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Research paper

Cyclothymic affective temperament and low positive attitude coping strategies as predictors of comorbid depressive symptomatology in adult ADHD patients

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ABSTRACT

Introduction: Attention deficit hyperactivity disorder (ADHD) in adults could be frequently underdiagnosed due to concomitant psychiatric disorders, including depressive symptomatology, which could determine inappropriate treatments. Our study aims at clinically characterizing adult ADHD with or without depressive symptomatology in order to identify the relationship with specific affective temperamental profiles and coping strategies.

Methods: A total of 225 outpatients consecutively afferent to our outpatient adult ADHD service since September 2019 were retrospectively screened for eligibility and administered Beck Depression Inventory-II (BDI-II), Coping Orientation to Problems Experienced Inventory (COPE-NV) and Temperament Evaluation of the Memphis, Pisa, Paris and San Diego (TEMPS-M).

Results: 64.7 % of patients displayed a significant comorbid depressive symptomatology. According to the multivariate linear regression model, depressive levels were positively predicted by TEMPS-M cyclothymic subscale ($B = 0.567$, $p = 0.004$) and negatively predicted by COPE-NVI "positive attitude" subscale ($B = -0.438$, $p = 0.024$) ($R = 0.496$, $R^2 = 0.246$, $F(2,66) = 10.747$, $p < 0.001$).

Limitation: While considering the results, it should be taken in consideration that: the assessment was carried out only at baseline, our sample is constituted only by adult ADHD patients and mostly without a previous ADHD diagnosis, the presence of a discrepancy between the rates of ADHD subtypes, the absence of a healthy control group and emotional dysregulation was not directly assessed.

Conclusion: Affective temperamental profiles and coping strategies could help in clinically characterizing and personalizing treatment in adult comorbid ADHD-depressive symptomatology patients. Further research is warranted to explore the efficacy of targeted psychotherapeutic and pharmacological interventions within this ADHD sub-sample.

1. Introduction

Attention Deficit Hyperactivity Disorder (ADHD) is a childhood-onset neurodevelopmental condition potentially associated with chronic impairment in nearly every domain of overall functioning (e.g. scholastic and/or work and/or social activities), including difficulties in following instructions, finalizing specific goal-oriented tasks, issues in problem solving and planification/organization of daily activities, emotional dysregulation, associated with inappropriate attentional levels and/or hyperactivity-impulsivity (APA, 2022). The typical core symptomatology may also become clinically manifest in late adolescence and/or in adulthood (Zalsman and Shilton, 2016; Adler et al., 2017). Nevertheless, there is currently only limited awareness among clinicians about the possibility to identify ADHD patients also in the late adolescence and/or adulthood, as most of them are more likely misdiagnosed or confused with other concomitant psychiatric conditions

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(Asherson et al., 2012; Ginsberg et al., 2014; Rivas-Vazquez et al., 2023). The appropriate diagnosis may be further complicated by the fact that ADHD psychopathological picture could variably manifest across different ages, based on the different levels of deficits in executive functioning and/or emotional/impulsiveness control (Salvi et al., 2019). Many studies found that symptoms of hyperactivity and impulsivity might overly decline with the age; while other studies found that, for instance, attentional deficits could maintain over the time and/or manifest in a different phenotypic clinical picture in the adulthood (Turgay et al., 2012; Kysow et al., 2017; Canela et al., 2017).

Overall, the most predominant ADHD symptomatology in adulthood consists of restlessness, impulsivity and difficulties in planning daily activities, all of which may contribute to the challenge in keeping a stable job and stable effective and/or interpersonal relationships (Kieling and Rohde, 2012; Salvi et al., 2019). Furthermore, in approximately two thirds of cases, ADHD adults may often display at least one comorbid psychiatric disorder (Kooij et al., 2012; Katzman et al., 2017; Bitter et al., 2019). Similarly, ADHD is reported in 15 % of adults affected by psychiatric disorders, such as mood and anxiety disorders, substance use disorders and personality disorders (Kooij et al., 2012; Katzman et al., 2017; Bitter et al., 2019). In adulthood, the presence of comorbid psychiatric conditions could often hide the core symptoms of ADHD and determine an underdiagnosis of ADHD which, in turns, may result in inappropriate treatments and worse outcomes (Kooij et al., 2012; Katzman et al., 2017; Bitter et al., 2019; Sandstrom et al., 2021; Choi et al., 2022). In particular, ADHD in adults has been frequently reported to be associated with an increased rate of comorbid depressive symptomatology (ranging from 20.7 % to 28 %) (Fischer et al., 2007; Yoshimasu et al., 2018; Quintero et al., 2019), despite one should also consider that ADHD and depression may share overlapping symptoms which could complicate and, hence, delay the ADHD diagnosis (Milberger et al., 1995; Riglin et al., 2021).

However, much of the literature focused on the delayed diagnosis of ADHD in adults with depression (Patros et al., 2013; Di Nicola et al., 2014; Chen et al., 2015; Purper-Ouakil et al., 2017; Sternat et al., 2018; Wang et al., 2020; Sandstrom et al., 2021; Sadeghian Nadooshan et al., 2022). Existing literature demonstrated that ADHD-depression comorbidity can adversely affect the short- and long-term outcomes, being associated with increased severity of the illness, worsen functional impairment and poorest quality of life (Matthies et al., 2018; Giupponi et al., 2018; Stickley et al., 2018; Babinski et al., 2020).

Given the paucity and heterogeneity of available literature on the topic among adult ADHD patients (Goodman and Thase, 2009; Yoshimasu et al., 2018; Salvi et al., 2019; Riglin et al., 2021; Powell et al., 2021; Babinski et al., 2020; Choi et al., 2022), particularly in naturalistic settings, our study aims to: a) perform a screening on a cohort of adult outpatients with ADHD for the presence of a clinically relevant comorbid depressive symptomatology at the baseline of their first access to our outpatient service, in order to evaluate if any association with depressive symptomatology exists depending on the early/childhood versus late/adult ADHD onset; b) identify socio-demographic and psychopathological predictors of comorbid ADHD-depression (ADHD-DEP) among adult ADHD patients, compared to the subgroup of adult ADHD patients without comorbid depression (ADHD-nonDEP). These will help us to highlight potential predictors of underdiagnosis due to a comorbid depressive symptomatology as well as to evaluate which psychopathological determinants (e.g., predominant affective temperaments, coping strategies, etc.) could indeed guide clinicians in establishing a more tailored and personalized adult ADHD treatment depending on the presence/absence of depression comorbidity.

2. Methods

2.1. Study design and participants

A naturalistic observational study was carried out by retrospectively collecting information documented from outpatients' electronic medical records (EMRs) at the Regional Outpatient Service for adult Attention Deficit Hyperactivity Disorder (adult ADHD unit), at the Unit of Clinical Psychiatry, of the University Hospital of Marche within Polytechnic University of Marche, in Ancona, Italy. All outpatients who consecutively accessed the outpatient adult ADHD unit were screened and assessed for the diagnosis of ADHD and comorbid psychiatric conditions. Outpatients are usually referred following consultation with their general medical practitioner (GP) or psychiatrists, or from the Child and Adolescent Psychiatry unit of the University Hospital of Marche (to ensure the continuity of care when they are >18-years-old). All outpatients who were afferent to our outpatient service since September 2019 were retrospectively screened for eligibility. Inclusion criteria included the following: a) age ≥18 years old at the time of the assessment; b) diagnosis of ADHD, according to the DSM-5-TR criteria (APA, 2022), by means of the digital version of DIVA 5.0 (Diagnostic Interview for ADHD in adults) (Kooij et al., 2019; Ramos-Quiroga et al., 2019); c) consent to participate in the study and written informed consent to use their data for research purposes. Exclusion criteria were: a) the lack of willingness or capacity to provide an informed consent to participate in the study; b) a diagnosis of other neurodevelopmental disorders (e.g., autism spectrum disorder), intellectual disability or mental retardation or a cognitive impairment which could influence the administration and/or full understanding of questions included in the assessment tools; c) a current and/or recent (during the last 3 months) use of alcohol and/or other substances of abuse. All recruited outpatients were asked to voluntarily provide written consent to use the clinical information collected and rating scales administered during their outpatient evaluation as standard routinary clinical practice for research purposes.

The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki and according to the guidelines for Good Clinical Practice (GCP). The institutional Ethics Committee approved the study (Prot. 142/2024). This research study was conducted retrospectively from data obtained for clinical purposes.

2.2. Evaluations

The study used EMR variables that clinicians collected within standard psychiatric clinical practice during the first visit at the outpatient adult ADHD unit. The assessment consists of two visits. During the first visit, the assessment was performed during a semi-structured clinical interview including also an ad hoc case report form (CRF) administered by an expert psychiatrist or a psychiatry resident trained to administer instruments. During the second visit, the patient was asked to fill out a set of self-report questionnaires and to complete the first evaluation (if not completed during the first visit). The CRF included socio-demographic features (i.e., age [in years], sex, ethnic, marital status, educational level [in years], psychomotor neurodevelopment, presence/absence of scholastic failures, number of scholastic failures, the need of a scholastic supporting teacher, current job status, presence/absence of current regular physical activity, family and personal psychiatry history, presence/absence of current nicotine and/or alcohol and/or other substances use) and clinical/psychopathological features (e.g., illness duration, type of ADHD, comorbid psychiatric and/or medical conditions, age of illness onset, history of legal issues related to ADHD, history of suicidality, history of sleep disorders, history of brain injuries, concomitant alcohol and/or substance use disorders). The psychiatric diagnosis was made through the MINI-5 clinical interview (Mini-International Neuropsychiatric Interview, Italian Translation, version 7.0.0) (Rossi et al., 2004; Sheehan et al., 1998) and the DIVA 5.0 (Kooij et al., 2019; Ramos-Quiroga et al., 2019). Following internal routinary assessment protocol of our outpatient service, the DIVA 5.0 interview was also completed in the presence of a partner (if any) and/or family member(s) of the patient, to enable retrospective and collateral information to be ascertained (Kooij et al., 2019; Ramos-Quiroga et al., 2019). Comorbid psychiatric conditions, including major depressive

disorder diagnosis, were also assessed by using the MINI-5 clinical interview (Rossi et al., 2004; Sheehan et al., 1998). While the assessment of personality disorders were conducted by using the SCID-5-PD screening form (First et al., 2016). Furthermore, all patients were also administered the following self-report questionnaires: Beck Depression Inventory-II (BDI-II) (Beck et al., 1996), the Coping Orientation to Problems Experienced Inventory (COPE-NV) (Carver et al., 1989) and the Temperament Evaluation of the Memphis, Pisa, Paris and San Diego (short TEMPS-M) (Fico et al., 2020).

The DIVA 5.0 is a semi-structured diagnostic interview for the assessment of ADHD in adults based on the diagnostic criteria of DSM-5-TR criteria (APA, 2022). The DIVA 5.0 consists of three parts covering the following areas: 1) ADHD symptoms in childhood and adulthood; 2) age of ADHD onset; and, 3) areas of impairment due to ADHD. Whereas three or more criteria were met for either inattention and/or hyperactivity/impulsivity in childhood before the age of 12 years old, and five or more criteria were met in adulthood as reported by the patient and collateral informant(s), a clinical diagnosis of lifetime ADHD is confirmed. The DIVA interview is also completed with collateral data, such as the patient's school reports, and conducted in the presence of a family member or a close relative, in order to better identify the presence of ADHD symptoms during childhood and the age of onset of the disorder. The DIVA was found to be a reliable diagnostic tool for clinical and research purposes (Kooij et al., 2019).

The Italian version of the BDI-II (Ghisi et al., 2006) is a 21-item self-report questionnaire assessing the severity of depressive symptomatology, asking patients to select statements that reflect how they have felt over the last 2 weeks. The Italian version displays a good internal consistency (Cronbach's α ranging from 0.80 to 0.85) and a good convergent, divergent and criterion validity (Ghisi et al., 2006). In our study, the BDI-II showed an excellent internal consistency too (Cronbach's $\alpha = 0.91$). The threshold of 14 has been used in previous studies to examine the prevalence of depressive symptomatology, as reported in a systematic review and meta-analysis (Rotenstein et al., 2016; Tam et al., 2019). Therefore, our sample was stratified in two groups, considering a score $\geq$14 to identify the presence/absence of a comorbid depressive symptomatology (ADHD-DEP versus ADHD-nonDEP).

The COPE-NVI is a 28-item self-report questionnaire designed to measure both effective and ineffective coping strategies in response to a stressful life event (Sica et al., 2008). In this questionnaire, the patient should indicate the frequency through which he/she employs a set of coping strategies during stressful/challenging events, through a 4-point Likert scale (ranging from "usually do not do it = 1" to "almost always do it = 4"). The internal structure consists of five basic scales: a) social support (referring to seeking comfort); b) avoidance strategies (denial, substance use, mental and behavioral detachment); c) positive attitude (acceptance, restraint, and positive reinterpretation); d) problem-focused orientation (active and strategic attitude); and, e) transcendent orientation (religion and absence of humor). In our study, COPE-NVI displays a good internal reliability (Cronbach's $\alpha = 0.872$).

Furthermore, all patients filled the Italian validated short version of the TEMPS-M (Fico et al., 2020), a 5-point Likert 35-items questionnaire used to assess affective temperaments as described by Akiskal (Akiskal et al., 1998; Akiskal et al., 2005), using a dimensional approach (depressive, anxious, hyperthymic, cyclothymic and irritable). TEMPS-M displays a good internal consistency (Cronbach α ranging from 0.69 to 0.84) (Fico et al., 2020), also in our study (Cronbach $\alpha = 0.89$).

2.3. Statistical analysis

Data analysis was performed using the Statistical Package for Social Science for MacOS (SPSS) Software, version 27.0.1.0. (IBM Corp., November 2021, Armonk NY). All the analyses were two-sided with α of 0.05. Descriptive statistics were performed in order to describe the socio-demographic and clinical characteristics of the sample. Clinical and socio-demographic categorical variables were summarized using frequency (N) and percentage (%). After verifying the normality distribution according to the skewness, kurtosis and the Shapiro-Wilk test, and the equality of variances by Levene test, parametric or non-parametric statistical tests were performed, when appropriate. Normally distributed continuous variables were represented using the mean and standard deviation (SD).

The total sample was initially divided in two groups, according to the total score of the BDI-II: ADHD-DEP (BDI-II $\geq$ 14) and ADHD-nonDEP (BDI-II < 14). To compare all socio-demographic and categorical variables in each group, the χ^2 Test was used. After verifying the normality and homoscedasticity of the TEMPS-M and COPE-NV distributions, one-way Analysis of Variance (ANOVA) was performed to compare these continuous variables between ADHD-DEP versus ADHD-nonDEP groups. Primary outcome consists of identifying (if any) specific affective temperaments and coping strategies could represent significant predictors of the presence of comorbid depressive symptomatology (as measured by BDI-II) within the sample of adult ADHD patients.

Multivariate linear regression models were run to investigate all psychopathological and socio-demographic variables associated with depressive symptomatology, within the sample of adult ADHD outpatients by including as independent variables all five Akiskal's affective temperaments, all coping strategies and a set of socio-demographic variables.

3. Results

3.1. Socio-demographic and clinical characteristics of the sample

A total of 225 consecutive patients attending the outpatient ADHD service since September 2019 were retrospectively screened for eligibility, of which 75.6 % (N = 170) of them were definitely recruited. Most participants were males (55.9 %; N = 95), caucasian (96.5 %; N = 164) and without a stable affective relationship (87.1 %; N = 148). Median age at the first evaluation was 24.0 (SD = 9.9, range 17 to 59). Average educational level was 12.4 (SD = 3.1). Around 28 % (N = 48) of the sample declared to have had a low scholastic performance and only 11.8 % of the sample (N = 20) declared the need of a supporting teacher when they came to obligatory school. While 34.7 % (N = 59) of the sample declared to be currently a university student while 34.1 % (N = 58) to have a stable job. Most of the sample (84.1 %; N = 143) did not report current regular physical activity. Nicotine consumption is reported in 22.4 % (N = 38) of the sample. A habitual alcohol use is described in 33.5 % (N = 57) of the sample. While 37.6 % (N = 64) of the participants displayed a previous and/or current substance use, despite only 12.9 % (N = 22) of them regularly consulted outpatient services for pathological addictions, despite they do not display a current alcohol and/or substance use. Most participants did not have a history of brain injury (93.5 %; N = 159). Most of the sample did not declare a current and/or previous legal issue (90.0 %; N = 153). A suicidality history was found only in 7.1 % (N = 12) of the sample. Around one-third of participants had concomitant sleep disorders (N = 61).

Regarding the diagnosis, most participants received a diagnosis of combined-type ADHD (57.6 %; N = 98), while 35.3 % (N = 60) of them had a diagnosis of inattentive-type ADHD and 7.1 % of hyperactive-type ADHD (N = 12). A previously diagnosed comorbid psychiatric condition was reported in around one half of the sample (50 %; N = 85) while a comorbid medical disorder was reported in 19.4 % (N = 33). Only 10.6 % (N = 18) of the ADHD sample reported a previous diagnosis of major depressive disorder (MDD) (Table 1).

3.2. Psychopathological characteristics of the sample

The mean score at BDI-II was 21.0 (SD = 12.2), without any sex-based differences (p = 0.308) and without significant differences depending on the ADHD type (p = 0.814). After stratifying the sample according to the established BDI-II cut-off, around 64 % (N = 110)

Table 1
Socio-demographic and clinical characteristics of the sample.

	Total sample	Inattentive-type ADHD	Hyperactive-type ADHD	Combined-type ADHD	p-Value
ADHD type					
Inattentive-type ADHD	60 (35.3 %)				
Hyperactive-type ADHD	12 (7.1 %)				
Combined-type ADHD	98 (57.6 %)				
Sex					
Males	95 (55.9 %)	31 (51.7 %)	9 (75.0 %)	55 (56.1 %)	$\chi^2 = 2.214$
Females	75 (44.1 %)	29 (48.3 %)	3 (25.0 %)	43 (43.9 %)	$p = 0.331$
Age (years)					
M (SD)	27.6 (10.3)	27.5 (10.0)	28.8 (11.4)	27.4 (10.5)	$p = 0.907$
Educational level (years)					
M (SD)	12.4 (3.1)	12.5 (3.2)	12.1 (3.4)	12.4 (2.9)	$p = 0.892$
Ethnicity					
Caucasian	164 (96.5 %)	57 (95.0 %)	12 (100 %)	95 (97.0 %)	$\chi^2 = 1.645$
African	3 (1.8 %)	1 (1.7 %)	0 (0 %)	2 (2.0 %)	$p = 0.801$
South American	3 (1.8 %)	2 (3.3 %)	0 (0 %)	1 (1.0 %)	
Relationship status					
Single	148 (87.1 %)	53 (88.3 %)	12 (100 %)	83 (84.7 %)	$\chi^2 = 2.406$
Married/in a relationship	15 (8.8 %)	5 (8.3 %)	0 (0 %)	10 (10.2 %)	$p = 0.662$
Separated/divorced	7 (4.1 %)	2 (3.3 %)	0 (0 %)	5 (5.1 %)	
Low scholastic performance					
No	122 (71.8 %)	42 (70.0 %)	9 (75.0 %)	71 (72.4 %)	$\chi^2 = 0.177$
Yes	48 (28.2 %)	18 (30.0 %)	3 (25.0 %)	27 (27.6 %)	$p = 0.915$
Supporting teacher					
No	150 (88.2 %)	56 (93.3 %)	11 (91.7 %)	83 (84.7 %)	$\chi^2 = 2.822$
Yes	20 (11.8 %)	4 (6.7 %)	1 (8.3 %)	15 (15.3 %)	$p = 0.244$
Working status					
Stable worker	58 (34.1 %)	23 (38.3 %)	5 (41.7 %)	30 (30.6 %)	$\chi^2 = 6.497$
Part-time worker	12 (7.1 %)	2 (3.3 %)	0 (0 %)	10 (10.2 %)	$p = 0.592$
Unemployed	40 (23.5 %)	15 (25.0 %)	3 (25.0 %)	22 (22.4 %)	
Student	59 (34.7 %)	19 (31.7 %)	4 (33.3 %)	36 (36.7 %)	
Retired	1 (0.6 %)	1 (1.7 %)	0 (0 %)	0 (0 %)	
Physical activity					
Never	112 (65.9 %)	38 (63.3 %)	8 (66.7 %)	66 (67.3 %)	$\chi^2 = 2.303$
Regular physical activity	27 (15.9 %)	12 (20.0 %)	1 (8.3 %)	14 (14.3 %)	$p = 0.890$
Previous physical activity	31 (18.2 %)	10 (16.7 %)	3 (25.0 %)	18 (18.2 %)	
Infant ADHD diagnosis					
No	153 (90.0 %)	54 (90.0 %)	10 (83.3 %)	89 (90.8 %)	$\chi^2 = 0.665$
Yes	17 (10.0 %)	6 (10.0 %)	2 (16.7 %)	9 (9.2 %)	$p = 0.717$
ADHD family history					
No	156 (91.8 %)	55 (91.7 %)	11 (91.7 %)	90 (91.8 %)	$\chi^2 = 0.002$
Yes	14 (8.2 %)	5 (8.3 %)	1 (8.3 %)	8 (8.2 %)	$p = 0.999$
History of suicidal attempts					
No	158 (92.9 %)	57 (95.0 %)	10 (83.3 %)	91 (92.9 %)	$\chi^2 = 2.077$
Yes	12 (7.1 %)	3 (5.0 %)	2 (16.7 %)	7 (7.1 %)	$p = 0.354$
Sleep disorders					
No	109 (64.1 %)	46 (76.7 %)	9 (75.0 %)	54 (55.1 %)	$\chi^2 = 8.187$
Yes	61 (35.9 %)	14 (23.3 %)	3 (25.0 %)	44 (44.9 %)	$\mathbf{p = 0.017}$
History of brain injury					
No	159 (93.5 %)	54 (90.0 %)	12 (100 %)	93 (94.9 %)	$\chi^2 = 2.368$
Yes	11 (6.5 %)	6 (10.0 %)	0 (0 %)	5 (5.1 %)	$p = 0.306$
Nicotine consumption					

(*continued on next page*)

Table 1 (*continued*)

	Total sample	Inattentive-type ADHD	Hyperactive-type ADHD	Combined-type ADHD	p-Value
No	126 (74.1 %)	43 (71.7 %)	8 (66.7 %)	75 (76.5 %)	$\chi^2 = 1.906$
Yes	38 (22.4 %)	14 (23.3 %)	4 (33.3 %)	20 (20.4 %)	p = 0.753
Previous use	6 (3.5 %)	3 (5.0 %)	0 (0 %)	3 (3.1 %)	
Habitual alcohol use					
No	113 (66.5 %)	43 (71.7 %)	7 (58.3 %)	63 (64.3 %)	$\chi^2 = 1.293$
Yes	57 (33.5 %)	17 (28.3 %)	5 (41.7 %)	35 (35.7 %)	p = 0.524
Substance use					
No	106 (62.4 %)	41 (68.3 %)	6 (50.0 %)	59 (60.2 %)	$\chi^2 = 3.957$
Current substance use	42 (24.7 %)	15 (25.0 %)	4 (33.3 %)	23 (23.5 %)	p = 0.412
Previous substance use	22 (12.9 %)	4 (6.7 %)	2 (16.7 %)	16 (16.3 %)	
In charge at the outpatient services for pathological addictions					
No	146 (85.7 %)	53 (88.3 %)	8 (66.7 %)	85 (86.7 %)	$\chi^2 = 5.144$
Yes	22 (12.9 %)	6 (10.0 %)	4 (33.3 %)	12 (12.2 %)	p = 0.273
Previous	2 (1.2 %)	1 (1.7 %)	0 (0 %)	1 (1.0 %)	
Bipolar disorder comorbidity					
No	150 (88.2 %)	56 (93.3 %)	9 (75.0 %)	85 (86.7 %)	$\chi^2 = 3.740$
Yes	20 (11.8 %)	4 (6.7 %)	3 (25.0 %)	13 (13.3 %)	p = 0.154
Borderline personality disorder comorbidity					
No	164 (96.5 %)	60 (100 %)	11 (91.7 %)	93 (94.9 %)	$\chi^2 = 3.720$
Yes	6 (3.5 %)	0 (0 %)	1 (8.3 %)	5 (5.1 %)	p = 0.156
Other psychiatric comorbidity					
No	105 (61.8 %)	35 (58.3 %)	11 (91.7 %)	59 (60.2 %)	$\chi^2 = 4.944$
Yes	65 (38.2 %)	25 (41.7 %)	1 (8.3 %)	39 (39.8 %)	p = 0.084
Medical disorder comorbidity					
No	137 (80.6 %)	45 (75.0 %)	9 (75.0 %)	83 (84.7 %)	$\chi^2 = 2.493$
Yes	33 (19.4 %)	15 (25.0 %)	3 (25.0 %)	15 (15.3 %)	p = 0.287
Legal issues					
No	153 (90.0 %)	54 (90.0 %)	10 (83.3 %)	89 (90.8 %)	$\chi^2 = 0.665$
Yes	17 (10.0 %)	6 (10.0 %)	2 (16.7 %)	9 (9.2 %)	p = 0.717

ADHD: Attention Deficit Hyperactivity Disorder; M: mean; SD: standard deviation.
Significant p-values are in bold.

displayed significant depressive symptomatology. Subjects with a previous history of suicidal attempt or academic failure display a trend (even though not significant) towards higher BDI-II scores (respectively, p = 0.057 and p = 0.058). Patients who received an ADHD diagnosis during childhood and patients who have a family history of ADHD displayed significantly lower BDI-II scores (respectively, p = 0.045 and p = 0.01). In addition, ADHD patients with a comorbid diagnosis of borderline personality disorder displayed significantly higher BDI-II scores (p = 0.014), compared to the rest of the sample. No significant differences at BDI-II mean scores were observed regarding employment status (p = 0.233) or the presence/absence of a stable affective relationship (p = 0.352) (Supplementary Material 1).

Supplementary Material 2 reported mean scores at each TEMPS-M affective temperament subscales. No significant sex-based differences either in any other socio-demographic features were observed in none of each affective temperament, except for the variable 'scholastic performance' for which the hyperthymic affective temperament appears to be relatively protective (p = 0.017). ADHD patients with predominant inattentive-type diagnosis were those who significantly displayed lower scores at irritable and hyperthymic affective temperaments (respectively, p = 0.001 and p = 0.036). No significant differences were reported for the hyperactive-type while combined-type ADHD significantly displayed higher scores at TEMPS-M cyclothymic and irritable subscales (respectively, p = 0.024 and p = 0.004). Moreover, ADHD patients who did not receive a previous ADHD diagnosis during childhood significantly displayed higher scores at anxious affective temperaments (p = 0.045). Furthermore, ADHD patients with a comorbid bipolar disorder diagnosis showed significantly higher scores at TEMPS-M irritable affective temperament (p = 0.032). While ADHD patients with comorbid borderline personality disorder significantly displayed higher scores at TEMPS-M anxious affective temperament (p = 0.002) (Supplementary Material 2).

Table 2 reported mean scores at each COPE-NVI subscales. No significant sex differences were observed in any of the coping strategies. ADHD patients with comorbid borderline personality disorder displayed significantly higher scores at social support subscale (p = 0.018) while lower scores at positive attitude (p = 0.006) and problem solving (p < 0.001) subscales. ADHD patients who reported a positive history for legal issues significantly displayed higher scores at problem solving scales (p = 0.031). While patients with a previous ADHD diagnosis in childhood significantly displayed higher scores at COPE-NVI positive attitude (p = 0.004), problem solving (p = 0.008) and turning to religion subscales (p = 0.003) (Table 2).

3.3. *Affective temperamental profiles and coping strategies according to the presence/absence of comorbid depressive symptomatology*

ADHD-DEP group displayed significantly higher scores at the TEMPS-M depressive (p = 0.01), cyclothymic (p = 0.002) and anxious affective temperaments (p = 0.003), compared to ADHD-nonDEP. In

Table 2
COPE-NVI subscale scores across different sociodemographic and clinical characteristics in the total sample.

		Social support subscale		Avoidance strategies subscale		Positive attitude subscale		Problem solving subscale		Turning to religion subscale	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Sex	Males	30.2	7.1	30.6	8.3	30.1	6.3	26.3	7.4	17.4	5.3
	Females	33.0	8.2	30.2	6.5	27.8	6.7	25.0	7.2	16.7	4.5
	p-Value*	0.115		0.806		0.127		0.449		0.587	
Ethnicity	Caucasian	31.7	7.8	30.4	7.6	28.9	6.7	25.7	7.4	17.0	5.0
	African	28.0	6.1	29.7	7.6	30.3	2.5	26.7	4.5	18.0	5.0
	South American	24.0	.	37.0	.	31.0	.	27.0	.	23.0	.
	p-Value**	0.454		0.677		0.897		0.960		0.462	
Working status	Stable worker	31.7	8.2	30.4	6.0	29.1	5.1	26.2	7.0	17.6	4.5
	Part-time worker	30.4	5.1	32.0	4.7	28.2	4.3	23.4	2.6	16.0	2.8
	Unemployed	31.9	8.7	33.8	11.8	32.3	6.3	25.6	8.2	18.7	6.4
	Student	30.7	7.3	28.3	5.7	26.5	7.5	25.2	7.6	15.9	4.9
	Retired	40.0	.	21.0	.	42.0	.	38.0	.	13.0	.
	p-Value**	0.812		0.154		**0.020**		0.469		0.393	
Low scholastic performance	No	32.3	7.7	29.8	7.2	28.6	7.0	25.8	7.4	17.2	5.2
	Yes	29.4	7.5	32.1	8.2	30.2	4.9	25.5	7.1	16.9	4.6
	p-Value*	0.149		0.231		0.318		0.850		0.810	
Supporting teacher	No	31.5	7.8	30.1	7.3	28.8	6.4	25.1	6.9	16.9	5.0
	Yes	31.0	7.3	32.2	9.4	30.5	7.5	30.0	8.6	18.5	4.8
	p-Value*	0.844		0.424		0.446		**0.045**		0.335	
ADHD type	Inattentive-type ADHD	30.0	8.5	29.9	7.5	30.8	5.3	26.2	6.6	16.0	5.0
	Hyperactive-type ADHD	30.8	7.9	30.8	5.1	27.8	8.8	24.8	7.5	17.3	2.2
	Combined-type ADHD	32.4	7.2	30.7	7.8	28.0	6.9	25.5	7.7	17.7	5.1
	p-Value**	0.424		0.918		0.205		0.893		0.342	
Infant ADHD diagnosis	No	31.7	7.8	30.3	7.3	29.2	6.3	25.5	7.1	16.8	4.7
	Yes	29.4	7.3	31.3	9.8	28.1	8.4	27.4	8.9	19.3	6.5
	p-Value*	0.409		0.699		0.656		0.455		0.148	
Bipolar disorder comorbidity	No	31.6	7.6	29.7	6.7	28.8	6.6	25.9	7.2	17.1	5.1
	Yes	29.3	9.6	38.8	11.4	31.3	5.1	24.0	8.8	16.7	3.8
	p-Value*	0.487		0.107		0.369		0.546		0.833	
Borderline personality disorder comorbidity	No	31.0	7.6	30.1	7.5	29.4	6.3	25.9	7.3	17.2	5.0
	Yes	41.7	3.2	38.0	5.3	19.0	4.0	20.7	1.2	15.3	3.1
	p-Value*	**0.018**		0.075		**0.006**		**<0.001**		0.538	
Other psychiatric comorbidity	No	31.8	7.8	30.9	7.9	29.7	6.3	26.0	7.5	17.3	4.7
	Yes	30.9	7.7	29.7	7.0	28.0	6.8	25.3	7.0	16.7	5.4
	p-Value*	0.629		0.482		0.270		0.661		0.591	
Medical disorder comorbidity	No	32.1	7.5	30.5	7.2	29.0	6.6	25.6	7.2	16.8	5.0
	Yes	29.1	8.4	30.0	9.1	29.2	6.6	26.2	7.6	18.0	5.0
	p-Value*	0.176		0.807		0.878		0.780		0.407	
Legal issues	No	31.4	7.9	30.1	6.9	28.9	6.7	25.2	7.2	16.8	4.8
	Yes	31.5	6.6	33.5	13.2	30.3	4.3	31.8	4.8	20.5	6.3
	p-Value*	0.988		0.299		0.612		**0.031**		0.078	
ADHD family history	No	31.4	7.8	30.9	7.4	28.5	6.3	25.2	7.0	16.7	4.5
	Yes	32.8	7.2	21.8	1.0	38.0	4.5	35.0	5.0	24.0	8.2
	p-Value*	0.733		**<0.001**		**0.004**		**0.008**		**0.003**	
History of suicidal attempts	No	31.3	7.5	30.6	7.6	29.0	6.7	25.5	7.3	17.0	4.7
	Yes	33.4	11.7	27.6	5.8	29.8	4.5	29.0	7.5	17.8	8.5
	p-Value*	0.563		0.391		0.786		0.301		0.740	
Sleep disorders	No	31.9	7.9	29.4	6.1	29.1	6.1	25.3	7.0	17.0	5.2
	Yes	30.7	7.5	32.3	9.5	29.0	7.3	26.5	7.8	17.2	4.6
	p-Value*	0.538		0.158		0.950		0.510		0.850	
History of brain injury	No	31.8	7.7	30.3	7.6	29.0	6.5	25.7	7.2	17.0	5.0
	Yes	24.3	3.5	32.3	8.3	30.0	8.9	27.7	9.5	18.7	5.1
	p-Value*	0.104		0.656		0.794		0.641		0.576	
Habitual alcohol use	No	31.4	7.7	28.4	6.6	29.2	6.4	26.1	7.5	16.7	4.6
	Yes	31.5	8.1	35.5	7.7	28.6	6.9	24.8	6.6	18.0	5.9
	p-Value*	0.987		**<0.001**		0.709		0.474		0.296	
Inattentive-type ADHD	No	32.3	7.2	30.7	7.6	28.0	7.0	25.5	7.7	17.7	4.9
	Yes	30.0	8.5	29.9	7.5	30.8	5.3	26.2	6.6	16.0	5.0
	p-Value*	0.212		0.677		0.074		0.665		0.145	
Hyperactive-type ADHD	No	31.5	7.8	30.4	7.7	29.1	6.4	25.8	7.3	17.1	5.1
	Yes	30.8	7.9	30.8	5.1	27.8	8.8	24.8	7.5	17.3	2.2
	p-Value*	0.853		0.928		0.690		0.783		0.944	
Combined-type ADHD	No	30.1	8.3	30.0	7.2	30.4	5.7	26.0	6.6	16.1	4.8
	Yes	32.4	7.2	30.7	7.8	28.0	6.9	25.5	7.7	17.7	5.1
	p-Value*	0.193		0.716		0.121		0.767		0.165	
Relationship status	Single/separated/divorced	31.3	7.7	30.9	7.7	28.5	6.6	25.3	7.4	16.7	4.9
	Married/in a relationship	32.6	8.3	27.2	5.6	32.7	4.6	28.3	6.1	19.5	5.3
	p-Value*	0.617		0.149		0.055		0.233		0.098	
Physical activity	No	31.2	7.8	29.8	7.0	29.4	6.0	26.0	6.9	17.0	4.7
	Yes	32.9	7.4	33.6	9.5	27.1	8.9	24.3	9.4	17.6	6.3
	p-Value*	0.478		0.112		0.262		0.444		0.704	
Nicotine consumption	No	31.9	7.9	30.1	7.5	29.1	6.6	25.9	7.3	17.3	5.0

(*continued on next page*)

Table 2 (*continued*)

		Social support subscale		Avoidance strategies subscale		Positive attitude subscale		Problem solving subscale		Turning to religion subscale	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
	Yes	28.9	6.3	32.5	8.1	28.8	6.1	24.7	7.2	15.7	4.5
	p-Value*	0.239		0.334		0.909		0.623		0.331	
Current or previous substance use	No	32.1	8.1	29.0	6.0	29.6	6.7	26.3	7.1	16.5	4.3
	Yes	30.2	7.0	33.0	9.3	28.0	6.1	24.7	7.5	18.1	6.0
	p-Value*	0.304		0.052		0.292		0.344		0.195	

ADHD: Attention Deficit Hyperactivity Disorder, COPE-NVI: Coping Orientation to Problems Experienced Inventory - New Italian Version. Significant p-values are in bold.
* *t*-Test.
** ANOVA.

addition, significantly higher scores at COPE-NVI avoidance strategies subscales ($p = 0.026$) were reported in ADHD-DEP compared to ADHD-nonDEP group.Conversely, ADHD-nonDEP group significantly displayed higher scores at COPE-NVI positive attitude and problem solving subscales (respectively, $p < 0.001$ and $p = 0.001$) (Table 3).

According to the multivariate linear regression model, the depressive levels (as measured through BDI-II) were positively predicted only by TEMPS-M cyclothymic subscale ($B = 0.567$, $p = 0.004$) and negatively predicted by only COPE-NVI "positive attitude" subscale ($B = -0.438$, $p = 0.024$) ($R = 0.496$, $R^2 = 0.246$, $F(2,66) = 10.747$, $p < 0.001$) (Table 4).

4. Discussion

Overall, previous literature already described ADHD as frequently associated with comorbid psychiatric conditions, particularly among those patients with a previously undiagnosed or misdiagnosed ADHD in childhood (Kooij et al., 2012; Katzman et al., 2017; Powell et al., 2021). Also, a more complex clinical picture has been previously shown to determine a delay in identification, diagnosis and effective management of condition and treatment (Salvi et al., 2019; Powell et al., 2021). In particular, adult ADHD patients appeared to be 3-fold more likely to develop a MDD, 6-fold more likely to develop dysthymia, and 4-fold more likely to manifest any other mood condition and/or disorder, including depressive symptomatology (Katzman et al., 2017). However, previous studies did not investigate the specific psychopathological and/or socio-demographic predictors of comorbid depressive symptomatology in adult ADHD, which could allow a better clinically characterize the adult ADHD patient and to personalize management/treatment strategy accordingly. For this reason, in our retrospective study based on a naturalistic patients' sample, we collected socio-demographic and psychopathological data on affective temperamental profiles and patterns in coping strategies in a sample of adult ADHD outpatients, stratified according to the presence of significant comorbid depressive symptomatology. In our sample, we found a percentage of 64.7 % of all screened participants who displayed comorbid depressive symptomatology at the baseline visit at our outpatient adult ADHD service. Indeed, the higher percentage found in our sample compared to previous studies (Fischer et al., 2007; Katzman et al., 2017; Yoshimasu et al., 2018; Quintero et al., 2019) should be carefully evaluated as ADHD and depression could share overlapping symptomatology which could mask the correct diagnosis, particularly among late/adult ADHD onset patients (Taylor et al., 2022; Williams et al., 2023). In fact, according to the current literature, an overall prevalence rate of depressive symptomatology ranging from 20.7 % to 28 % was reported within the sample constituted by only adult ADHD patients (Fischer et al., 2007; Yoshimasu et al., 2018; Quintero et al., 2019). Similarly, an overall prevalence rate of comorbid ADHD of 9 %–16 % was found within the sample of MDD patients (McIntosh et al., 2009; Bond et al., 2012).

However, our sample is mainly constituted by patients without a previous ADHD diagnosis during childhood. Hence, one could argue that our sample is much more likely represented by subjects who needed a treatment but who did not previously receive an effective management of their ADHD condition. The delay in ADHD diagnosis could be responsible for the onset of a comorbid depressive symptomatology due to the challenges that the patient could have to face during his/her daily lives and the potential impactful pressure experienced by the society, family and institutions. On the other hand, one could also support the hypothesis that "*child and adult ADHD are distinct syndromes*" and that "*adult ADHD is not a neurodevelopmental condition, is complex and nor merely the continuation of childhood ADHD*" (Taylor et al., 2022; Buitelaar, 2023). Indeed, adult onset ADHD did not necessarily exclude the concept of a neurodevelopmental condition, as one could argue that

Table 3
Affective temperamental profiles and coping strategies of the sample stratified according to the presence/absence of depressive symptomatology (according to the BDI-II).

		Depressive symptomatology		p-Value*
		ADHD-nonDEP	ADHD-DEP	
TEMPS [M (SD)]	Depressive subscale	20.0 (8.1)	24.7 (6.3)	**0.010**
	Cyclothymic subscale	21.9 (7.4)	24.7 (6.3)	**0.002**
	Hyperthymic subscale	22.6 (6.3)	20.9 (5.9)	0.298
	Irritable subscale	18.5 (8.0)	20.6 (6.5)	0.256
	Anxious subscale	17.5 (5.1)	22.6 (6.7)	**0.003**
COPE-NVI [M (SD)]	Social support subscale	31.1 (8.5)	31.6 (7.5)	0.830
	Avoidance strategies subscale	27.3 (7.8)	31.6 (7.2)	**0.026**
	Positive attitude subscale	33.6 (5.2)	27.3 (6.1)	**<0.001**
	Problem solving subscale	30.2 (7.4)	24.0 (6.5)	**0.001**
	Turning to religion subscale	18.0 (5.2)	16.7 (4.9)	0.346

TEMPS-M: Temperament Evaluation in Memphis, Pisa and San Diego, COPE-NVI: Coping Orientation to Problems Experienced Inventory - New Italian Version.
Significant p-values are in bold.
* *t*-Test.

Table 4
Multiple Linear Regression Model (BDI-II as dependent variable).

	B	SE	Beta	t	p-Value
TEMPS-M cyclothymic subscale	0.567	0.191	0.339	2.974	**0.004**
COPE-NVI positive attitude subscale	−0.438	0.190	−0.263	−2.304	**0.024**

SE: Standard Error, BDI-II:Beck Depression Inventory-II, TEMPS-M: Temperament Evaluation in Memphis, Pisa and San Diego, COPE-NVI: Coping Orientation to Problems Experienced Inventory - New Italian Version.

specific neurocognitive vulnerabilities may be dominant for a long-time and trigger clinical escalation in the face of increasing environmental demands (Buitelaar, 2023). Within this context, one hand, depressive symptomatology could indeed cover the core ADHD symptomatology and, hence, determine a diagnosis delay. On the other hand, one could also suppose that depressive symptomatology and its detrimental impact on the individual's global functioning could also act as stressful life circumstance potentially triggering ADHD clinical manifestation, accordingly to the stress-related ADHD hypothesis (van der Meer et al., 2015; Buitelaar, 2023).

Interestingly, subjects who had a family member with a previous ADHD diagnosis appeared to significantly display lower depressive symptomatology compared to those without a positive family ADHD history, by suggesting a possible 'protective role' of having a previous knowledge of ADHD on the presence of depressive symptomatology. This knowledge on ADHD diagnosis could be due to a previous early ADHD diagnosis or due to a previous experience with an ADHD family member. It would be interesting to better deepen and explore personal narrative experiences of ADHD patients, by comparing them according to the age of ADHD onset and the timing of first ADHD diagnosis, as well as by longitudinally following-up them according to their clinical course, outcomes and prognosis over the time. Furthermore, one could also suppose that having a relative affected with ADHD could also potentially reduce the perceived internal stigma towards the illness as well as improve the knowledge about how to identify early signs and/or symptoms and how to seek help. Indeed, there is no literature so far published investigating these variables. Moreover, our results suggest that those patients with a positive ADHD family history usually more predominantly use positive coping strategies (such as positive attitude, problem solving and religion) compared to the counterpart who more frequently prefer to use avoidance coping strategies. Overall, previous literature clearly reported that ADHD patients much more likely use dysfunctional coping strategies compared to the general population, which determined more management, planification and organizational difficulties during their daily life (Young, 2005; Al-Yagon et al., 2020a). Similarly, studies conducted on family members of ADHD patients found a predominant use of more dysfunctional coping strategies, which could potentially explain a sort of intergenerational learning effect in preferring these maladaptive coping strategies among those children who live within this dysfunctional family environment (Craig et al., 2020; Al-Yagon et al., 2020b). Conversely, having a family member with ADHD could lead to "normalizing" one's child's illness, leading to the development of more positive coping patterns. These findings could help clinicians in encouraging/proposing the development of a family-based psychoeducational intervention with the aim to increase parents' and patients' awareness of ADHD as well as the use of more functional/positive coping strategies and/or providing a Cognitive Behavioural Therapy (CBT)-oriented psychotherapy to patients specifically addressed in learning more functional/positive coping strategy also to manage a comorbid depressive symptomatology (Newark and Stieglitz, 2010; Al-Yagon et al., 2020a; Craig et al., 2020).

Furthermore, when we analyzed in our sample affective temperamental profiles in ADHD subjects with and without depression, we found significantly higher scores for TEMPS-M depressive, cyclothymic and anxious affective temperaments within the ADHD-DEP group, when compared to ADHD-nonDEP group. In our sample, ADHD-DEP patients also more frequently displayed predominant maladaptive coping strategies (avoidance strategies) compared to positive/functional coping strategies (such as positive attitude and problem solving strategies), compared to ADHD-nonDEP. Indeed, according to our regression analyses, the development of a comorbid depression in ADHD patients appeared to be significantly predicted only by a predominant cyclothymic affective temperament and a lower propensity to use positive attitude coping strategies. While the other affective temperamental profiles and coping strategies did not apparently appear to explain the model, according to our findings. A recent systematic review has shown that adult ADHD patients have higher levels of depressive, cyclothymic, irritable and anxious temperament (Pinzone et al., 2019). These findings are partially confirmed by previous literature (Landaas et al., 2012; Pinzone et al., 2019; Syrstad et al., 2020). Indeed, it has been observed that cyclothymic temperament in adult ADHD patients is a predictor for developing depression and anxiety disorders (Landaas et al., 2012; Syrstad et al., 2020). Therefore, a predominant cyclothymic affective temperament could potentially act as a significant predictor in the development of comorbid depressive symptoms which could determine a worsen clinical outcome and course in adult ADHD patients. On the other hand, it has been well documented that a predominant cyclothymic affective temperamental profile and the predominant use of avoidance-type coping strategies are usually associated with emotional dysregulation dimension (Faraone et al., 2019; Paulus et al., 2021).

Although emotional dysregulation dimension is not part of the diagnostic criteria, it is a pivotal component of ADHD (Paulus et al., 2021) partially overlapping with the construct of cyclothymic temperament (Perugi et al., 2017). At the same time, emotional dysregulation has been linked to a ADHD severity, persistence of clinical manifestation and worsen outcomes both in childhood and adulthood (Faraone et al., 2019). However, despite the emotional dysregulation dimension could potentially mediate the relationship between a comorbid depressive symptomatology and ADHD, in our study we did not specifically assess this dimension. Therefore, further studies could help clinicians in better deepening the role of emotional dysregulation in influencing the relationship between affective temperaments, coping strategies and ADHD-depression comorbidity.

Despite these preliminary promising findings, our study has several limitations that should be carefully considered before generalizing the results in other clinical settings. First of all, despite our sample coming from a naturalistic setting, it is a retrospective data collection and the assessment was carried out only at the baseline (at the first clinical evaluation). Therefore, we could not draw definitive conclusions about the causal relationship between a specific affective temperamental profile and the predominant use of a specific coping strategy in fully explaining whether these variables could effectively act as causal risk factors. Further longitudinal studies should evaluate the efficacy and effectiveness of specific targeted interventions on dysfunctional coping strategies on the improvement of comorbid depressive symptomatology within the sample of adult ADHD patients. Secondly, our sample is constituted only by adult ADHD patients and mostly without a previous ADHD diagnosis in childhood, while it could be interesting to compare whether the comorbid depressive symptomatology could be effectively a consequence of an ADHD diagnosis delay, by comparing and longitudinally monitor both sample of adult ADHD patients with a previous diagnosis in childhood, adolescence or a current first diagnosis in adulthood. Thirdly, our sample, coming from the real-world setting, could be influenced by selection biases being mainly represented by combined-type and inattentive-type ADHD and being poorly represented by the hyperactivity-type ADHD, hence, our findings could be potentially influenced by this selection bias effect. Fourthly, despite in our design study we compared two groups stratified according to the presence/absence of comorbid depressive symptomatology, we did not include a healthy control group and we did not stratified according to the type (i.e., severity, associated with MDD and/or bipolar disorder, etc.) and/or a specific specifier of the current depressive episode. Fifthly, our findings suggested a possible role of the emotional dysregulation dimension but we did not directly assess this variable through the use of a specific questionnaire/scale. Finally, despite all patients being properly administered the MINI-5 for assessing a comorbid psychiatric diagnosis, including a MDD diagnosis, we stratified the sample only according to the BDI-II cut-off. Therefore, we could draw considerations only limiting to comorbid current depressive symptomatology and not on comorbid MDD. Furthermore, being our sample constituted by few subjects with a previous MDD diagnosis, we could not homogeneously stratify the sample according to this variable and we could not draw

definitive conclusions regarding the causal depression trajectory and its relationship with ADHD onset.

Overall, our initial findings should be replicated in larger sample sizes, by recruiting both adult ADHD patients with a previous ADHD diagnosis in childhood and comparing them with those with a delayed diagnosis (Brancati et al., 2023). Moreover, our findings should be tested by implementing interventional (both pharmacological and non-pharmacological) studies able to address both cyclothymic affective temperament predisposition and maladaptive coping strategies, in order to evaluate whether a tailored therapeutic strategy could effectively manage comorbid depressive symptomatology rather than only limiting treatment strategies in targeting ADHD core symptomatology. Therefore, further studies with a longitudinal design and the possibility to test specific interventional programmes should be carried out in order to monitoring the clinical course, outcomes and prognosis of adult ADHD patients with comorbid depressive symptomatology as well as clearly deepening which clinical and socio-demographic factors are potentially responsible of the increased chance to manifest depressive symptomatology in comorbidity and how this clinical manifestation could differently impact on ADHD clinical course and quality of life.

In conclusion, it would be useful to routinely screening adult ADHD patients for significant clinical depression as well as clearly evaluate the impact that specific affective temperamental profiles could impact on the clinical course of comorbid ADHD-depression patients and whether the predominant use of specific coping strategies could act as maladaptive strategies to manage a delayed ADHD diagnosis as well whether depression could represent rather a consequence of a misdiagnosis for ADHD since childhood and/or adolescence or be responsible of a delayed ADHD diagnosis in adulthood. A careful diagnostic assessment and clinical characterization of adult ADHD could help clinicians to better identify and test whether pharmacological and non-pharmacological strategies could be more effective and tolerable in this sub-sample of adult ADHD patients.

CRediT authorship contribution statement

Laura Orsolini: Writing – original draft, Supervision, Methodology, Formal analysis, Data curation, Conceptualization. **Rosa Volgare:** Writing – original draft, Investigation. **Simone Piergentili:** Writing – original draft, Investigation. **Michele Servasi:** Investigation. **Giulio Perugi:** Writing – review & editing, Supervision. **Umberto Volpe:** Writing – review & editing, Supervision.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jad.2024.08.083.

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