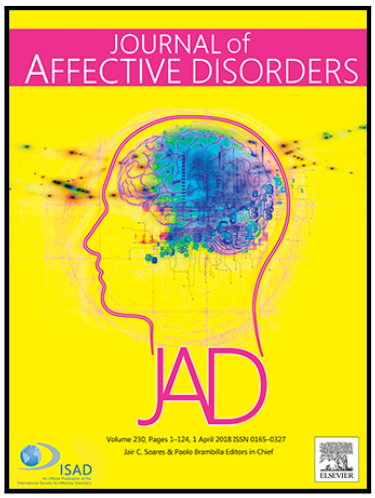

Prevalence of Anxiety and Depressive Disorders among Youth with Intellectual Disabilities: A Systematic Review and Meta-Analysis

Christophe Maïano , Sylvain Coutu , Danielle Tracey , Stéphane Bouchard , Geneviève Lepage , Alexandre J.S. Morin , Grégory Moullec

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Highlights

- This meta-analysis focuses on anxiety and depressive disorders among youth with ID
- Pooled prevalence of anxiety and depressive disorders were 5.4% and 2.8%
- Pooled prevalence for subtypes of anxiety disorders ranged from 0.2%-11.5%
- Pooled prevalence for subtypes of depressive disorders ranged from 2.5%-3.4%
- Pooled prevalence significantly differed as a function of studies characteristics

Running title: Anxiety, Depression, and Intellectual Disabilities

Prevalence of Anxiety and Depressive Disorders among Youth with Intellectual Disabilities: A Systematic Review and Meta-Analysis

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Abstract

Background. The purpose of this meta-analytic study was to determine the pooled prevalence estimates of anxiety and depressive disorders among children and adolescents with intellectual disabilities (ID) and to assess the extent to which these pooled prevalence rates differed I·ÕÕ2ℕŘιyƎ ű2 ăűdzŘιŜăΩ ÕKI·ℕI·ÕűŜℕιăűιÕă.

Method. A systematic literature search was performed in nine databases and 20 studies, published between 1975 and 2015, met the inclusion criteria.

Results. The resulting pooled prevalence estimates of combined subtypes of anxiety and depressive disorders were respectively (a) 5.4% and 2.8% across samples; (b) 1.2% and 0.03% among children; and (c) 7.9% and 1.4% among adolescents. Pooled prevalence estimates for specific subtypes of anxiety disorders ranged from (a) 0.2% to 11.5% across samples; (b) 0.7% to 17.6% among children; and (c) 0.6% to 19.8% among adolescents. Pooled prevalence estimates of dysthymic disorder and major depressive disorder were respectively (a) 3.4% and 2.5% across samples; (b) 2.1% and 3.2% among children; and (c) 6.9% and 5.7% among adolescents. Finally, subgroup analyses showed significant variations in the pooled prevalence estimates of combined subtypes of anxiety disorders, obsessive-compulsive disorder, and generalized anxiety disorder; and combined subtypes of depressive disorders.

Limitations. The present findings of this meta-analysis should be interpreted with caution given several limitations related to the characteristics of the populations, diagnosis method and sampling method.

Conclusion. Findings provide recommendations for future studies investigating psychological disorders among youth with ID, as well as how clinicians and policy makers can improve diagnostic practices and support for youth with ID.

Keywords: diagnostic criteria, informant, intellectual disability level, moderation, psychological disorders

1. Introduction

The last two decades have witnessed a growing research interest in the prevalence of psychological disorders among youth with intellectual disabilities (ID) and their results have been summarized in a few systematic reviews[1] (e.g., Einfeld, Ellis, & Emerson, 2011; Hudson & Chan, 2002; Oeseburg, Dijkstra, Groothoff, Reijneveld, & Jansen, 2011; Whitaker & Read, 2006). Overall, these reviews reveal that a large proportion of youth with ID present with at least one psychological disorder, although exact prevalence rates remain poorly documented (Oeseburg et al., 2011). For example, Einfeld et al. (2011), and Whitaker and Read (2006) reported that between 30%-50% of children and 24%-54% of adolescents with ID experience at least one psychological disorder. Einfeld et al. (2011) further showed that this rate was 2.8 to 4.5 times greater for youth with ID than the rates obtained among typically developing (TD) youth.

Although the proportion of youth with ID experiencing psychological disorders, in general, has been addressed within the literature, reviews focusing on prevalence estimated for specific psychological disorders in this population remain limited. In particular, no systematic review or meta-analysis have yet provided a summary of findings, or analysis of findings, from prevalence studies focusing specifically on depressive disorders among youth with ID or reported pooled prevalence estimates of depressive disorders among this population. Additionally, although Reardon, Gray, and Melvin (2015) recently summarized studies on the prevalence of anxiety disorders among youth with ID, their initial effort presents several shortcomings that need to be addressed. First, the pooled prevalence of specific and combined subtypes of anxiety disorders have not been estimated, notably those of *anxiety-related disorders* (as defined in previous diagnostic classifications), such as obsessive-compulsive or posttraumatic stress disorders. Second, Reardon et al. (2015) did not examine whether the prevalence estimates of specific and combined subtypes of anxiety disorders differ accordin

characteristics, such as age (children vs. adolescents-young adults), sex (boys vs. girls), ID level (e.g., mild vs. moderate or severe), and geographic location (e.g., North America vs. Europe). Third, Reardon et al. (2015) did not investigate the potential moderating role played by the specific source of information used to assess the presence of anxiety disorders (e.g., medical records, interview, clinical judgment, or multiple assessments).

The specific focus of the present article on anxiety and depressive disorders is highly relevant. Firstly, longitudinal studies with TD youth have established that anxiety and depressive disorders in childhood and adolescence serve as significant predictors of future mood disorders (Roza, Hofstra, van der Ende, & Verhulst, 2003) and major depression in adulthood (Reinherz, Paradis, Giaconia, Stashwick, & Fitzmaurice, 2003). Given their role as precursors for adulthood wellbeing, research must seek to determine the specific prevalence of anxiety and depressive disorders for youth with ID and whether these disorders are prevalent at higher or lower levels than in TD youth in order to guide the preventative work of policy makers, researchers, and practitioners. Secondly, although previous systematic reviews investigating a wider range of psychological disorders in general are helpful (e.g. Einfeld et al., 2011; Oeseburg et al., 2011), a specific focus on anxiety and depression affords a more thorough and nuanced analysis of both the potential sample and study characteristics that may be driving disputed prevalence rates for youth with ID. Providing precise and up to date information is critical to inform future research and practice in the identification and management of anxiety and depression disorders for youth with ID.

With the present systematic review and meta-analysis we intend to address the shortcomings of previous research. More specifically, the first objective was to estimate the pooled prevalence rates of anxiety and depressive disorders (specific and combined subtypes) for all of the samples in this review, as well as separately for samples of children and adolescents. The second objective was to examine

whether the pooled prevalence rates of anxiety and depressive disorders differ as a function of specific characteristics of the studies.

2. Method

This systematic review and meta-analysis was performed following guidelines from the Preferred Reporting Items for Systematic reviews and Meta-Analyses statement (PRISMA; Liberati et al., 2009) and the Meta-Analysis Of Observational Studies in Epidemiology statement (MOOSE; Stroup et al., 2000).

2.1 Information Sources and Search Strategy

Potentially relevant studies were identified through a systematic and simultaneous electronic search in Academic Search Complete, CINAHL Plus with Full-Text, Education Sources, ERIC, Medline with Full-Text, Psychology and Behavioral Sciences Collection, and SocINDEX via the EBSCO database. In addition, a systematic electronic search was conducted separately in the PsycARTICLES (including PsycINFO) and Scopus databases. No year restriction was imposed in the electronic search and the last updated search was performed on the 26th of November 2016. Studies were identified in the aforementioned databases using the following three groups of search terms: (1) άintellectual* dis*έ OR άmental* retard*έ OR άdevelopmental dis*έ OR άdevelopmental del*έ; AND (2) anxiet* OR anxious OR depress* OR άl·ffect* dis*έ; AND (3) child* OR adolescen* OR student* OR youth* OR paediatric* OR pediatric*. The search strategy used in Scopus database is presented in the online supplement (see the section S1). More precisely, these groups were combined and researched in the title, abstract and keywords of the studies published by the journals indexed in the searched databases. Finally, a manual search was also conducted in: (a) the reference lists of the articles included in the meta-analysis and in the manuscripts citing these articles; and (b) in previous literature reviews on anxiety (Reardon et al., 2015) and psychological disorders (Borthwick-Duffy, 1994; Einfeld et al., 2011; Hemmings et al., 2013; Hudson & Chan, 2002; Oeseburg et al., 2011; Whitaker & Read, 2006; Yoo et al., 2012) among people

with ID.

2.2 Inclusion Criteria

Only the studies meeting the following inclusion criteria were included in the meta-analysis. First, participants had to present mild, moderate, severe, or profound ID[2] (or a developmental delay) of known (i.e., autism spectrum disorder, Down syndrome, Fragile X syndrome, Williams syndrome, Prader-Willi, etc.) or unknown etiology. However, studies exclusively focusing on participants with ID of a specific known etiology were not included. The rationale for excluding these studies is that: (1) we could not be confident that all studies limited to these subpopulations would be identified as they often do not focus on their ID levels as does the current meta-analysis; (2) the prevalence of anxiety or depression disorders has already been quantified for these subpopulations (e.g., Royston, Howlin, Waite, & Oliver, 2017; van Steensel, Bögels, & Peerin, 2011); and (3) the phenotype of people from these subpopulations can heighten their vulnerability to anxiety or depressive disorders, and thus bias prevalence estimates associated with more generic forms of ID (e.g., Royston et al., 2017; van Steensel et al., 2011). Finally, studies which included a range of disabilities within the sample were considered to be eligible if the data on the relevant outcomes were available for participants with ID.

Second, the participants with ID included in the studies had to be infants (0-3 years), children (4-11 years), or adolescents-young adults (12-22 years). Mixed samples of adolescents and adults with ID were included if the data on the relevant outcomes were presented for the participants aged 22 years and lower. Studies exclusively focusing on samples of adults with ID were excluded.

Third, studies were considered to be eligible only if one of their main objective was to determine the prevalence of anxiety (e.g., combined subtypes of anxiety disorder[3], agoraphobia, generalized anxiety disorder, obsessive-compulsive disorder) and/or depressive disorders (i.e., combined subtypes of depressive disorders[4], dysthymic disorder, major depressive disorder) among youth with ID. Therefore,

studies including participants with a diagnosed anxiety disorder and/or depressive disorder aiming to compare their clinical features with those from non-clinical participants, or to validate screening instruments, were not included. In addition, when the same sample (or a part of a sample) was used in several publications, the most recent or the largest sample was included. In this situation, outcomes of interest not reported in the selected publication were also included from the other publication.

Fourth, for studies to be included, anxiety and/or depressive disorders had to be diagnosed by qualified professionals (e.g., physician, psychiatrist, psychologist, pediatrician) and/or obtained by the research team through a structured diagnostic interview. Therefore, studies focusing on specific symptoms or using screening cut-off scores (e.g., Child Behavior Checklist, Developmental Behavior Checklist) were excluded. Indeed, the focus here was on the prevalence of psychiatric diagnoses, rather than on either the clinical severity of symptoms or the presence of participants άΙ·ύ ΝΧăϯέ of meeting clinical criteria diagnoses. In addition, the diagnosis performed by qualified professionals requires a discussion with the target participant and/or informant as well as an assessment of the severity and discomfort associated with the assessed symptoms, which is typically lacking as part of screening severity procedures relying on participant and/or informant reports.

Finally, we only included studies relying on cohort (only the first or initial measure was considered), cross-sectional or case-control design written in English and published or in-press in a peer-reviewed journal. Case studies, book chapters, conference proceedings, and non-original studies (i.e., comments, reviews, theoretical papers) were excluded.

2.3 Selection of the Relevant Studies

As recommended by the PRISMA Statement (Liberati et al., 2009), the eligibility of the relevant studies was determined based on the examination of the titles-abstracts and full texts. First, the relevance of the titles-abstracts of the studies were independently screened by three authors (first,

second, and last). Then, the full texts of the studies selected based on their titles-abstracts were also independently screened by the same three authors to assess their eligibility. At each step, discrepancies between authors were resolved by discussion until an agreement was reached.

2.4 Data Extraction

The same three authors independently extracted the information and data presented in the full text articles of studies included in the meta-analysis. The following information was extracted: (a) location (country); (b) design (cohort, cross-sectional, case control); (c) recruitment setting (e.g., service agencies, special school, child psychiatric unit); (d) type of samples (children, adolescents, mixed); (e) characteristics of samples with ID (i.e., sample size, percentage of boys, age range, and ID level); (f) presence/absence (yes/no) and sample size of TD participants; (g) diagnostic information (i.e., informant, method, and criteria); (h) types of anxiety disorders (e.g., combined subtypes, agoraphobia without panic disorder, generalized anxiety disorder, any anxiety disorders); (i) types of depressive disorders (e.g., combined subtypes, depressive disorders, dysthymic disorder, major depressive disorder); (j) prevalence estimates (i.e., the percentage and the sample size or the frequencies) of anxiety and depressive disorders. The information and the data extracted were reviewed and discrepancies were resolved by discussion.

2.5 Quality Assessment of the Studies Included in the Meta-Analysis

An adapted version of the Methodological evaluation of Observational REsearch (MORE) checklist for observational studies of incidence or prevalence of chronic diseases was used to assess the quality of reporting of studies (Shamliyan et al., 2013). The scoring regarding the external (i.e., sampling method, estimation of sampling bias, sampling bias in the analysis) and internal validity (i.e., source, definition and measurements of anxiety/depression) was completed independently by the first and last

authors. Their results were then reviewed by the two authors, and remaining disagreements were resolved by the second author.

2.6 Statistical Analysis

All the analyses were performed using the version 2.2.064 of the Comprehensive Meta-Analysis (CMA) software developed by Borenstein, Hedges, Higgins, and Rothstein (2005). Given the heterogeneity of the studies included in the meta-analysis óLJI·ℕűλŐλLJI·yűăΩ ŐKI·ℕI·ŐűŜℕăúλŐăΣ diagnostic method, sample size, etc.), a random effects model was used to estimate the pooled or weighted prevalence of anxiety and depressive disorders. First, the pooled or weighted prevalence rates of anxiety and depressive disorders were estimated including all the relevant studies. Second, the pooled or weighted prevalence rates of anxiety and depressive disorders were separately estimated for studies including children or adolescents. The forest plots of these pooled prevalence estimates were graphed using the Microsoft Excel spreadsheet developed by Neyeloff, Fuchs, and Moreira (2012). The heterogeneity of the pooled prevalence estimates was examined using CochrI·yΩă ómфpлú *Q* test and IλƎƎλyãΣ ¢K2YLJă2yΣ 5ŜŜ]ăΣ I·yŘ !fűYI·yΩă óнллоú I^2 statistic. Finally, several statistical tests provided by the CMA software were used (Begg and MazundarΩă ℕank correlation test, 1994; Duval and ¢øŜŜŘλŜΩă áúℕλY I·yŘ ₹λttɛ úŜăú, 2000; 9ƎƎŜℕΩă úŜăú of the intercept, 1997) to assess potential publication bias in the pooled prevalence estimates of anxiety and depressive disorders.

Moderation analyses were examined using a mixed effect model. We performed a series of pre-specified subgroup analyses for the four following variables: (a) ID level (borderline, mild, moderate, severe, profound, unspecified); (b) geographic regions as defined by the World Health Organization (Europe, North America, South America); (c) diagnostic method (interview, medical records, multiple assessments); (d) diagnostic criteria (the diagnostic and statistical manual of mental disorders [DSM]: second, third, third-revised, fourth, and text revision of the fourth edition; and tenth edition of the

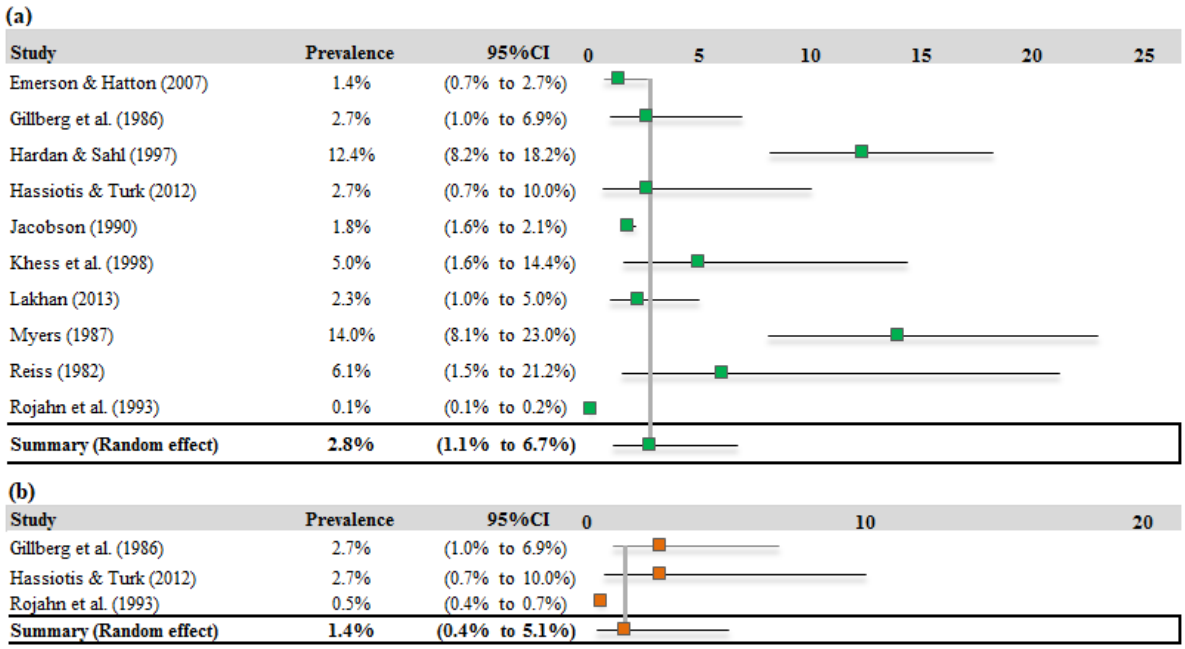

Figure 3. Forest plot of random-effects pooled prevalence estimates of combined subtypes of depressive disorders in (a) all reviewed samples (mixed, children, and adolescents), and (b) adolescent samples

Note. For the estimation of the overall sample, the prevalence estimates of the children and the adolescent samples from RojI·Ky˝Ŝű I·fQå óMффoú ăűdzŘè KI·ØŜ õŜŜy˝Ŏ2Y˝ōlySŘ

Study	Country	Design	Recruitment setting	Type of samples	ID sample	TD sample

Table 1

Main Characteristics of the Studies Included in the Meta-Analysis

					Sample size (N)	% of boys	Age range	ID level	Yes/No	Sample size (N)
Baker et al. (2010)	USA	Cohort	Service agencies	CHILD	95[a]	60	5	NM	Yes	141
Bradley et al. (2011)	Canada	CS	NM	ADOS	72[b]	NM	14-20	NM	No	
Chadwick et al. (2005)	UK	Cohort	Special school	CHILD	82[c]	56	4-11	Severe	No	
Dekker & Koot (2003)	Netherlands	Cohort	Special school	Mixed	474	62	7-20	Mild-Moderate	No	
Emerson & Hatton (2007)	UK	CC	National survey - ONS (1999, 2004)	Mixed	641	66	5-15	NM	Yes	17,774
Gillberg et al. (1986)	Sweden	CS	Service agencies, schools	ADOS	149	62	13-17	Mild-Severe	No	
Gothelf et al. (2008)	Israel	CS	Special school	ADOS	87[d]	53	12-21	Mild-Moderate	No	
Green et al. (2015)	USA	Cohort	Service agencies	CHILD	74[a]	61	5	Borderline-Moderate	Yes	116
Hardan & Sahl (1997)	USA	CC	Service agencies, community, school	Mixed	170[e]	NM	3-19	Borderline-Profound	Yes	63
Hassiotis & Turk (2012)	UK	CS	Service agencies	ADOS	75	64	12-19	Mild-Profound	No	
Jacobson (1990)	USA	CS	Information system	Mixed	9,876	59	0-21	Mild-Profound	No	
Khess et al. (1998)	India	CS	Child psychiatric unit	Mixed	60	68	NM	Mild-Profound	No	
Koskentausta et al. (2002)	Finland	CS	Rehabilitation center, hospitals, special schools	Mixed	155	59	6-13	Mild-Profound	No	
Lakhan (2013)	India	CS	Service agencies	Mixed	262[f]	NM	3-18	Borderline-Profound	No	
Manor-Binyamini (2010)	Israel	CS	Special school	ADOS	30	70	12-21	Mild-Moderate	No	
Myers (1987)	USA	CS	Hospital	Mixed	86[g]	53	10-21	Mild-Profound	No	

Philipps & Williams (1975)	USA	CS	Psychiatric clinic	Mixed	62[h]	61	0-18	Borderline-Severe	No
Reiss (1982)	USA	CS	Service agencies	Mixed	33	70	6-20	Mild-Profound	No
Rojahn et al. (1993)	USA	CS	Service agencies	CHILD, ADOS	43,738[i]	NM	0-20	Mild-Profound	No
Stromme & Diseth (2000)	Norway	CS	Referred to the study	Mixed	178	58	8-13	Mild-Severe	No
Temtek et al. (2015)	Turkey	CS	Hospital	Mixed	1,572	60	6-18	Mild-Profound	No

Note. ADOS = adolescent sample; CC = case control; CHILD = children sample; CS = cross-sectional; N = number; NM = not mentioned; TD = typically developing; UK = United Kingdom; USA = United States of America. [a]The data are those from age 5 only, and the participants with a borderline intellectual disability were included. [b]This sample includes youth with intellectual disabilities and youth with intellectual disabilities and autism; [c]The data are those from the initial study. [d]Only the current prevalence's data have been used. [e]The participants with a borderline and an unspecified intellectual disability were included in the sample. [f]The participants with a borderline intellectual disability were included in the sample. [g]The participants with a borderline intellectual disability were not included in the sample because they were reported together with those without an intellectual disability. [h]This sample only comprised children with intellectual disabilities without psychiatric disorders. [i]The data from the New York State sample were not included because of the probable overlap with Jacobson's (1990) sample.

Table 2

Diagnostic Information and Types of Anxiety and Depressive Disorders of the Studies Included in the Meta-Analysis

Study	Diagnostic information			Types of anxiety disorders	Types of depressive disorders
	Informant	Method	Criteria		
Baker et al. (2010)	P	Interview-S (DISC-IV)	DSM-IV-TR	Not included[U]	MDD, DD
Bradley et al. (2011)	P	Interview-S (SAPPA)	ICD-10	GAD	Not examined
Chadwick et al. (2005)	P	Medical records	NM	Combined[a]	Not examined
Dekker & Koot (2003)	C, P	Interview-S (DISC-IV)	DSM-IV	Combined[a], AGO, GAD, OCD, PDWA, PDWIA, PTSD, SAD, SP, SPHOBIA	MDD, DD
Emerson & Hatton (2007)	C, Y, T	Multiple assessments	ICD-10	Combined[a], AGO, GAD, OCD, PD, PTSD, SAD, SP, SPHOBIA	Combined[b]
Gillberg et al. (1986)	P, Y	Multiple assessments	DSM-III	Combined[c]	Combined[d]
Gothelf et al. (2008)	P	Interview-S (K-SADS-PL)	DSM-IV-TR	Combined[a], GAD, OCD, PD, PTSD, SAD, SP, SPHOBIA	MDD, DD
Green et al. (2015)	P	Interview-S (DISC-IV)	DSM-IV	Combined[a], GAD, SAD, SP	Not examined
Hardan & Sahl (1997)	NM	Medical records	DSM-III-R	Combined[e], OCD, PTSD	Combined[f]
Hassiotis & Turk (2012)	Y	Interview-SM	ICD-10	Combined[a], SP	Combined[b]
Jacobson (1990)	NM	Medical records	DSM-II	Combined[g]	Combined[h]
Khess et al. (1998)	NM	Multiple assessments	ICD-10	Not examined	Combined[i]
Koskentausta et al. (2002)	NM	Medical records	ICD-10	Combined[j]	MDD
Lakhan (2013)	P, Y	Multiple assessments	ICD-10	Combined[k], OCD	Combined[l]

Manor-Binyamini (2010)	P	Interview-S (K-SADS-PL)	DSM-IV-TR	Combined[a], OCD, SPHOBIA	Not examined
Myers (1987)	P	Multiple assessments	DSM-III	Combined[m]	Combined[n]
Philipps & Williams (1975)	NM	Medical records	DSM-II	Combined[o]	Not examined
Reiss (1982)	C, P, Y	Multiple assessments	NM	Combined[p]	Combined[i]
Rojahn et al. (1993)	NM	Medical records	DSM-III-R	Combined[a]	Combined[q]
Stromme & Diseth (2000)	P, Y	Multiple assessments	ICD-10	Combined[r]	Not examined
Temtek et al. (2015)	NM	Medical records	DSM-IV-TR	Combined[a]	Not examined

Note. AGO = agoraphobia without panic disorder; C = caregiver; DD = dysthymic disorder; DISC-IV = Diagnostic Interview Schedule for Children ς 4th version; DSM-II = diagnostic and statistical manual of mental disorders ς 2nd edition; DSM-III = diagnostic and statistical manual of mental disorders ς 3rd edition; DSM-III-R = diagnostic and statistical manual of mental disorders ς revised 3rd edition; DSM-IV = diagnostic and statistical manual of mental disorders ς 4th edition; DSM-IV-TR = diagnostic and statistical manual of mental disorders ς text revision of the 4th edition; GAD = generalized anxiety disorder; ICD-10 = international statistical classification of diseases and related health problems ς 10th revision; Interview-S = structured interview; Interview-SM = semi-structured interview; K-SADS-PL = Schedule for Affective Disorders and Schizophrenia for School-Aged Children, Present and Lifetime; MDD = major depressive disorder; NM = not mentioned; OCD = obsessive-compulsive disorder; P = parents; PD = panic disorder; PDWA = panic disorder without agoraphobia; PDWIA = panic disorder with agoraphobia; PTSD = posttraumatic stress disorder; SAD = separation anxiety disorder; SAPPA = Schedule for the Assessment of Psychiatric Problems associated with Autism (and other developmental disorders); SP = social phobia; SPHOBIA = specific phobia; T = teacher; Y = youth. [U]These data were not included because of the probable overlap with the Green et al.'s (2015) sample. [l]Given that the nature of phobia was not specified these data were not included. [a]anxiety disorder. [b]Depressive disorder. [c]Emotional disorder (anxiety and fear without loss of reality-sense were the most incapacitating symptoms). [d]Depressive syndrome. [e]Overanxious disorder, separation anxiety disorder, anxiety disorder, not otherwise specified, phobias, and panic disorder. [f]Depressive major, depressive disorder, recurrent, depressive disorder, not otherwise specified, and dysthymia. [g]Neurosis (anxiety and phobic disorders). [h]Nonpsychotic organic brain syndromes. [i]Depression. [j]Emotional disorders with onset specific to childhood. [k]Anxiety, obsessive compulsive disorder. [l]Depression. [m]Separation anxiety disorder, overanxious, obsessive compulsive disorder. [n]Depression, major affective disorder. [o]Neurotic traits (phobias, obsessive-compulsive symptoms, mannerisms and preoccupations, anxiety reactions). [p]Phobia, anxiety neurosis. [q]Affective disorders. [r]Anxiety, phobic, obsessive-compulsive.

Table 3

Results of the Random Effects Models, Tests for heterogeneity, and Publication Bias Across Samples and Types of Anxiety Disorders

Samples	Types of anxiety disorders	*N* studies	Random effects models					Tests for heterogeneity				Publication bias					
			Prevalence	95% CI		*Z*-value	*p*	*Q*	df	*p*	I^2 (%)	B-M test	Egger-T	DT-TF	Prevalence	95% CI	
All	Combined	18	5.4%	(2.5% to	11.5%)	-6.82	<.001	1110.2	17	<.001	98	.11	.34	1 missing	4.7%	(2.1% to	10%)
	AGO	2	0.6%	(0.1% to	3.6%)	-5.51	<.001	3.7	1	.05	73	NA	NA	NA			
	GAD	5	2.2%	(0.5% to	9.1%)	-4.95	<.001	39.7	4	<.001	90	.40	.21	No missing			
	OCD	6	2.4%	(0.8% to	7.2%)	-6.43	<.001	40.0	5	<.001	87	.13	.15	No missing			
	PD	2	0.3%	(0.1% to	1.2%)	-7.89	<.001	0.4	1	.53	0	NA	NA	NA			
	PDWA	1	0.4%	(0.1% to	1.6%)	-7.58	<.001	0	0	1	0	NA	NA	NA			
	PDWIA	1	0.2%	(0.03% to	1.5%)	-6.04	<.001	0	0	1	0	NA	NA	NA			
	PTSD	4	1.1%	(0.3% to	3.7%)	-7.20	<.001	10.4	3	.02	71	.50	.21	No missing			
	SAD	4	5.0%	(1.8% to	13.3%)	-5.36	<.001	35.6	3	<.001	92	.37	.38	No missing			
	SP	5	2.7%	(1.2% to	5.8%)	-8.75	<.001	15.7	4	.003	75	.40	.48	No missing			
	SPHOBIA	4	11.5%	(4.0% to	28.9%)	-3.52	<.001	63.1	3	<.001	95	.50	.33	1 missing	10.2%	(4.1% to	23.2%)
Children	Combined	3	1.2%	(0.02% to	49.1%)	-1.98	.048	224.1	2	<.001	99	.50	.39	2 missing	0.1%	(0.001% to	5.5%)
	AGO	-	-	-	-	-	-	-	-	-	-	-	-	-			
	GAD	1	0.7%	(0.04% to	9.8%)	-3.53	<.001	0	0	1	0	NA	NA	NA			
	OCD	-	-	-	-	-	-	-	-	-	-	-	-	-			
	PD	-	-	-	-	-	-	-	-	-	-	-	-	-			
	PDWA	-	-	-	-	-	-	-	-	-	-	-	-	-			

	PDWIA	-	-	-	-	-	-	-	-	-	-	-	-	-		
	PTSD	-	-	-	-	-	-	-	-	-	-	-	-	-		
	SAD	1	17.6%	(10.5% to	21.8%)	-5.06	<.001	0	0	1	0	NA	NA	NA		
	SP	1	2.7%	(0.7% to	10.2%)	-5.00	<.001	0	0	1	0	NA	NA	NA		
	SPHOBIA	-	-	-	-	-	-	-	-	-	-	-	-	-		
Adolescents	Combined	5	7.9%	(0.6% to	54.6%)	-1.82	.068	499.7	4	<.001	99	.50	.12	3 missing	0.5%	(0.03% to 7.8%)
	AGO	-	-	-	-	-	-	-	-	-	-	-	-	-		
	GAD	2	8.7%	(2.4% to	27.1%)	-3.39	<.001	4.4	1	.03	78	NA	NA	NA		
	OCD	2	12.0%	(7.2% to	19.2%)	-7.00	<.001	0.1	1	.79	0	NA	NA	NA		
	PD	1	0.6%	(0.04% to	8.4%)	-3.64	<.001	0	0	1	0	NA	NA	NA		
	PDWA	-	-	-	-	-	-	-	-	-	-	-	-	-		
	PDWIA	-	-	-	-	-	-	-	-	-	-	-	-	-		
	PTSD	1	3.4%	(1.1% to	10.2%)	-5.67	<.001	0	0	1	0	NA	NA	NA		
	SAD	1	5.7%	(2.4% to	13.1%)	-6.07	<.001	0	0	1	0	NA	NA	NA		
	SP	2	5.4%	(1.9% to	14.6%)	-5.11	<.001	2	2	.16	50	NA	NA	NA		
	SPHOBIA	2	19.8%	(11.8% to	31.3%)	-4.47	<.001	1.6	1	.21	38	NA	NA	NA		

Note. AGO = agoraphobia without panic disorder; B-M test = Begg and Mazumdar rank correlation test; DT-FT = Duval and Tweedie's trim and fill; Egger-T = Egger's test of the intercept; GAD = generalized anxiety disorder; OCD = obsessive-compulsive disorder; PD = panic disorder; PDWA = panic disorder without agoraphobia; PDWIA = panic disorder with agoraphobia; PTSD = posttraumatic stress disorder; SAD = separation anxiety disorder; SP = social phobia; SPHOBIA = specific phobia.

Table 4

Results of the Random Effects Models, Tests for heterogeneity, and Publication Bias Across Samples and Types of Depressive Disorders

Samples	Types of depressive disorders	*N* studies	Random effects models					Tests for heterogeneity				Publication bias					
			Prevalence	95% CI		*Z*-value	*p*	*Q*	df	*p*	I^2 (%)	B-M test	Egger-T	DT-TF	Prevalence	95% CI	
All	Combined	10	2.8%	(1.1% to	6.7%)	-7.58	0.00	242.3	9	<.001	96	.24	.31	3 missing	1.6%	(0.6% to	3.7%)
	DD	3	3.4%	(1.5% to	7.4%)	-7.95	<.001	5.2	2	.07	62	.50	.45	No missing			
	MDD	4	2.5%	(1.2% to	5.4%)	-8.98	<.001	6.8	3	.08	56	.50	.41	No missing			
Children	Combined	1	0.03%	(0.02% to	0.06%)	-24.00	<.001	0	0	1	0	NA	NA	NA			
	DD	1	2.1%	(0.5% to	8.0%)	-5.37	<.001	0	0	1	0	NA	NA	NA			
	MDD	1	3.2%	(1.0% to	9.4%)	-5.85	<.001	0	0	1	0	NA	NA	NA			
Adolescents	Combined	3	1.4%	(0.4% to	5.1%)	-6.31	0.00	14.5	2	<.001	86	.50	.07	2 missing	0.5%	(0.2% to	1.6%)
	DD	1	6.9%	(3.1% to	14.5%)	-6.15	<.001	0	0	1	0	NA	NA	NA			
	MDD	1	5.7%	(2.4% to	13.1%)	-6.07	<.001	0	0	1	0	NA	NA	NA			

Note. B-M test = Begg and Mazumdar rank correlation test; DD = dysthymic disorder; DT-FT = Duval and Tweedie's trim and fill; Egger-T = Egger's test of the intercept; MDD = major depressive disorder.

Table 5

Quality Assessment of the Reviewed Studies

Studies	External Validity				Internal Validity					
	Sampling method (random) or population based (yes/no)	Sampling bias estimated (response rate) (yes/no)	Sampling bias addressed in the analysis (subgroup analyses) (yes/no)	Subject flow (yes/no)	Reference period of diagnosis reported (yes/no)	Source of measure reported (yes/no)	Outcomes measured for the purpose of the study (yes/no)	Validity and reliability of the instrument reported (Yes/no)	Precision of estimate reported (error, 95% CI) (yes/no)	Adjusted estimates reported (yes/no)
Baker et al. (2010)	1	1	,	1	,	,	,	,	,	1
Bradley et al. (2011)	,	,	,	1	1	,	,	1	1	1
Chadwick et al. (2005)	1	1	1	1	,	,	1	1	1	1
Dekker & Koot (2003)	,	,	1	,	,	,	,	,	,	1
Emerson & Hatton (2007)	,	,	1	1	,	,	,	,	,	,
Gillberg et al. (1986)	,	1	1	1	,	,	,	1	1	1
Gothelf et al. (2008)	1	1	1	1	,	,	,	,	1	1
Green et al. (2015)	1	1	,	1	,	,	,	,	,	,
Hardan & Sahl (1997)	1	1	,	1	1	1	1	1	1	1
Hassiotis & Turk (2012)	1	,	1	1	1	,	,	1	1	1
Jacobson (1990)	,	1	,	1	1	1	1	1	1	1
Khess et al. (1998)	1	1	1	1	1	1	1	1	1	1
Koskentausta et al. (2002)	1	1	1	1	1	1	1	1	1	1

Lakhan (2013)	¹	¹	¸	¹	¹	¸	¸	¹	¹	¹
Manor-Binyamini (2010)	¹	¹	¹	¹	¹	¸	¸	¹	¹	¹
Myers (1987)	¹	¹	¹	¹	¹	¸	¹	¹	¹	¹
Philipps & Williams (1975)	¹	¹	¹	¹	¹	¸	¹	¹	¹	¹
Reiss (1982)	¹	¹	¹	¹	¹	¸	¹	¹	¹	¹
Rojahn et al. (1993)	¸	¹	¸	¹	¹	¹	¹	¹	¹	¹
Stromme & Diseth (2000)	¹	¹	¸	¹	¹	¸	¸	¹	¹	¹
Temtek et al. (2015)	¹	¹	¸	¹	¹	¹	¹	¹	¹	¹
Total	6/21	4/21	9/21	1/21	7/21	15/21	11/21	5/21	4/21	2/21

Note. ¸ = met the criteria; ¹ = did not meet the criteria; Total = number of studies meeting each quality criteria