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Review

Gender differences in alexithymia: Insights from an Updated Meta-Analysis

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ABSTRACT

Alexithymia refers to the difficulty in identifying and communicating feelings. The only published meta-analysis on gender differences in alexithymia is based on studies at least 20 years old. However, due to changes in gender roles in recent decades, reviewing the updated literature on this topic is needed. A meta-analysis was conducted to examine gender differences in alexithymia and its dimensions between the years 2004 and 2023. In sum, 120 studies with 145 samples ($N = 88{,}721$; $M_{age} = 33.81$ and $SD_{age} = 3$; 47.6 % of women) met the inclusion criteria. Results revealed a significant and small effect of gender differences in alexithymia ($d = 0.22$; 95 % CI [0.20, 0.24]), as well as in its two dimensions: difficulties in identifying and differentiating feeling from bodily sensations ($d = -0.24$; 95 % CI [0.20, 0.28]) and difficulties in describing feelings to others ($d = 0.26$; 95 % CI [0.20, 0.30]). A medium and statistically significant effect size was only observed in externally oriented thinking ($d = 0.49$; 95 % CI [0.41, 0.58]). Age-related and some cultural aspects were relevant moderators in explaining gender differences in alexithymia. The results are discussed in light of theoretical and practical implications.

1. Introduction

Alexithymia refers to a deficit in the recognition and communication of feelings (Bagby et al., 1994; Nemiah & Sifneos, 1970). Over the past decades, the subject of alexithymia has experienced a proliferation of studies that have sought to explore its behavioral, linguistic, physiological, and neurological correlates, as well as the design and validation of tools for its assessment (e.g., Bagby et al., 1994; Schroeders et al., 2022).

One aspect that has received considerable attention within this field is the study of gender[1] differences in alexithymia. Nevertheless, there are still gaps in the systematization of the results. The only meta-analysis conducted to date on gender differences in alexithymia (Levant et al., 2009) included studies published up to 2004; since then, relevant societal changes in the understanding of gender roles may have occurred (United Nations Development Programme, 2023). Nowadays, a considerable amount of research continues to find higher levels of alexithymia in men compared to women (e.g., Remondi et al., 2020; Spinelli et al., 2018). Such studies also note relevant aspects that could explain gender differences in alexithymia, such as age (e.g., di Nicola et al., 2017; Moriguchi et al., 2007) or culture (e.g., Besharat, 2007; Páez et al., 1999). Consequently, one might ask whether the differences between men and women today in alexithymia have undergone any transformation from the emotional prescriptive norms of the late 20th; in other words, whether the results obtained regarding the magnitude of gender differences in Levant et al.'s (2009) meta-analysis (Hedges' $d = 0.22$) can be generalizable to the current times (i.e., early 21st century). This is not a trivial issue, because updating knowledge in this area is relevant for professionals working with people with this type of emotional difficulties, associated with various psychological problems: autism spectrum disorder (Kinnaird et al., 2019), eating disorders (Minnich et al., 2017), substance abuse (Honkalampi et al., 2022) and depression (Sfeir et al., 2020).

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[1] According to APA (2013): "Gender refers to the attitudes, feelings, and behaviors that a given culture associates with a person's biological sex. Gender is a social construct and a social identity. Use the term 'gender ' when referring to people' as social groups ".

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1.1. Alexithymia: conceptualization and measures

The term "alexithymia", first coined by Sifneos (1973), has Greek origin; it combines the prefix "*a*" (without) with the words "*lexis*" (words) and "*thymos*" (emotions). It refers to a relatively stable personality trait (Kekkonen et al., 2021) defined by: (1) difficulties in identifying and distinguishing between feelings and bodily sensations (DIF); (2) difficulties in describing and communicating feelings to others (DDF); (3) a concrete and externally oriented style of thinking, i.e., a cognitive style characterized by a tendency to concentrate more on the external world and avoid anything related to internal states (EOT); and, (4) restriction of imaginary life, fantasy and dreams (Nemiah & Sifneos, 1970; Sifneos, 1973; Taylor et al., 1997). Individuals with high levels of alexithymia struggle to regulate their emotions (Taylor, 2000; Thorberg et al., 2016), to show empathy (Grynberg et al., 2010), to establish healthy and close bonds (Vanheule et al., 2007), and are more prone to engage in aggressive behavior (Sfeir et al., 2020).

The measurement of alexithymia has also evolved (Taylor, 2004). A number of standardized measures have been developed, and have subsequently been validated in different contexts and languages (e.g., Emotional Experience Questionnaire by Sifneos, 1973; Toronto Alexithymia Scale or TAS-26 by Taylor et al., 1985; or Toronto Structured Interview for Alexithymia-TSIA by Bagby et al., 2006; Perth Alexithymia Questionnaire by Preece et al., 2017). All in all, the TAS-20, along with its dimensions, is the most popular and widely used tool, being considered one of the most highly regarded scale measures given its high validity and reliability (Bagby et al., 2020).

Regarding its prevalence, people with elevated levels of alexithymia, i.e. those scoring ≥61 on the Toronto Alexithymia Scale (Bagby et al., 1994) range from 8 % to 30 % in community samples including diverse cultural groups, including African-Islamic (Hamaideh, 2017), Protestant Europe (Karukivi et al., 2010) and English speaking (McGillivray et al., 2017) regions. Furthermore, as previously noted, high alexithymia scores are more frequent in men (7.8 % - 16.6 %) than in women (4.4 % - 9.6 %; e.g., Honkalampi et al., 2000; Horwitz et al., 2015). However, in clinical populations, the prevalence is significantly higher compared to community samples, reaching as high as 70 % (e.g., McGillivray et al., 2017; Thorberg et al., 2009).

1.2. Gender differences in alexithymia

One of the most widely accepted hypotheses to elucidate the origin of gender differences in alexithymia has been the traditional masculinity ideology hypothesis (Levant, 1992), which, in turn, converges with social learning theory (Kirmayer & Robbins, 1993). It refers to certain attitudes, behaviors, feelings, and thoughts that men must incorporate to be socially accepted. In detail, this hypothesis posits that differential gender socialization encourages women to be more emotionally expressive and to communicate their emotions and feelings to others more often and more clearly (Rimé, 2009). Men, on the other hand, are more restricted in their emotional expression because of socialization and, consequently, find it more difficult to "put their feelings into words". In addition, they have a higher EOT (e.g., Patwardhan et al., 2019; Thorberg et al., 2020). Restricting their emotional expression and acting against prescriptive norms would grant them a sense of power and control, whereas not doing so would place them in a position of vulnerability (Sullivan et al., 2015). In this sense, restricting emotional expression in patriarchal[2] societies may be considered an advantage in a competitive, instrumentalized, and masculinized environment and, thus, an adaptive response to that context (Levant et al., 2009).

A further explanation for gender differences in alexithymia is based on the gender socialization regarding a differential feedback about physiological responses (Prentice et al., 2022). This may be fostered by social attention derived from the social status of such cues or external attribution of physiological cues in women and men. Research (e.g., Prentice et al., 2022; Roberts & Pennebaker, 1995) suggests that, compared to women, men show a higher rate of correspondence between objective and subjective physiological indices (e.g., self-reports). This means that how men and women are socialized in relation to gender expectations and social norms could influence how they interpret their physiological and emotional responses. That is, a circular feedback would be generated between physiological and social cues, as derived from research suggesting that women exhibit higher DIF scores than men (e.g., Ng & Chan, 2020; Patwardhan et al., 2019).

1.3. Potential factors related to inconsistent findings on gender differences in alexithymia

The literature has identified several variables that could explain gender differences in alexithymia, such as the developmental stage of the participants, cultural values, as well as some age-related variables. In the following section, the main factors related to gender differences in alexithymia are discussed.

1.3.1. Age and developmental stage

Age and developmental stage play a role in the patterns of gender differences observed in alexithymia scores. The magnitude of gender differences is smaller during adolescence (e.g., Pascual et al., 2012), with girls scoring somewhat higher on alexithymia than boys, compared to later developmental stages. These differences reverse as adulthood progresses, with men scoring higher than women (e.g., Remondi et al., 2020; Spinelli et al., 2018), and, in older age, no statistically significant gender differences are found in the literature (e.g., Mattila et al., 2006).

1.3.2. Culture

Based on our observations, few previous research studies included a cross-cultural analysis of gender differences in alexithymia, except for a few notable exceptions (e.g., Besharat, 2007; Páez et al., 2000; Ryder et al., 2018). Cross-cultural research commonly used Hofstede Insights (2020) and Inglehart and Welzel's (2005) geographical cultural regions perspectives.

First, regarding "masculinity-femininity" cultural dimension (Hofstede et al., 2010), in countries of high masculinity, men are more alexithymic than women (Páez et al., 2000; Remondi et al., 2020). Previous research (e.g., Páez & Vergara, 1995; Remondi et al., 2020) observed that men show lower alexithymia scores in feminine countries, compared to their counterparts in masculine cultures. Overall, the differences in alexithymia are small in both masculine (e.g., Spinelli et al., 2018) and feminine countries (e.g., Pascual et al., 2012). However, it appears that cultures with a more feminine orientation tend to report larger gender differences (Páez & Vergara, 1995; Remondi et al., 2020). Furthermore, research examining the cultural dimension of "individualism-collectivism" (Hofstede et al., 2010) suggests that in collectivist societies (e.g., Iran), women tend to show score higher than men on DDF (e.g., Yavuz et al., 2020); in individualistic cultures, conversely, men scored higher on alexithymia than women (e.g., Remondi et al., 2020). Regarding the magnitude of gender differences, these differences tend to be greater in individualistic (e.g., Remondi et al., 2020; Thorberg et al., 2020), as opposed to in collectivistic countries (e.g., Yavuz et al., 2019). Finally, the magnitude of gender differences in high-power distance cultures is not statistically significant (e.g., Yavuz et al., 2019). In low-power distance cultures, the magnitude of the differences is small (de Schutter et al., 2016; Levant & Wong, 2013), with men exhibiting more alexithymic traits (Bowling & Banissy, 2017).

Regarding the cultural categorization proposed by Inglehart and Welzel (2005), there is a lack of prior research examining gender differences in alexithymia based on these regions. The few studies

[2] Patriarchal "refers to "a system of political, social, and economic relations and institutions structured around the gender inequality of socially defined men and women" (Kitchin & Thrift, 2010).

conducting cross-country comparisons did not find significant gender differences in alexithymia(Mamatova & Wille, 2012; Martínez-Sánchez et al., 2013). However, given the importance of mapping potential cultural differences across regions, this exploratory analysis was undertaken. Specifically, the classification is based on the Inglehart-Welzel cultural map of the world, which is a scatter plot derived from the World Values Survey (Haerpfer et al., 2022) and European Values Survey. This map categorizes countries into distinct areas based on closely interrelated cultural values that vary across societies along two key dimensions: traditional versus secular-rational values on the vertical axis, and survival versus self-expression values on the horizontal axis. It implies nine clusters: Anglophone, Latin American, European Catholic, European Protestant, Afro-Islamic, Baltic, South Asian, Orthodox, and Confucian groups.

1.4. Aim of the study

This study will carry out a meta-analytic synthesis of gender differences in alexithymia, as well as in three main dimensions, widely assessed: DIF, DDF, and EOT. It also seeks to explain the heterogeneity of these differences by exploring several moderators: a result of differential gender socialization (Prentice et al., 2022). This is consistent with age-related variables (age, developmental stage), three cultural dimensions of Hofstede et al. (2010) ("masculinity-femininity", "individualism-collectivism" and "high-low power distance", cultural regions of Inglehart and Welzel (2005) and research language, and study-specific aspects (percentage of women, publication year, study design). We hope to present an updated meta-analysis on gender differences in alexithymia, as well as to explore the role of age-related factors, some of the most relevant cultural moderators, and study-specific aspects.

2. Method

2.1. Databases and bibliographic search strategy

The present meta-analysis was conducted according to the guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement (Page et al., 2021) and the Meta-Analysis Reporting Standards (MARS) checklist of recommended methods (American Psychological Association, 2008).[3] The systematic search was conducted in September 2023 in the following electronic databases: Scopus, Web of Science, APA PsycInfo, APA PsycArticles, Pubmed, Google Scholar, Dialnet, PsyArxiv, and Research Square. For this purpose, the combination of the terms "Alexithymia", "TAS-20", "TSIA", "Rorschach Alexithymia Scale", "Observer Alexithymia Scale", "Bermond-Vorst Alexithymia Questionnaire", "BVAQ", "BIQ", "Beth Israel H"; "Perth Alexithymia Questionnaire" and "Gender" were used in the title and/or abstract of the article (see Table S1 of the Supplementary Material, SM, https://osf.io/g8mzd/?view_only=05735f562b404cb0909de4fa7510a3cc).

2.2. Inclusion criteria

Studies that met the following criteria were included in this meta-analysis: (a) they reported primary studies with quantitative data and adequate reliability indices; (b) they provided data on the direct relationship between gender and alexithymia; (c) they were published between 2004 and 2023; (d) they were published peer-reviewed articles; (e) they were written in English, Spanish, French, Portuguese, German, Italian, or Turkish; and, (f) they reported sufficient information to extract an effect size (ES) of the magnitude of the gender differences in alexithymia (i.e., mean and standard deviation, exact *p*-, *t*-, or *z*-values).

[3] This meta-analysis was pre-registered with OSF (reference *masked for review*).

2.3. Quality criteria and study selection

When selecting the studies, we established minimum quality criteria based on the sample description (i.e., defined sample including gender-specific data) and the value of the assessment instrument (i.e., validated instruments, and adequate reliability). The reliability of the studies was ensured by means of the following steps: (a) studies with alpha value lower than 0.60 were excluded. (b) If a study failed to report reliability, authors were contacted, and, in absence of reply, a validated version of the scale used in the same population (e.g., national, clinical, non-clinical, adolescent) was searched for and the reported alpha from that validation was included. Only when no data for validation was not obtained or when there was no validated version, the study was excluded.

As for exclusion criteria, studies encompassing the following criteria were excluded: (1) they did not relate gender and alexithymia; (2) they were published before 2004; (3) they only included one gender (female or male, but not both); (3) they were qualitative or theoretical, and (4) they were not journal articles (master's theses, dissertations, book chapters, etc.).

Three authors independently performed the first selection of studies by reading titles, abstracts, and keywords. Two other authors proceeded to complete the reading of the documents and agreed on the resolution of discrepancies. Finally, 120 papers presenting data from 145 samples were included (see Fig. 1).

2.4. Process and study coding

The coding of the studies was conducted using an agreed coding scheme based on Lipsey and Wilson's (2001) recommendations (Table S2, SM). Three authors documented key aspects related to the studies' characteristics, samples, and cultural dimensions.

2.5. Meta-analytic procedure

Data on gender differences in alexithymia were extracted from the statistical parameters (*M* and *SD*), the indicators of mean differences (*t or F*), and the related ES (*d* or *g*). Although we used Pearson's *r, rho* (see attenuation correction section) and Cohen's *d* as ES to report the magnitude of gender differences in alexithymia in Tables (see Table 1 and Tables S8, S9, S10, and S11), we reported and interpreted these magnitudes using Cohen's *d* along the text.

ES were adjusted for the reliability of the criterion variable (alexithymia), by dividing the direct ES of the differences (*r-s*) by the square root of the Cronbach's alpha of the criterion variable. In this way, the *rho* values (Jensen, 1998; Spearman, 1904; Trafimow, 2016) were obtained, representing a magnitude of the difference corrected for the instrument's reliability with which it was measured. In cases where reliability indices were unavailable, Cronbach's alpha from the scale's validation was used. The obtained values were used to calculate the pooled ES and finally transformed into *d* for simplified interpretation.

2.6. Statistical analyses

This work was performed using the Comprehensive Meta-Analysis software version 3.0 (CMA; Borenstein, 2022) and according to Rosenthal's (1979) suggestions and the guidelines proposed by Cumming (2013). We estimated the individual and pooled ES (*rho*, see attenuation correction section), the confidence intervals (95 % CI), and indicators of the validity of the ES (e.g., publication bias, credible interval). The pooled ES was estimated with a random-effects model (Cai & Fan, 2020). Lenhard and Lenhard's (2016) "Psychometrica" tool was used for the ES transformations (https://www.psychometrica.de/effect_size.html).

Regarding the interpretation of the magnitude of ES, we adopted the criteria proposed the following scales for *d* values (Cohen, 1988): no effect (0 to 0.10), small effect (0.10 to 0.30), intermediate effect (0.50 to

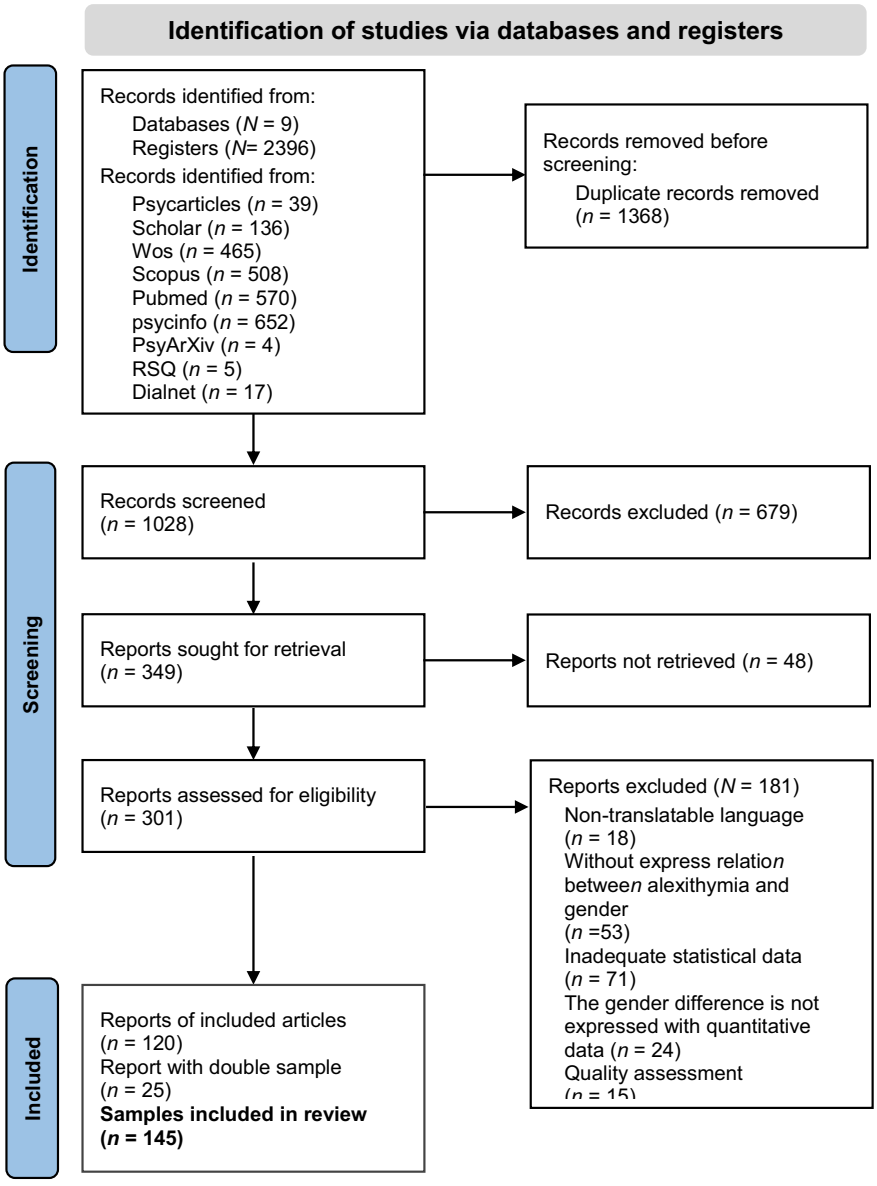

Fig. 1. The flowchart only includes database and registry searches (PRISMA 2020).

0.80), and large (0.80 to 1). Likewise, for *rho* the following criteria are established: low (≤ 0.16), medium-low (0.17 to 0.25), medium-high (0.26 to 0.37) and high (> 0.38; Gignac & Szodorai, 2016; Lipsey & Wilson, 2001). A negative value was attributed to the ES when gender differences in alexithymia indicated that women scored higher than men, whereas a positive value when ES indicated that men presented more alexithymic traits than women.

Finally, we estimated the 80 % credible interval of *rho* (Makowski et al., 2019; Riley et al., 2011). The credible interval is a range containing a particular percentage of probable values. This corresponds to a Bayesian inference that returns a value, given the observed data, of the effect of a hypothetical new study (posterior) that has an 80 % probability of falling within this range.

To explore possible publication bias, we estimated pooled ES *rho*: Egger's regression tests (Egger et al., 1997) and fail-safe *N* tests (Rosenthal, 1979). If Egger's regression tests are statistically significant, this would show an asymmetric relationship between ES and standard errors, confirming publication bias. On the other hand, the fail-safe *N* tests refer to the number of new or missing studies with a zero ES that are necessary for the *p*-value to become non-significant (robustness of the effects). Rosenthal (1979) suggests a rather conservative tolerance level, indicating that if the value of fail-safe *N* tests is $>5\,k + 10$, the observed ES is reliable.

For heterogeneity analysis, we incorporate (a) the *Q* test for heterogeneity (Cochran, 1954), (b) the I^2 statistic (Deeks et al., 2021; Higgins & Thompson, 2002); and (c) the τ^2 and SE τ^2 (Borenstein et al., 2009). When the value of *Q* is statistically significant, the distribution of ES around the mean is wider and probably heterogeneous. The I^2 statistic describes the percentage of variation between studies that is due to heterogeneity rather than change (i.e., the percentage of true variability). A percentage close to 100 % would indicate a maximum degree of heterogeneity, while values below 100 % would indicate a lower degree of heterogeneity.

2.7. Moderation analysis

For moderation analyses with categorical variables, ANOVA with post hoc comparisons were carried out: age-related aspects (developmental stage, and age group); cultural aspects (Inglehart & Welzel, 2005; Europe vs. other cultural regions) and cultural dimensions

Table 1
Average effect size (corrected for reliability) of gender differences on Alexithymia and its dimensions.

Criterion variables	N	k	Effect Size	Cred. Int.	Heterogeneity						fail-safe N analysis	Egger's regression		
			d [95 % CI] / *rho [95 % CI]*	[80 % CV]	*Q*	*(df)*	*p*	I^2	Tau^2	$\tau^2(SE)$	*n*	*Intercep*	*t(7)*	*p (two-tailed)*

Criterion variables	N	k	d [95 % CI]	rho [95 % CI]	Cred. Int. [80 % CV]	Q	(df)	p	I^2	Tau^2	$\tau^2(SE)$	fail-safe N analysis n	Egger's Intercep	Egger's t(7)	Egger's p (two-tailed)
Alexithymia	88,721	139	0.22 [0.20; 0.24]	0.11 [0.10; 0.12]	[0.02; 0.20]	585.40	138	0.000	76.4 %	0.072	0.005	6481	−0.001	0.006	0.099
DIF	60,997	81	-0.24 [0.18; 0.28]	-0.12 [0.09; 0.14]	[0.01; 0.22]	435.17	80	0.000	81.6 %	0.078	0.006	8768	1.421	3.568	0.000
DDF	58,556	65	0.26 [0.20; 0.30]	0.13 [0.10; 0.15]	[0.00; 0.22]	502.67	64	0.000	87.2 %	0.089	0.008	1279	−0.320	0.538	0.592
EOT	40,320	41	0.49 [0.41; 0.58]	0.24 [0.20; 0.28]	[−0.02; 0.25]	518.12	40	0.000	92.2 %	0.110	0.010	6323	−1.048	1.166	0.250

Note. *DIF* = Difficulty Identifying and distinguishing between Feelings and bodily sensations; *DDF* = Difficulty Describing Feelings and verbalizing them to others; *EOT* = Externally Oriented Thinking; *rho*: effect size with a correction for reliability.

(categorized indicators of masculinity-femininity, individualism-collectivism and low-high power distance; Hofstede Insights, 2020), and study aspects (study design, language of alexithymia scale, and decade of publication). For continuous covariables (i.e., age mean, women percentage, publication year, and continuous indicators of masculinity-femininity, individualism-collectivism and low-high power distance), meta-regression models with a predictor (independent effect) were estimated.

3. Results

3.1. Descriptive data

Regarding the included studies: (a) 82.8 % of the samples consisted of participants over 18 years old (M_{age} = 33,81 and SD_{age} = 3) and there were no samples of children under 11 years old; b) geographically, 62.1 % of the studies were conducted with European participants, 25.4 % with Asian and Oceanic participants, and 9.7 % with North American participants. The most commonly used instrument to measure alexithymia was the TAS-20 (91 %), followed by a small number of studies using the TAS-26 (2.8 %) or other instruments (6.2 %). The instruments were administered in various languages, the most notables being English (28.3 %), Italian (19.3 %), French (10.3 %), Finnish (8.3 %), Turkish (6.2 %), Japanese (4.2 %); Korean (4.2 %), and Spanish (4.8 %) (for more information, see Table S2 in the Supplementary Materials). The descriptions of the individual studies included in this meta-analysis are presented in the Supplementary Materials (Table S3).

3.2. General analyses

In relation to total alexithymia, the results indicate that 51.1 % (k = 71) of studies reported that men had higher scores in alexithymia than women, 48.2 % (k = 67) of these showed that were women who scored higher, and 0.7 % (k = 1) reported no differences (d = 0). When comparing the magnitudes of gender differences in studies where men scored higher (d = 0.24; 95 % *CI* [0.20, 0.28]) with those where women scored higher (d = 0.20, 95 % CI [0.16, 0.26]), the contrast of differences was not statistically significant [Q(2) = 4.88, p = .087].

Similarly, adjusted pooled ES was estimated for the three dimensions of alexithymia. On the DIF dimension, the majority of studies (k = 58; 71.60 %) reported higher scores in women, compared to studies in which men scored higher (k = 21; 25.93 %) and 2.47 % (k = 2) reported no differences (d = 0). In this dimension, gender differences could be greater in those studies, where women reported higher scores (d = 0.26; 95 % CI [0.22, 0.32]), as opposed to studies where men scored higher (d = 0.16; 95 % CI [0.10, 0.24]. The differences between the comparison groups did reach significance [*Q(1)* = 4.63, p = .032].

On DDF dimension, a larger number of studies showed that men (k = 39; 60 %) scored higher than women (k = 24; 36.9 %) on DDF and 3.1 % (k = 2) reported no differences. Furthermore, the magnitude of gender differences in this dimension was greater for studies in which males scored higher, d = 0.32, 95 % *CI* [0.24, 0.38], compared to studies in which females scored higher, d = 0.18, 95 % *CI* [0.12, 0.24], with the differences between the two groups being significant [Q(1) = 7.29, p = .007].

Finally, in the EOT dimension, the magnitude of gender differences was significantly higher than in the previous dimensions: d = 0.53, 95 % CI [0.36, 0.72]. However, in this dimension, a comparison between groups was not possible, as the vast majority (k = 37; 90.2 %) reported that males scored higher than females (k = 4; 9.8 %).

3.3. Effect sizes of gender differences

In relation to the individual studies ES (d) for alexithymia and its dimensions, these ranged from 0.00 to 1.71 for alexithymia (k = 139), from 0.00 to 0.77 for DIF (k = 81), while from 0.00 to 1.07 for DDF (k =

65) and from 0.02 to 1.28 for EOT ($k = 41$). As can be seen, in the latter case, the individual studies' ES were more variable and larger (see Supplementary Tables S4, S5, S6, and S7).

Table 1 shows the results obtained for pooled ES (*rho* and *d)* as well as heterogeneity tests of the ES, fail-safe *N* tests and publication bias analyses. The model estimates yielded an adjusted pooled ES of gender differences in alexithymia, $d = 0.22$, 95 % CI [0.20, 0.24]). Similarly, adjusted pooled ES were estimated for the three dimensions of alexithymia. On DIF dimension, the magnitude of differences was small (d = -0.24, 95 % CI [0.20, 0.28]). For DDF dimension, the magnitude of gender differences was also small ($d = 0.26$, 95 % CI [0.20, 0.30]). Finally, in EOT dimension, the magnitude of gender differences was significantly higher than in the previous dimensions ($d = 0.49$ 95 % CI [0.41, 0.58]). All estimated ES reported high levels of heterogeneity.

The 80 % credible interval of the coefficient of variation for alexithymia and for each studied dimension is presented as a supplementary

Table 2
Moderators: Synthesis of the results of the analysis of variance for categorical variables and meta-regression for continuous variables.

	Post-hoc comparisons			Meta-regression		
	Age-related factors	Cultural aspects	Study-related aspects	Age-related factors	Cultural aspects	Study-related aspects
Alexithymia	no sig.	***Masculinity-Feminity*** [Q (1) = 6.20, p = .013]. Feminity (*rho* = 0.13; d = 0.26) Masculinity (*rho* = 0.09; d = 0.18)	no sig.	***Mean age*** b = 0.0019; p = .007, R^2 = 0.11	***Masculinity-Feminity*** b = −0.001, p = .003, R^2 = 0.29	no sig.
DIF	***Developmental stage*** [Q (2) = 19.87, p < .001]. Adolescents (*rho* = 0.16; d = 0.32) Young adults (*rho* =. 10; d = 0.20) Adults (*rho* = 0.05; d = 0.10) ***Age group*** [Q (1) = 6.763, p = .009]. Under 18 years (*rho* = 0.16; d = 0.32) 18 years and over (*rho* = 0.09; d = 0.18)	no sig	no sig.	***Mean age*** b = −0.002; p = .002, R^2 = 0.39		no sig.
DDF	no sig.	***Masculinity-Feminity*** [Q (1) = 12.98, p < .001]. Feminity (*rho* = 0.16; d = 0.32) Masculinity (*rho* = 0.08; d = 0.16) ***Individualism-Collectivism*** [Q (1) = 8.80, p = .003]. Individualism (*rho* = 0.085; d = 0.17) Collectivism (*rho* = 0.15; d = 0.30)	no sig.	***Mean age*** b = 0.0029; p = .009, R^2 0.25	***Masculinity-Feminity*** b = −0.0017, p = .001, R^2 = 0.52 ***Power distance*** b = 0.0024, p = .002, R^2 = 0.45	no sig.
EOT	***Developmental stage*** [Q (2) = 5.981, p = .050]. Adolescents (*rho* = 0.156; d = 0.315). Young adults (*rho* = 0.253; d = 0.523 Adults (*rho* = 0.292; d = 0.611)	***Masculinity-Feminity*** [Q (1) = 13.207, p < .001]. Feminity (*rho* = 0.30; d = 0.63) Masculinity (*rho* = 0.16; d = 0.33) ***Individualism-Collectivism*** [Q (1) = 14.036, p < .001]. Individualism (*rho* = 0.14; d = 0.28) Collectivism (*rho* = 0.28; d = 0.58)	**Publication year** [Q (1) = 10.247, p = .001]. ≤ 2012 (*rho* = 0.31; d = 0.65) ≥ 2013 (*rho* = 0.20; d = 0.40)	***Mean age*** b = 0.0043; p = .007; R^2 = 0.12	***Masculinity-Feminity*** b = −0.0048, p = .000, R^2 = 0.60 ***Power distance*** b = −0.004, p = .034, R^2 = 0.24	***% of women*** b = 0.0038, p = .004, R^2 = 0.42

Note: only those moderators that have had a significant effect are highlighted; *DIF* = Difficulty Identifying and distinguishing between Feelings and bodily sensations; *DDF* = Difficulty Describing Feelings and verbalizing them to others; Q; *EOT* = Externally Oriented Thinking; b = regression coefficient of the moderator variable; R^2 = proportion of variance accounted for by the moderator variable.

material (Table S5). Other than EOT, significant associations were found between the overall score and the remaining dimensions. Therefore, it is probable that these associations will persist in future studies. Additionally, most of these associations are anticipated to reveal gender differences in alexithymia with predominantly small or medium-low pooled ES. In addition, *N*-tests to failures yielded values above 1000 studies for both alexithymia and the dimensions. In the same way, the *p*-values of Egger's regression tests were not significant ($p > .05$), except for DIF, indicating the absence of publication bias in the analyses (see Table 1).

3.4. Moderation analyses

The results found on the heterogeneity of the pooled ES (Table 1) highlighted the need to proceed with the moderator analysis to explain or reduce the residual heterogeneity. Given the large volume of moderator analysis, we include a summary table (Table 2) with the main results.[4]

In the case of the categorical variables, ANOVAs with post hoc comparisons were carried out. In the overall alexithymia score, some cultural aspects were relevant in explaining the heterogeneity in gender differences. The masculinity-femininity category showed a higher magnitude of differences in more feminine countries and a lower difference in more masculine countries.

In the analysis of the DIF dimension, age-related factors aspects stood out, being relevant the developmental stage at the categorical level, where adolescents showed greater gender differences, young people somewhat less, and adults the least. Also, age group was a significant factor, with indicating that younger individuals (those under 18 years) experiencing higher gender differences in DIF, while differences were fewer in adulthood (18 years and over).

Regarding the DDF dimension, cultural factors emerged as significant moderators. Countries with higher levels of femininity exhibited larger gender differences, contrasting with countries characterized by higher masculinity. Additionally, collectivistic countries displayed larger differences compared to individualistic nations, while countries with lower power distance exhibited greater gender disparities in this dimension when compared to those with medium or high power distance.

Ultimately, in the EOT dimension, age-related factors emerged as noteworthy, particularly the developmental stage of participants. Adolescents exhibited fewer gender differences in EOT, while younger individuals (those under 18 years) showed somewhat greater disparities, and adults (18 years and over) displayed the most pronounced differences. Cultural factors also played a crucial role as moderators. Gender disparities were accentuated in countries characterized by higher femininity levels, collectivistic cultural orientations, and lower power distance. The decade of publication in EOT was the sole significant moderation factor, revealing higher gender differences in the decade preceding 2013 compared to the subsequent period.

Furthermore, it is noteworthy that cultural aspects derived from Inglehart and Welzel's (2005) description did not show any significant association with alexithymia or its dimensions. This may be due to a large uneven distribution of studies across regions. The created grouped categories also did not yield meaningful data —i.e., comparing Europe or Occident to other regions— (see supplementary Tables S8, S9, S10, S11).

Additionally, a random-effects meta-regression was conducted to investigate the influence of continuous moderator variables on explaining heterogeneity (independent effects). Regarding the overall alexithymia score, mean age stood out for its explanatory power, revealing that gender differences were the least pronounced during adolescence and they increased with age (this variable explained about 11 % of the variability in the differences). The cultural dimension of masculinity-femininity displayed a significant inverse relationship with gender differences, suggesting that higher levels of masculinity correlated with smaller gender differences in alexithymia. The masculinity-femininity dimension can explain about 29 % of the variability in the differences observed in alexithymia between genders. However, the remaining moderators did not yield significant results (see Table S12).

The meta-regression analysis revealed a significant relationship between mean age and DIF, specifically showing that age (assessed at the continuous level) had an impact on that dimension. The negative coefficient suggests that when individuals are younger, particularly during adolescence, the gender differences in DIF are more pronounced. As individuals move into adulthood, the differences in DIF between genders tend to decrease. Mean age can explain about 39 % of the variability in the differences between genders observed in DIF.

In relation to DDF, the mean age of the sample was a significant moderator (explaining about 25 % of the variability of the differences). Older age was associated with larger gender differences, while younger age predicted smaller gender differences in DDF. Cultural factors were particularly salient in explaining differences. The cultural aspect of masculinity-femininity (52 % of the variability) and high-low power distance demonstrated (45 % of the variability) significant explanatory power, suggesting that gender differences were more pronounced in countries characterized by more femininity and greater hierarchical structures.

In EOT analysis, mean age stood out for its explanatory magnitude of heterogeneity (12 % of the variability of the differences), indicating that, in the included studies, gender differences were the lowest in adolescence and increase with age. The cultural category of masculinity-femininity was inversely related to differences, the higher the masculinity indicator (60 % of the variability), the smaller the gender differences; likewise, power distance went in the same direction (62 % of the variability). In summary, those countries that were more feminine and with low power distance showed greater differences in alexithymia between men and women. Only in this dimension of alexithymia (i.e., EOT, see Table 2) one aspect of the study shows a significant individual effect. Specifically, the percentage of women in the sample indicates that those samples with a higher percentage of women exhibited larger gender differences (42 % of the variability).

Finally, it is worth noting that the year in which the research was published, despite being analyzed here, was not significant for alexithymia or any of its dimensions. Specific results are provided in supplementary materials (Table S12).

4. Discussion

The present study was designed to carry out an updated meta-analytic synthesis of the gender differences in alexithymia, including three dimensions (DIF, DDF, and EOT), tripling the number of including studies since Levant et al.'s (2009) previous meta-analytic efforts, which have been published in languages other than in English, and including samples collected in a number of different countries. It also sought to examine moderators related to sociodemographic, cultural, and study-specific aspects; thus, it contributes to explaining gender differences in alexithymia by giving answers to some inconsistencies found in the results of previous studies. Overall, the findings showed gender differences of small magnitude. When contrasting our results ($d = 0.22$; studies from 2004 to 2023) with Levant et al.'s (2009): $d = 0.22$; studies from 1981 to 2004), we might conclude the magnitude of gender differences in alexithymia remains relatively consistent. This is in line with the findings of other authors, such as for instance in the Finnish adult population (Hiirola et al., 2017). Their research found stable gender differences in alexithymia when comparing two decades (2011-2021). At the same time, some research in gender psychology (e.g., Croft et al., 2021)

[4] Additionally, in the SM extended tables are provided (S8, S9, S10, and S11), which report ANOVA results for alexithymia, DIF, DDF, and EOT, respectively, along with Table S12 for all meta-regression results.

suggests that, despite progress towards gender equality in some societies, gender role differences in emotional identification and expression have been insensitive to change, as they are rooted in deep-rooted social constructs.

A possible explanation of gender differences in alexithymia is the traditional masculinity hypothesis (Levant, 1992), which posits that men have been educated to focus more on material and instrumental aspects and repress those related to public emotional expression, while women have been assigned the role of caregivers and providers of emotional support (e.g., Fischer et al., 2013). Therefore, this gender-differentiated socialization could explain the differences between men and women, yet women are more skilled at identifying external emotional states (Hamaideh, 2017; Páez et al., 2000; Yavuz et al., 2020), while men find it more difficult to express their feelings (Hiirola et al., 2017; Patwardhan et al., 2019) and tend to repress internal emotional experiences by putting the cognitive focus on the exterior (Kret & de Gelder, 2012; Páez et al., 2000).

As already noted in previous research (Remondi et al., 2020; Spinelli et al., 2018), in most of the included studies, men had higher levels of alexithymia than women, being the magnitude of the differences greater in such studies. Looking at the dimensions of alexithymia, the results suggest that, while women had higher DIF (Hamaideh, 2017; Páez et al., 2000; Yavuz et al., 2020), men higher more DDF (Hiirola et al., 2017; Patwardhan et al., 2019) and showed a higher EOT (Hiirola et al., 2017; Thorberg et al., 2020; Yavuz et al., 2019). However, a significant difference in magnitude could only be found based on which gender scored higher on DIF (with women scoring higher), and on DDF (with men scoring higher).

On another issue, we observed high levels of variation among the analyzed studies due to their heterogeneity. Among the explanatory aspects and predictors of this variability, cultural indicators stand out. Several investigations have pointed out that culture is related to the emotional adjustment of individuals and to emotional identification and expression (Matsumoto et al., 2008; Páez et al., 2000). In this sense, countries with higher feminization tendencies, characterized by the promotion of emotional expression (Matsumoto et al., 2008; Páez & Vergara, 1995), showed greater gender differences in alexithymia, DDF and EOT. It is possible that in masculine countries, where such emotional expression is repressed, gender differences are reduced, applying a strongly normative emotional system (Basabe et al., 2002) that affects both genders.

Likewise, while the gender differences in alexithymia and DIF between individualistic and collectivistic countries did not reach significance and contrary to findings from earlier studies (Minnich et al., 2017; Morice-Ramat et al., 2018), there was a smaller magnitude of differences observed in individualistic countries compared to collectivistic countries in the dimensions of DDF and EOT. Some authors (e.g., Fernández et al., 2014; Guimond et al., 2007) pointed out that in individualistic cultures emotional expression would be considered a freely chosen behavior and a reflection of a person's inner personality (not so much with gender), which is positively valued in both men and women. Thus, in collectivist cultures, emotional suppression and expressive homogeneity would be more highly valued (Costa Jr. et al., 2001; Guimond et al., 2007; Ramzan & Amjad, 2017). These investigations contradict the results provided by this research given that traditionally, in collectivist countries, alexithymia traits are attributed to norms rather than to the true "expression of the person", while, on the contrary, in individualistic countries they are seen as an "expression of the person" (Costa Jr. et al., 2001).

In the third cultural dimension (i.e., high-low power distance), the results indicate that expressing feelings in the public sphere is more prominent in countries characterized by lower power distance and greater egalitarianism. In these countries, women tend to exhibit lower levels of alexithymic traits compared to countries with higher power distance. Conversely, in countries with high power distance, there is a greater acceptance of instrumental behavior and status differences, including between men and women, often accompanied by higher levels of sexism (Moya et al., 2002). Consistent with these findings, Guimond et al. (2007) found that in high power distance countries —characterized by greater hierarchical structures and control over individuals and public spaces—, gender differences in difficulties with public emotional expression are less pronounced. As our results show, in such cultures men generally experience more difficulties in communicating and paying attention to their feelings (Bowling & Banissy, 2017).

Nevertheless, when explaining gender differences in alexithymia, it is essential to take into account the interaction between the three cultural dimensions. Gender differences in alexithymia in cultures with more feminine and low power distance values are consistent with studies indicating that more egalitarian cultures show greater gender differences in self-esteem, personality, subjective well-being, depression and mental health (e.g., Peleg & Rahal, 2012). On the other hand, our results go in the partially opposite direction of studies that indicate that in collectivistic countries the results between men and women on alexithymia are similar. For example, individualistic and low power distance cultures prefer emotional expression, whereas collectivistic and high power distance cultures focus more on expressive suppression (Ramzan & Amjad, 2017). Our results, therefore, support the idea that alexithymia is associated with cultures that promote self-control and low emotional expression for both genders (Moya et al., 2002), and, consequently, that do not emphasize the identification and communication of emotion (Ryder et al., 2018).

Turning to age and developmental stages, they have been revealed as factors with the greatest explanatory power for gender differences in alexithymia: the younger the age, the smaller the magnitude of gender differences in alexithymia (e.g., Weissman et al., 2020). In contrast, the DIF dimension shows an inverse relationship, with greater gender differences in adolescence and smaller differences in adulthood, coinciding with being the dimension with the largest number of studies where alexithymia scores are higher in females. Adolescent girls experience important changes during their transition to womanhood, potentially influencing these differences (di Nicola et al., 2017; Pascual et al., 2012; Yavuz et al., 2019). High scores in adolescence may be attributed to the transitional and developmental process, including physiological and psychological changes and social difficulties (Kekkonen et al., 2021). Conversely, these high scores in adolescence are not necessarily a direct predictor of alexithymia in adulthood, given that alexithymia in adulthood is linked to deficits in emotional development processes (Thorberg et al., 2016).

Overall, the results obtained in this meta-analytic review wrap up in a consistent pattern. Therefore, we believe that the existence of more marked social norms of emotional development and expression, the lower importance given to internal life and its expression, the external attribution of emotions to role and norms rather than to personality. And, in a similar way, the low level of social comparison between sexes, tend to make men and women perceive and describe themselves more homogeneously in terms of alexithymia traits.

4.1. Limitations and future directions

This research has certain limitations that should be taken into account in future research. First, the selected studies did not provide sufficient information to calculate an average ES for the fourth dimension of the TAS-26, which refers to the restriction of imaginary life, fantasy, and dreams. Therefore, it would be of interest to include this dimension when enough data are available in the future. In addition, based on findings from previous research on other socio-demographic variables, it would be promising to explore other possible moderating variables related to personal, socioeconomic, and human development in gender differences in alexithymia in people of different cultural backgrounds (Levant & Wong, 2013), years of education (Hiirola et al., 2017), and gender identities (Kallitsounaki & Williams, 2023). Likewise, in relation to the included studies, although we examined some of their quality criteria applicable to this type of meta-analysis (i.e., involving cross-

sectional data), we did not apply a standard checklist, such as AXIS (Downes et al., 2016) because many criteria were not relevant here, or the Joanna Briggs Institute appraisal tools because, although remarkably useful when clinical studies are assessed, it lacks appropriateness for the personality studies included in this meta-analysis.

4.2. Contributions and practical implications

The present work expands and updates scientific knowledge on gender differences in alexithymia, contributing to a more rigorous and robust science. Additionally, the results of this work point out that it is essential to incorporate the gender perspective when dealing with alexithymia, its social learning component, and its transdiagnostic nature (Preece et al., 2017). Thus, the results obtained might be relevant in the fields of clinical, developmental, educational and social psychology. In this sense, it would be advisable to reflect on sociocultural learning and on the impact of the most traditional gender roles and prescriptive cultural norms for emotional expression, specifically implementing actions to counteract such traditional gender roles linked to men's emotional expression and flexibility (Croft et al., 2021). Additionally, our results contribute to build up on knowledge underlining the importance of designing prevention protocols and gender-differential treatment of mental health problems characterized by difficulties in emotional regulation –e.g., mood disorders (Comacchio et al., 2022), or eating disorders (Greenberg & Schoen, 2008)–.

In summary, our research fills a crucial gap by presenting synthesized updated findings. This quantitative review on alexithymia provides innovative evidence and relevant implications for understanding this personality trait. Furthermore, it has the potential to facilitate the development of targeted educational and therapeutic interventions tailored to the specific needs of individuals, taking into consideration their gender, developmental stage, and cultural background.

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CRediT authorship contribution statement

Jara Mendia: Conceptualization, Formal analysis, Methodology, Writing – original draft, Writing – review & editing, Investigation. **Larraitz N. Zumeta:** Conceptualization, Formal analysis, Investigation, Methodology, Writing – original draft, Writing – review & editing. **Olaia Cusi:** Conceptualization, Formal analysis, Methodology, Writing – original draft, Writing – review & editing, Investigation. **Aitziber Pascual:** Supervision, Writing – review & editing. **Itziar Alonso-Arbiol:** Supervision, Writing – review & editing. **Virginia Díaz:** Supervision, Writing – review & editing. **Darío Páez:** Supervision, Writing – review & editing.

Declaration of competing interest

None.

Data availability

All the databases used for this meta-analysis can be found in OSF: https://osf.io/g8mzd/.

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