timing of follow-up (as categorical)	$Q_1 = 2.123$		$Q_1 = 5.090^{**}$		$Q_1 = 2.563$	
0 = follow-up less than or equal to 1 month	n = 3	2.275	–	–		
1 = follow-up between 1 month and 2 months	n = 2	−0.117	n = 5	0.191*	n = 2	0.109
2 = follow-up more than 2 months	–	–	n = 3	0.590***	n = 3	0.291***
Timing of follow-up (as continuous)	$Q_1 = 1.405$	$\beta = -0.001$	$Q_1 = 0.607$	$\beta = 0.002$	$Q_1 = 0.592$	$\beta = 0.000$
Attrition rate (as categorical)	–	–	$Q_1 = 2.876^{*}$ [a]		$Q_1 = 0.260$	
0 = less than or equal to 10%	–	–	n = 5	0.374*** [a]	n = 2	0.102
1 = more than 10%	–	–	n = 4	0.115 [a]	n = 4	0.195*
Attrition rate (as continuous)	$Q_1 = 1.234$	$\beta = -0.011$	$Q_1 = 0.015$	$\beta = 0.003$	$Q_1 = 1.138$	$\beta = -0.011$

Note. *Q* values indicate whether the comparison of subgroups is statistically significant.
[a] Fixed-effects model.
* $p < .10$.
** $p < .05$.
*** $p < .01$

School Participation). This overall effect size was smaller than that obtained in several meta-analyses of the effects of EW among adults, which range from 0.15 to 0.47 (Frattaroli, 2006; Frisina et al., 2004, 2005; Harris, 2006; Meads & Nouwen, 2005; Smyth, 1998). Comparisons with effect sizes in similar research may be useful to understand this finding. For example, in a meta-analysis of 121 youth prevention programs for aggressive behavior (Wilson & Lipsey, 2007), an effect size of 0.20 was reported. A meta-analysis of 32 depression prevention programs for children and adolescents (Stice, Shaw, Bohon, & Marti, 2009) reported an average effect size of $r = .11$, which is a small effect. As these interventions were complex, finding similar or smaller effects of a brief and easy-to-implement intervention such as EW should be considered meaningful.

There were few significant moderator effects, and the size and nature of the moderator effects varied across outcome domains. For example, for the outcome of School Performance, effect sizes were positive for students at risk for psychological problems and negative (or absent) for students not at risk. For Somatic Complaints, the effect sizes were larger with a greater number of writing sessions, when the writing sessions were not on sequential days, and, marginally, when participants' age increased. Thus, the findings from this meta-analysis provide only partial support that written emotional disclosure may be an effective intervention for adolescents in general.

4.1. Who may benefit more from EW?

EW may be more helpful for adolescents at risk for psychological problems, although the evidence found here is not strong. Students with high levels of emotional problems had larger positive outcomes in the domain of School Performance; effects were absent or even negative for students in good mental health at baseline. Those studies included adolescents with high test-anxiety (Ramirez & Beilock, 2011), risk of school dropout (O'Heeron, 1993), and learning difficulties (Evans, 2000). Mirroring this, EW was more effective for these students in outcome domains that involved emotions directly – such as Internalizing Problems or Problem Behavior, or indirectly – such as Social Adjustment or School Participation.

One can conclude, then, that EW may be particularly useful in the school domain, where emotional issues affect academic performance. Through writing, youth may observe themselves regulating their feelings and increase their sense of self-efficacy (Facchin, 2010). Students with a history of academic failure might reframe the emotional context of their school problems as more controllable, leading to better academic outcomes. A series of studies by Ramirez and Beilock (2011) showed that even a single brief session of EW before an exam increased performance on the exam compared to a control group that wrote about other topics, and that the effect was even stronger for students high in test anxiety. It was interesting that EW had null and even negative effects on School Performance for those adolescents with better mental health before writing; we wonder if, for this subgroup, focusing on emotional problems may interfere with adaptive self-distancing strategies (Ayduk & Kross, 2010; Kross et al., 2011) and undermine educational ability. Future research examining this possibility is needed.

With regard to participant characteristics, gender did not moderate the effects of EW.

The differential effectiveness of EW for women and men is not consistent among adult populations (Frattaroli, 2006; Lepore et al., 2014). Further, recent research on adolescents shows that boys may have negative attitudes toward activities that are focused on the emotional expression, deeming them as unhelpful (Rose et al., 2012). Thus, EW may affect adolescents depending on attitudes they hold about emotional disclosure. Future studies should further examine this as a moderator.

We found that the effects of EW varied across the stages of adolescence, yet marginally so (Fivush et al., 2007; McLean et al., 2010). Future comparisons of the effects of EW should be based on more precise measures of cognitive development rather than chronological age.

4.2. How should one write?

Several aspects of the writing task moderated the effects of EW on our one physical health measure, Somatic Complaints. First, a greater number of writing sessions enhanced the effects of writing, confirming Frattaroli's (2006) finding for adults. Specifically, the data suggest that the effectiveness of the standard three-session protocol may not be enough of a "dose" for adolescents; perhaps, expanding the intervention by a few additional sessions will lead to the desired effects. Second, contrary to the null findings for adults, the spacing of the writing sessions was found to moderate the effects on adolescents. Having writing sessions spaced more than one day apart produced a larger positive effect than writing on consecutive days. For adults, writing on consecutive days may be adequate to process negative experiences, but for adolescents it may be necessary to increase the interval between sessions to allow time to process the feelings stirred up by the writing task, and by doing so, alternate immersion and distancing (Kross et al., 2011). Thinking repeatedly about an experience for a longer time with intervals of *not* thinking (*not* writing) about it may help youth reframe their problems and think through how to handle them without being overwhelmed by them. We suggest that researchers experiment with different types, doses, and spacing of EW to determine the best combination for optimal effects.

4.3. Does the research design affect effectiveness?

Again, our findings are limited to one outcome domain, Somatic Complaints. Both the type of control condition and the attrition rate were significant moderators: Studies with an assessment only-control condition reported a greater mean effect size than studies that used a factual (neutral) writing control condition. Frattaroli (2006) did not find this effect in her meta-analysis of emotional disclosure with adults. The mere act of writing about a stressor – even factually – for adolescents, may stir up emotional issues without allowing for resolution, meaning making, or for creating a linear narrative.

Contrasting with Frattaroli's (2006) findings with adults, we found that studies with lower attrition rates produced larger effect sizes. This could be because lower attrition indicates a greater dosage of the intervention, which was found to be relevant for adolescents. We do not know what led to higher attrition rates in these studies. One conjecture is that EW may be too painful for students with fewer psychosocial resources, leading them to drop out. It is also possible that attrition can be attributed to less sophisticated cognitive and emotional processing in adolescence leading to frustration and dropping out of the study (Fivush et al., 2007) or lower motivation (Rapp-Paglicci & Savon, 1997). Some adolescents may not be able to regulate their attention, reach habituation, or create a coherent and meaningful narrative that allows them to regulate their emotions (Alexander, 2004). Emotional regulation and meaning-making processes in youth may have an important interpersonal component and cannot be done alone (Bird & Reese, 2006; Marin, Bohanek, & Fivush, 2008; McLean & Mansfield, 2012; Peterson & Roberts, 2003). Thus, for some adolescents, the EW intervention may need to be bolstered by interpersonal support from a parent, teacher, or counselor who can help the adolescent "finish" the narrative and make meaning of parts of the narrative that do not fit the adolescent's world view. However, our data cannot support this supposition directly and we urge caution in implementing it.

4.4. Limitations

Although the publication bias and sensitivity analyses allowed us to estimate the reliability of results, the lack of significance for some heterogeneity analyses may be a result of low statistical power, giving an impression that there was substantial homogeneity among the effect sizes. We could examine only a limited number of moderator variables to explain this heterogeneity and, thus, moderational analyses may be underpowered to detect small effect sizes. Further, most moderators were included in only one or two studies. For some moderators, such as the timing of follow-up and attrition rate, the findings were not replicated through meta-regression. Because the analyses were performed using a univariate approach, the correlation between moderators could not be controlled, resulting in a partial overlap of the effects reported. Moreover, the broad variation in those studies with at-risk students in terms of risk type precluded us from examining whether EW is more effective for particular subgroups on particular outcomes with particular instructions.

Finally, some issues arise from our operationalization of the outcome and moderator variables. First, given the heterogeneity of the studies included in the meta-analysis, some of the moderators (e.g., risk status) and outcome categories are quite broad and analyses may have failed to detect subtle differences. Second, as noted above, using age as a proxy for cognitive development has limitations. None of the studies included measures of cognitive development, and adolescents of the same age may vary considerably in their cognitive and emotional development. In light of these limitations, the moderational results must be taken with caution and should be considered as a basis for future investigations.

4.5. Conclusions

The mixed effects of expressive writing in this meta-analysis make it difficult to yield clear conclusions about its overall effectiveness for adolescents. Our findings suggest that EW may have significant albeit small effects in reducing Internalizing Problems, Problem Behaviors, and Somatic Complaints, and in improving Social Adjustment, School Participation, and School Performance. This suggests that EW is unlikely to be a broad spectrum intervention for adolescents. Rather than answering definitively the question whether or not the EW is an effective intervention for adolescents, our findings underscore the importance of examining the conditions under which EW has the most beneficial effects.

One under-appreciated aspect of EW with youth is the role of different instructions in fostering emotional processing. For example, as shown by Facchin et al. (2014), high school students who were assigned to a benefit-writing condition (i.e., writing about benefits they gained from the stressful situation) showed better outcomes in the academic domain compared with students who were given the traditional EW instructions. However, in studies with adults (e.g., Nazarian & Smyth, 2013) targeted instructions did not clearly lead to a theorized mechanism for the effects.

Finally, although our findings suggest emotional regulation as an important mediator, we cannot make conclusions about the nature of the specific processes involved (i.e., attention, habituation, and cognitive processing). Future research should continue to investigate both intra-individual and situational moderators and not assume that EW is a "one size fits all" solution. The current evidence on expressive writing as a viable intervention for adolescents is promising, but certainly not decisive.

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