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Review article

Defensive functioning in individuals with depressive disorders: A systematic review and meta-analysis☆

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ABSTRACT

Background: This systematic review and meta-analysis aimed to address the limited generalizability of studies on defense mechanisms in depression by comparing depressive individuals with non-clinical controls (aim a) and examining changes throughout psychological interventions (aim b) (PROSPERO CRD42023442620).
Methods: We followed PRISMA 2020 guidelines, searching PubMed/Web of Science/(EBSCO)PsycINFO until 13/04/2023 for studies evaluating defense mechanisms with measures based on the hierarchical model in depressive patients versus non-clinical controls or throughout psychological intervention. We conducted random-effect meta-analyses for mature defenses/non-mature (neurotic/immature) defenses/overall defensive functioning (ODF), with standardized mean difference (SMD) as outcome measure metric. Meta-regression/sub-group/sensitivity analyses were conducted. Study quality was appraised using the Newcastle-Ottawa Scale (NOS), and certainty of evidence for aim b outcomes was evaluated using GRADE (Grading of Recommendations, Assessment, Development and Evaluations).
Results: 18 studies were included (mean NOS score = 5.56). Depressive patients used significantly more non-mature defenses than non-clinical controls (SMD = 0.74; k = 13). Non-clinical controls did not significantly differ in use of mature defenses compared to depressive patients (SMD = 0.33; k = 14). Significant moderators were publication year/NOS score/geographical distribution/mean age for non-mature defenses and NOS score/geographical distribution for mature defenses. Throughout psychological interventions, only ODF significantly increased (SMD = 0.55; k = 2) (GRADE = very low).
Limitations: Quality of many studies was medium/sub-optimal, and longitudinal studies were scarce.
Conclusion: Individuals with depressive disorders show a high use of non-mature defenses that could be assessed and targeted in psychological interventions, especially in younger patients.

1. Introduction

Defense mechanisms are primarily unconscious operations that protect individuals from negative emotions, internal conflicts, and stressful events. One of the most established frameworks in this field is the hierarchical model proposed by Vaillant (1977, 1994) and operationalized by Perry (1990). This theoretical framework was also employed by the DSM-IV Task Force (APA, 1994; Skodol and Perry, 1993) for the construction of an Axis dedicated to defensive functioning evaluation. The hierarchical model describes defense mechanisms along a *continuum* based on their *maturity/adaptiveness* level (Di Giuseppe and Perry, 2021; Perry, 1990; Vaillant, 1977). Using mature defenses – such as affiliation, self-affirmation, and anticipation - enables one to be aware of both the cognitive and emotional sides of stressful events and

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conflictual situations. On the other hand, non-mature defenses (i.e., neurotic and immature defenses, such as undoing, idealization, and splitting) imply a certain degree of unawareness (Silverman and Doorn, 2023). For instance, individuals may experience feelings of distress without being aware of the reason or recur to impulsive acts to cope with painful emotions. The *Defense Style Questionnaire* (DSQ; (Andrews et al., 1993; San Martini et al., 2004)), the *Defense Mechanism Rating Scale* (DMRS; Perry, 1990), and the Defensive Functioning Scale (DFS; American Psychiatric Association, 1994) are widely used and validated instruments based on the hierarchical model and developed for the evaluation of defense mechanisms (Soultanian et al., 2005). Empirical research has found that mature defenses are associated with measures of psychological well-being (Tanzilli et al., 2022), whereas a substantial use of neurotic and immature defenses and a reduced use of mature defenses have been linked to various mental health conditions such as depressive disorders (DDs), personality disorders or clinical high risk for psychosis (Boldrini et al., 2020; Bond and Perry, 2004; Høglend and Perry, 1998; Maffei et al., 1995) and lower psychosocial functioning, indicating they could be a target in clinical practice (Blanco et al., 2023). Particularly, a relatively large body of research has focused on DDs, underscoring the crucial role of defense mechanisms.

According to the International Classification of Disease (ICD-11; WHO, 2019) and the Diagnostic and Statistical Manual of Psychiatric Disorders (DSM-5-TR; APA, 2022a), DDs are characterized by affective, cognitive, psychomotor, and behavioral symptoms – especially depressed mood and anhedonia – and by the impairment in the individual functioning. In 2019, DDs affected 280 million people worldwide, and an increase of up to 28 % after the COVID-19 pandemic was registered (WHO, 2022). The alarming spread of depression represents a reason for concern from both healthcare and economic perspectives (Herrman et al., 2022), warranting a more refined understanding of underlying psychological dimensions.

Studies focusing on individuals with DDs highlighted differences in their defensive functioning compared with nonclinical control groups. Specifically, fewer mature defenses and more immature defenses have been observed in depressive individuals (Blaya et al., 2006; Rajewska-Rager et al., 2023; Savilahti et al., 2020), suggesting defenses could represent a possible marker of psychopathological conditions such as DDs. Furthermore, the prevalence of immature defenses in depression has been related to greater symptom severity and persistence (e.g., Corruble et al., 2004; DeFife and Hilsenroth, 2005; McMahon et al., 2005), as well as poorer treatment outcomes and reduced treatment adherence (Babl et al., 2020; Müllen et al., 1999).

Clinical and empirical literature also highlights the role of defensive functioning as a mechanism of change over the course of psychological treatments in various populations (e.g., Bond and Perry, 2004; Conversano et al., 2023; McWilliams, 2004). This is particularly important within depressed patients since psychological treatments are considered a first-line intervention for DDs according to both clinical international guidelines and meta-analytic evidence (APA, 2022b; Cuijpers et al., 2023). Also, preliminary results suggest the existence of a group of immature defenses, referred to as "depressive defenses" that are thought to play a role in depression (de Roten et al., 2021; Perry et al., 2020).

Despite there is a growing body of evidence on the role of defense mechanisms in individuals with DDs, primary studies are highly heterogeneous, limiting the generalizability of the findings. To our knowledge, the only previous meta-analysis that addressed this topic has been conducted by Calati et al. (2010). Authors have acknowledged difficulties in comparing different measures of defensive functioning assessment, and therefore only studies employing DSQ have been considered (Soultanian et al., 2005). Their findings show that fewer mature defenses and more neurotic and immature defenses were employed by depressed individuals in comparison to healthy controls and a normative sample.

However, no meta-analytic study has considered all studies adopting any measures based on the hierarchical model nor has explored changes in defenses over the course of psychological interventions in the depressed population. Moreover, an updated meta-analysis is crucial to overcome the limited generalizability of the findings deriving from the individual studies. Finally, surprisingly, no meta-analytic study has systematically appraised the quality of the individual studies in this research area.

Therefore, this systematic review and meta-analysis aims to answer the following research questions:

(a) Do mature defenses, non-mature defenses, and Overall Defensive Functioning (ODF) scores significantly differ between individuals diagnosed with DDs and nonclinical control groups (i.e., without a psychiatric diagnosis)?
(b) Do mature defenses, non-mature defenses, ODF scores change during a psychological intervention in patients diagnosed with DDs?

2. Methods

We conducted a Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA; Page et al., 2021) 2020-compliant systematic review and meta-analysis (see Supplementary Materials S1 for the compiled checklist). The study protocol was registered on PROSPERO (CRD42023442620). Deviations from the protocol are reported in Supplementary Materials S2.

2.1. Search strategy and selection criteria

We searched PubMed, EBSCO/PsycINFO, and Web of Science for peer-reviewed articles up to 13/04/2023. The search strategy is reported in the Supplementary Materials S3. Title/abstract and full-text articles were screened by two independent and blinded judges (FF and GLB). A third judge (AT) was contacted to solve disagreements. Reasons to exclude articles after full-text assessment are displayed in Supplementary Materials S4.

We included primary research studies: (a) regardless of the study design, (b) reporting on individuals with a DD diagnosis assessed with valid/reliable clinical criteria/measures, (c) assessing defense mechanisms with a measure based on the hierarchical model, (d) assessing defense mechanisms in both depressive individuals and non-clinical control group(s) (i.e., without a psychiatric diagnosis) AND/OR reporting on defense mechanisms in depressive individuals throughout a psychological intervention (defenses were assessed in at least two time-points), (e) and written in English, Italian, or French.

We excluded: (a) meta-analytic studies and reviews, proceedings, dissertations, letters to the editor, and qualitative studies, (b) studies assessing DD(s) with non-reliable/valid clinical criteria/measures, (c) studies not assessing defense mechanisms with a measure based on the hierarchical model, (d) studies not reporting on defense mechanisms in both depressive individuals and non-clinical control(s) AND not reporting on defense mechanisms in depressive individuals throughout a psychological intervention (defenses were assessed in less than two time-points), (e) studies written in languages other than English, Italian, or French. In the case of studies with overlapping samples (i.e., the same data source), the study with the largest sample size was retrieved.

2.2. Variables of interest and outcomes

We organized defense mechanisms into two broad groupings–i.e., "mature defenses" and "non-mature defenses"–allowing us to include and pool the data of relevant studies that adopted any measure based on the hierarchical model. "Mature defenses" incorporate the high-adaptive defense level of the DMRS (Perry, 1990) and DFS (American Psychiatric Association, 1994) and the adaptive defenses of the DSQ (Andrews et al., 1993). Conversely, "non-mature defenses" incorporate a broad spectrum of less adaptive defense mechanisms, encompassing obsessional,

neurotic, minor image-distorting, disavowal, major image-distorting, action defense levels/neurotic and immature defensive categories of the DMRS; mental inhibition, minor image-distorting, disavowal, major image-distorting, and action defensive functioning levels of the DFS; and neurotic and maladaptive defenses of the DSQ. We also considered the ODF when assessed in the individual studies, which provides an average score indicating the global level of maturity (Di Giuseppe and Perry, 2021).

For study goal (a), the outcome was the difference in the scores of mature defenses, non-mature defenses, and Overall Defensive Functioning (ODF) between individuals with a DD diagnosis and non-clinical control groups. For study goal (b), the outcome was the change in the scores of mature defenses, non-mature defenses, and ODF over the course of psychological intervention in patients with a DD diagnosis.

2.3. Data extraction and study quality

Data extraction was performed by two independent and blinded authors (FF and GLB). For each included study, we extracted: authors, year of publication, country, sample size (i.e., individuals with a depressive disorder, individuals without a psychiatric disorder, individuals with a DD at T0 and T1), mean age (± SD), percentage of males, name and type of the instrument used for the depressive disorder diagnosis, type of depressive disorder, type of psychological intervention, name and type of instrument used for the assessment of defensive functioning, time from assessment of defenses at T0 and assessment of defenses at T1, N of evaluations of defenses from T0 to termination of treatment, N of sessions between T0 and T1, mean scores (± SD) of defenses (e.g., either cluster, levels or single defenses) in individuals with a DD, individuals without a psychiatric disorder, individuals with a DD at T0 and T1.

In studies that reported multiple evaluations of defense mechanisms over time in depressive individuals and control groups, we extracted the data from the first evaluation. In studies that reported multiple evaluations of defense mechanisms in depressive individuals in the context of psychological intervention, we extracted the data from the first evaluation and endpoint (not follow-up).

Two authors (FF and GLB) independently performed the quality assessment evaluation, reaching a third author (AT) to solve disagreements. We adopted a modified version of the Newcastle-Ottawa Scale (NOS), a widely used tool in meta-research (Catalan et al., 2021; Solmi et al., 2023b) that provides a total score from 0 to 8, in which a higher score reflects a higher study quality.

2.4. Statistical analyses and credibility of evidence

Before running meta-analytic estimates, we computed a mean score (±SD) for mature defenses, non-mature defenses, and ODF in individuals with a depressive disorder, control groups, and individuals with a DD at T0 and T1.

Since significant heterogeneity was expected, we conducted random-effect meta-analytic estimates. For both study goals (a) and (b), the effect size measure was the Standardized Mean Difference (SMD). Heterogeneity was evaluated with I^2 and Q statistics. Publication bias was assessed by examining funnel plots, complemented by Egger's test, Kendall's Tau, and the Duval and Tweedie's trim-and-fill procedure. The results were shown in Tables and through forest plots.

Further analyses were conducted to explore the impact of moderators on the difference in defensive functioning between depressive individuals and control groups. Meta-regression analyses evaluated the influence of publication year, age, % of men, and study quality (NOS scores), while sub-group analyses evaluated the influence of geographical distribution (Western countries versus other countries). We did not explore additional moderators since they were too under-represented/heterogeneous/inconsistent. Finally, we removed the extreme values and recalculated the effect size (i.e., sensitivity analysis).

We did not explore the impact of moderators on the change of defensive functioning in depressive individuals throughout psychological intervention due to the small N of studies on the topic. Statistical analyses were conducted with Comprehensive Meta-Analysis software V. 2 (Bornstein et al., 2005), with statistical significance set to $P < 0.05$.

The evidence from meta-analytic estimates for the outcomes (b) was classified using the Grading of Recommendations, Assessment, Development and Evaluations (GRADE) framework (Schünemann et al., 2013), rating the certainty of evidence as either very low, low, moderate, or high. Methodological guidelines (Balshem et al., 2011; Guyatt et al., 2011a, 2011b, 2011c, 2011d, 2011e) and previously published research were followed (Solmi et al., 2023a). The determinants of the level of evidence were risk of bias, inconsistency, indirectness, imprecision, and publication bias. Additional details are reported in the Supplementary Materials S3.

3. Results

3.1. Study selection

We screened titles and abstracts of 3347 studies and examined 295 full-text articles. We excluded 251 articles after full-text assessment. The reasons for exclusion at the full-text level are displayed in Supplementary Materials S4. We ultimately included 18 articles in this systematic review and meta-analysis (Fig. 1). The characteristics of the studies are displayed in Table 1 and Table 2. 14 studies were included for study aim (a), and 4 studies for study aim (b). 13 studies were conducted in Western Countries and 5 studies were conducted in different geographical regions. Overall, the NOS mean score was 5.56, ranging from a minimum of 4 to a maximum of 8. NOS evaluation is reported in more details in Supplementary Materials S5.

3.2. Differences in mature defenses between non-clinical controls and depressive individuals

In this meta-analytic comparison, we examined the differences in the use of mature defenses in non-clinical controls (B) versus depressive patients (A). The forest plot is shown in Fig. 2, and Table 3 shows the main analyses, sub-group analysis, sensitivity analysis and meta-regression. Pooling data from 14 studies, the results displayed a non-significant difference between groups (SMD = 0.33, 95 % CI −0.03 to 0.70, $p = 0.07$). Heterogeneity was very high ($I^2 = 92.12$ %). This result was not affected by publication bias (Egger regression intercept = −3.47, $t = 1.17$, $p = 0.266$; Tau = −0.10, z = 0.49, $p = 0.622$). Duval and Tweedie's trim and fill method provided further support for the absence of publication bias in our data. The funnel plot is displayed in Supplementary Materials Fig. S6. Meta-regression revealed that NOS score was positively associated with the effect size (beta = 0.37, SE = 0.04, $p < 0.001$), while sub-group analysis showed a smaller effect size in studies conducted in Western countries (SMD = 0.29, 95 % CI −0.21 to 0.79, k = 10) compared to other geographical regions (SMD = 0.40, 95 % CI 0.15–0.65, k = 4) ($p = 0.001$). Other moderators did not display a significant impact. Finally, by removing the studies with extreme values and repeating the main analysis, the effect size reached statistical significance (SMD = 0.44, 95 % CI 0.31–0.57, p < 0.001)–namely, depressive patients used less mature defenses than non-clinical controls–and the heterogeneity was reduced (I^2 = 22.77 %). Meta-regression analyses are also plotted in Supplementary Materials S7.

3.3. Differences in non-mature defenses between depressive individuals and non-clinical controls

In this meta-analytic comparison, we examined the differences in the use of non-mature defenses in depressive patients (B) versus non-clinical controls (A). The forest plot is shown in Fig. 3, and Table 4 shows the main analyses, sub-group analysis, sensitivity analysis and meta-

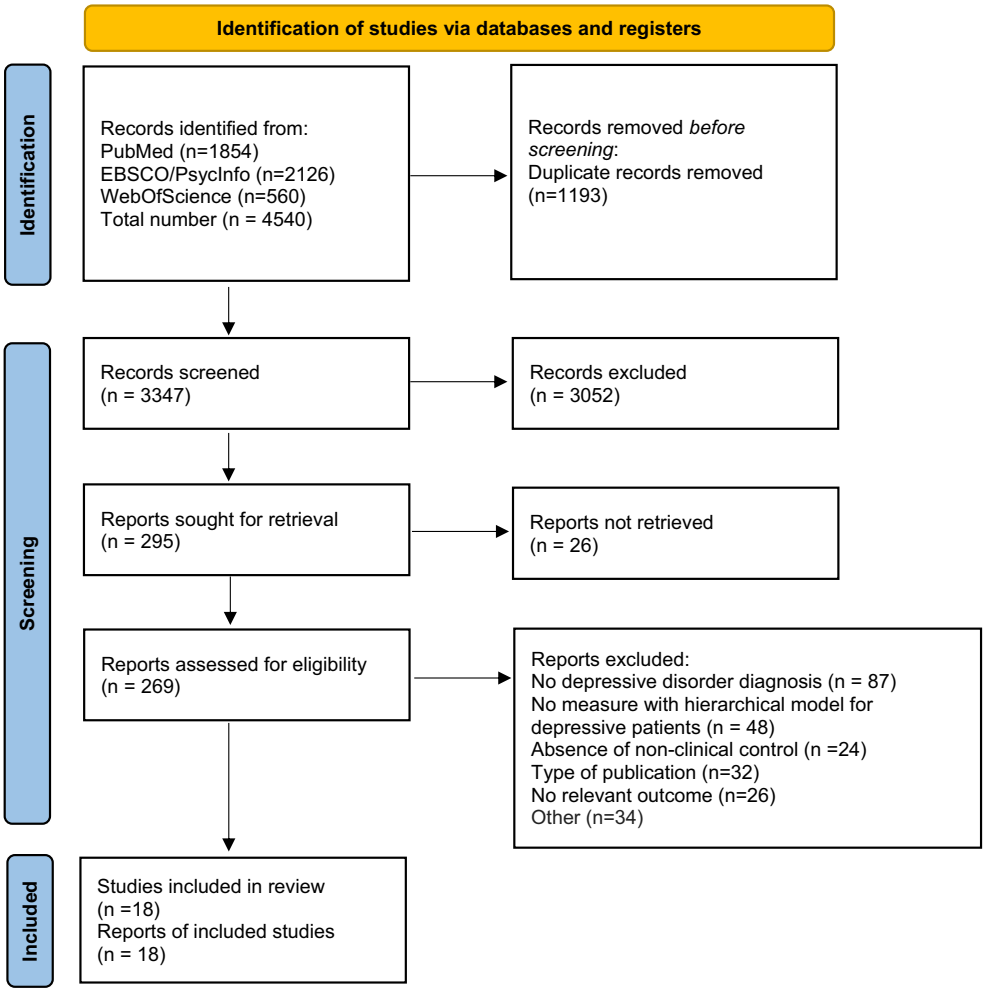

Fig. 1. PRISMA 2020 flow diagram.

regression. Pooling data from 13 studies, the results displayed a significant difference between groups (SMD = 0.74, 95 % CI 0.36–1.12, $p <$ 0.001)–namely, depressive individuals used more non-mature defenses than non-clinical controls. Heterogeneity was very high ($I^2 = 91.49$ %). This result was not affected by publication bias (Egger regression intercept = 0.95, $t = 0.31$, $p = 0.76$; Tau = 0.10, z = 0.49, $p = 0.63$). Also Duval and Tweedie's trim and fill method provided support for the absence of publication bias in our data. The funnel plot is displayed in Supplementary Materials S8. Meta-regression revealed that the year of publication (beta = 0.01, SE = 0.01, $p = 0.047$) was positively associated with the effect size, while NOS score (beta = −0.17, SE = 0.05, $p =$ 0.001) and age of participants (beta = −0.01, SE = 0.01, $p = 0.023$) were negatively associated with the effect size. Sub-group analysis revealed a larger effect size in studies conducted in Western countries (SMD = 0.77, 95 % CI 0.24–1.30, k = 9) compared to other geographical regions (SMD = 0.67, 95 % CI 0.20–1.14, k = 4) ($p < 0.001$). Other moderators did not have a significant impact. By removing the study with an extreme value, the effect size was smaller yet remained significant (SMD = 0.53, 95 % CI 0.37–0.69, $p < 0.001$), and the heterogeneity was reduced ($I^2 =$ 46.86 %). Meta-regression analyses are also plotted in Supplementary Materials S9.

3.4. Differences in ODF between non-clinical controls and depressive individuals

One study assessed ODF in non-clinical controls (B) versus depressive individuals (A) (SMD = 0.89, 95 % CI 0.24–1.54, $p = 0.007$) (Table 5).

3.5. Change of defense mechanisms in depressive individuals over psychological intervention

We examined the change of defense mechanisms throughout psychological intervention. Table 6 shows the main analyses. The use of mature defenses did not increase significantly (SMD = 1.34, 95 % CI -0.84 to 3.52, $p = 0.229$, k = 4), and the use of non-mature defenses did not decrease significantly (SMD = 0.56, 95 % CI -0.10 to 1.21, $p = 0.096$, k = 4). Heterogeneity was very high in both analyses focused on mature ($I^2 = 99.01$ %) and non-mature defenses ($I^2 = 88.10$ %). ODF increased over time, and the effect size reached statistical significance (SMD = 0.55, 95 % CI 0.20–0.90, $p = 0.002$, k = 2). The forest plots are depicted in Supplementary Materials S10. Very low certainty was found for these meta-analytic estimates (Table 6 and Supplementary Materials S11).

4. Discussion

To the best of our knowledge, the present meta-analysis is the first to comprehensively synthesize and assess existing literature on defense mechanisms, as conceptualized by the hierarchical model, in individuals with DDs (Di Giuseppe and Perry, 2021; Perry, 1990). Our work considered both mature and non-mature defenses as well as ODF. Pooling the data from the included studies, we showed the heightened use of non-mature defenses in individuals with DDs in comparison to non-psychiatric controls, whereas no significant differences were found in the use of mature defenses. Finally, we also found an improvement in the ODF level in depressive patients following a psychological

Table 1
Characteristics of included studies for aim a) of the study.

First author, year	Country	Design	Age: mean	Sex: % male	Depressive individuals sample size	Controls sample size	Depression assessment tools	Defense mechanisms assesment tools	NOS score
Blaya, 2006[1]	Brazil	Cross-sectional			28	36	MINI – Brazilian version 5.0.0 – DSM-IV	DSQ-40	6
Bram, 2018[2]	USA	Cross-sectional	46,48	0	46	47	SCID-I	DSQ-40	5.5
Colovic, 2016[3]	Serbia	Cross-sectional	34,2	28,33	30	30	SCID-I	DSQ-40	5
Kennedy, 2001[4]	USA	Cross-sectional			101	32	DSM-III-R diagnostic criteria + HAM-D	DSQ-88	6
Korkmatz, 2001[5]	Turkey	Cross-sectional	61,07	76,70	26	34	BDI	DSQ-40	4.5
McMahon, 2005[6]	Australia	Longitudinal Cohort	31,42	0	62	38	CIDI	DSQ-40	6.5
Milgrom, 2003[7]	Australia	Longitudinal Cohort	30,4	0	24	39	DSM-IV diagnostic criteria + EPDS	DSQ-40	5.5
Peng, 2023[8]	China	Cross-sectional	22,61	27,66	124	64	DSM-5	DSQ-88	5.5
Porcerelli, 2009[9]	USA	Cross-sectional	33	0	20	20	PHQ	DFS	5
Rajewska-Rager, 2023[10]	Poland	Longitudinal Cohort	19,64	21,74	52	40	K-SADS-PL/SCID	DSQ-40	5
Ruttuu, 2006[11]	Finland	Cross-sectional	16,4	18,78	211	199	GHQ-36, BDI + K-SADS-PL	DSQ-40	7.5
Sarrar, 2022[12]	Germany	Cross-sectional			29	261	PHQ-D	DSQ-22	4
Savilathi, 2020[13]	Finland	Cross-sectional			103	155	DSM-IV/K-SADS-PL	DSQ-40	8
Tabakci, 2020[14]	Turkey	Longitudinal Cohort	33,23	24	49	51	SCID-I	DSQ-40	5.5

BDI: Beck Depression Inventory; CIDI: The Composite International Diagnostic Interview; DFS: Defensive Functioning Scale; DSM: Diagnostic and Statistical Manual of Mental Disorders; DSQ: Defense Style Questionnaire; EPDS: Edinburgh Postnatal Depression Scale; GHQ: General Health Questionnaire; HAM—D: Hamilton Depression Rating Scale; ICD: International Classification of Diseases; K-SADS-PL: Schedule for Affective Disorders and Schizophrenia for School-Age Children-Present and Lifetime Version; MINI: Mini International Neuropsychiatric Interview; NOS: Newcastle-Ottawa Scale; PHQ: Patient Health Questionnaire; PHQ—D: Patient Health Questionnaire - German Version; SCID: Structured Clinical Interview.

Table 2
Characteristics of included studies for aim b) of the study.

First author and year	Country	Design	Age: mean	Sex: % male	Depressed patients sample size	Depression assessment tools	Defense mechanisms assesment tools	Psychological intervention	Number of sessions of psychological intervention: mean	NOS score
Babl, 2019[15]	Switzerland	RCT			22	ICD diagnostic criteria + SCID	DMSR	CBT + EFT/ CBT + SR	24	6
Békés, 2021[16]	USA	Longitudinal Cohort	41	37	28	HRSD-17	DMRS	CBT/ SP/ PP	33,97	5
da Silva Machado, 2023[17]	Brazil	Longitudinal Cohort			64	MINI-Plus	DSQ	SEDP/CBT	15	6,5
de Roten, 2021[18]	Switzerland	Longitudinal Cohort	44,25	34,15	41	DSM-IV diagnostic criteria + MADRS	DMRS, P-DMRS	IBPP	12	5,5

CBT: Cognitive Behavioral Therapy; DSM: Diagnostic and Statistical Manual of Mental Disorders; DMRS: Defense Mechanism Rating Scales; DSQ: Defense Style Questionnaire; EFT: Emotion Focused Therapy; IBPP: Inpatient Brief Psychodynamic Psychotherapy; HRSD: Hamilton Depression Rating Scale; ICD: International Classification of Diseases; MADRS: Montgomery–Asberg Depression Rating Scale; MINI: Mini International Neuropsychiatric Interview; MADRS: NOS: Newcastle-Ottawa Scale; P-DMRS: Psychotic-Level Defense Mechanisms Rating Scale; PP: Psychodynamic Psychotherapy; RCT: Randomized Control Trial; SCID: Structured Clinical Interview; SEDP: Supportive Expressive Dynamic Psychotherapy; SP: Supportive Psychotherapy; SR: Self Regulation.

intervention but no significant changes in the use of mature and non-mature defenses. Our findings are relevant for many reasons.

First, the current meta-analysis provides evidence of higher use of non-mature defenses (neurotic/immature) in depressive individuals in comparison with non-clinical controls and corroborates the association between depression and the use of less mature defenses (e.g., Blaya et al., 2006; Peng et al., 2023; Ruuttu et al., 2006). This finding is also in agreement with a previous meta-analysis conducted by Calati et al. (2010), who found higher use of neurotic and immature defenses in depressive individuals compared to healthy controls and a normative sample. Moreover, this result better clarifies the role of non-mature defenses in depressive individuals, especially in this field characterized by heterogenous findings (e.g., Bram et al., 2018; Korkmaz et al., 2022; Milgrom and Beatrice, 2003; Sarrar and Goth, 2022). Depressive disorders may compromise an individual's capacity to adaptively face stressful situations and painful emotions, and, conversely, a systematic reliance on non-mature defenses may reciprocally contribute to the reinforcement of psychopathological conditions and maladaptive patterns of functioning (American Psychiatric Association, 1994; Di Giuseppe and Perry, 2021; Perry, 1990).

However, it is crucial to acknowledge the high heterogeneity across studies, attributable to sample characteristics (sample sizes, mean age, sex prevalence) and to different tools employed for defense mechanisms and depression assessment. Notably, our results are influenced by different moderators that warrant further exploration. Higher study quality exhibited an association with a smaller effect size, suggesting a

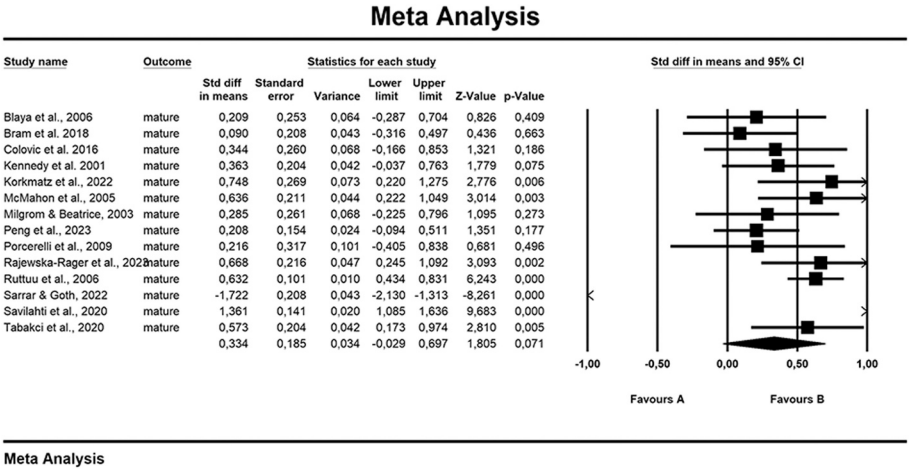

Fig. 2. Random-effect meta-analysis of differences in mature defenses between non-clinical controls (Favours B) and depressive individuals (Favours A).

Table 3
Random-effect meta-analysis of mature defenses differences in non-clinical controls versus depressive individuals, including sub-group analysis, sensitivity analysis, and meta-regression.

Main analyses	N of studies (k)	SMD	95 % CI	p	I^2	
Outcome: Differences in mature defenses	14	0.33	-0.03 to 0.70	0.07	92.12 %	Q(13) = 164.87, p < 0.001
Sub-group analysis						
1. Western countries	10	0.29	-0.21 to 0.79	0.249		Q(1) = 0.14, *p* = 0.710
2. Other countries	4	0.40	0.15–0.65	0.002		
Sensivity analysis (outliers removed)	12	0.44	0.31–0.57	<0.001	22.77 %	Q(11) = 14.24, *p* = 0.220
Meta-regression						
Moderator	K	Slope	SE	p		
1. Year of publication	14	−0.01	0.01	0.130		
2. NOS score	14	0.37	0.04	<0.001		
3. % males	10	0.00	0.00	0.242		
4. Mean age	10	−0.01	0.01	0.319		

potential overestimation in studies evaluated as of lower quality and emphasizing the need for a cautious interpretation (Funder and Ozer, 2019). Another noteworthy finding revealed that studies with a lower mean age of participants reported larger effects, underscoring the importance of assessing non-mature defenses in youths with DDs (e.g., Ruuttu et al., 2006; Sarrar and Goth, 2022) to plan psychological interventions aimed to promote adaptive responses to stressful internal or external events. The decrease in reliance on non-mature defenses over the course of adolescence and young adulthood, described by Vaillant (1977) and Cramer (1987), aligns with our findings (Di Giuseppe et al., 2019; Lingiardi and McWilliams, 2017). Moreover, Blanco et al. (2023) revealed a higher prevalence of immature defense mechanisms among younger individuals in a comprehensive study conducted on a nationally representative sample. Finally, studies conducted in Western countries exhibited a larger effect size, suggesting the potential impact of cultural aspects. For instance, cultural differences in emotion regulation strategies as well as in their expression may underpin variations in the use of defense mechanisms to face stressful situations (Lim, 2016; Matsumoto et al., 2021).

Secondly, our meta-analysis showed no significant differences in the use of mature defenses between individuals with DDs and non-psychiatric controls. Surprisingly, this finding partially challenges existing evidence derived from primary research studies (e.g., Korkmaz et al., 2022; McMahon et al., 2005; Rajewska-Rager et al., 2023; Ruuttu et al., 2006) which indicates the limited use of mature defenses in individuals with DDs. Also, in contrast with our findings, a previous meta-analysis conducted in 2010 by Calati and colleagues found higher use of mature defenses in depressive individuals compared to healthy control groups and a normative sample. Methodological differences (e.g., control groups, assessment measures) between the two meta-analytic studies may account for these discrepancies. Notably, we conducted a sensitivity analysis, removing two extreme values and re-running the main analysis. This additional scrutiny revealed a significant effect size–namely, depressive patients used less mature defenses than controls–suggesting cautious interpretations of our findings and highlighting the need for further studies to better elucidate the potential role of mature defenses in DDs.

Finally, in our meta-analyses of longitudinal studies, we found significant changes in the ODF over the course of psychological treatments in patients with DDs. It should be noted that only two studies were included in this meta-analytic estimate. Nevertheless, this result provides preliminary evidence supporting the assessment of defensive functioning in depressive patients during psychological interventions. Moreover, no changes in mature and non-mature (neurotic and immature) defenses over the course of treatments emerged. While some of the included studies suggest an increase in the employment of mature defenses (Babl et al., 2019; da Silva Machado et al., 2023; de Roten et al., 2021) and a decrease in non-mature defenses (da Silva Machado et al., 2023; de Roten et al., 2021) from baseline to the endpoint, these changes did not reach statistical significance in our meta-analytic estimates. The number of included studies (k = 4) may have impacted the statistical power of analyses, emphasizing the need for further longitudinal research in this field. With regards to aim b of the present meta-analysis, the assessment using GRADE framework revealed a very low level of certainty of evidence. This means that the real effects are likely to be substantially different from the provided estimates (Balshem et al., 2011).

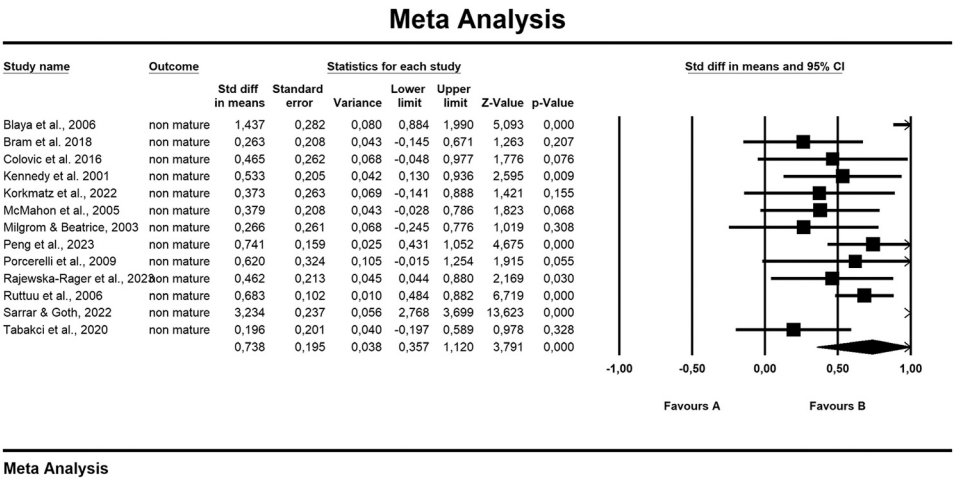

Fig. 3. Random-effect meta-analysis of differences in non-mature defenses between depressive individuals (Favours B) and non-clinical controls (Favours A).

Table 4
Random-effect meta-analysis of non-mature defenses differences in depressive individuals versus non-clinical controls, including sub-group analysis, sensitivity analysis, and meta-regression.

Main analyses	N of studies (k)	SMD	95 % CI	p	I^2	
Outcome: Differences in non-mature defenses	13	0.74	0.36–1.12	<0.001	91.49 %	Q(12) = 141.07, p < 0.001
Sub-group analysis						
1. Western countries	9	0.77	0.24–1.30	0.005		Q(1) = 0.07, *p* = 0.79
2. Other countries	4	0.67	0.20–1.14	0.005		
Sensivity analysis (outliers removed)	12	0.53	0.37–0.69	<0.001	46.86 %	
Meta-regression						
Moderator	k	Slope	SE	p		
1. Year of publication	13	0.01	0.01	0.047		
2. NOS score	13	−0.17	0.05	0.001		
3. % males	10	0.00	0.00	0.652		
4. Mean age	10	−0.01	0.01	0.023		

Note: SE = standard error; SMD = Standardized mean difference.

Table 5
Random-effect meta-analysis of ODF differences between non-clinical controls and depressive individuals.

Main analyses	N of studies (k)	SMD	95 % CI	p
Outcome: Differences in ODF	1	0.89	0.24–1.54	0.007

Note: NA = not applicable; SE = standard error; SMD = Standardized mean difference.

4.1. Limitations

This study has several limitations. First, the number of studies that assessed the changes of defense mechanisms over the course of psychological intervention is limited. Second, the quality of many primary research studies is medium or sub-optimal. Third, included studies are heterogeneous in both conceptualizations of defense mechanisms and assessment of DDs. Fourth, the inclusion of only studies written in English, Italian, and French could represent a source of bias. Fifth, the findings of the primary aim of this meta-analysis (aim a) should be interpreted cautiously given the cross-sectional design of the majority of the included studies; therefore, it is not possible to infer causal-effect relationships from these findings. Finally, this study does not provide evidence on the most effective intervention strategies to improve defensive functioning in this population, warranting future meta-analyses of randomized controlled trials comparing the efficacy of "bona fide therapies" such as psychodynamic therapies and cognitive-behavioral treatment (Cuijpers et al., 2019; Wampold et al., 1997).

5. Conclusion

This is the first meta-analytic study including all measures based on the hierarchical model of defense mechanisms in samples of individuals with DDs. We showed that depressive individuals are characterized by a high use of non-mature defenses. This result has crucial clinical implications since non-mature defense could be assessed and targeted in psychological interventions to improve the capability to cope with stressful situations in depressive patients, especially in younger ages. More high-quality studies are needed to clarify the role of mature defenses. There was an improvement in the ODF over the course of psychological intervention, with very low certainty of evidence. Future meta-analyses of randomized controlled trials are crucial to determine the most effective interventions to improve defensive functioning in individuals with DDs.

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CRediT authorship contribution statement

Flavia Fiorentino: Writing – review & editing, Writing – original draft, Methodology, Data curation, Conceptualization. **Gabriele Lo Buglio:** Writing – review & editing, Writing – original draft, Methodology, Data curation, Conceptualization. **Mara Morelli:** Writing – review & editing, Methodology, Formal analysis, Data curation. **Antonio**

Table 6
Random-effect meta-analyses of defenses changes in depressive individuals over the course of psychological intervention.

Main analyses	N of studies (k)	SMD	95 % CI	p	I^2		GRADE
Outcome: Changes of mature defenses (T1 versus T0)	4	1.34	−0.84 to 3.52	0.229	99.01 %	Q(3) = 303.76, p < 0.001	Very low
Outcome: Changes of non-mature defenses (T0 versus T1)	4	0.56	−0.10 to 1.21	0.096	88.10 %	Q(3) = 25.22, p < 0.001	Very low
Outcome: Changes of ODF (T1 versus T0)	2	0.55	0.20–0.90	0.002	0	Q(1) = 0.96, *p* = 0.327	Very low

Note: NA = not applicable; SE = standard error; SMD = Standardized mean difference.

Chirumbolo: Writing – review & editing, Methodology, Formal analysis, Data curation. **Mariagrazia Di Giuseppe:** Writing – review & editing. **Vittorio Lingiardi:** Supervision. **Annalisa Tanzilli:** Writing – review & editing, Supervision, Methodology, Conceptualization.

Declaration of competing interest

None.

Data availability

The database that originated the results is available upon reasonable request.

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None.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jad.2024.04.091.

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