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# Borderline Intellectual Functioning: A Scoping Review

Cristina Orío-Aparicio  | Carmen López-Escribano | Cristina Bel-Fenellós

Faculty of Education Teacher Training Center, Department of Research and Psychology in Education, Complutense University of Madrid, Madrid, Spain

**Correspondence:** Cristina Orío-Aparicio ([crisorio@ucm.es](mailto:crisorio@ucm.es))**Received:** 10 October 2024 | **Revised:** 23 January 2025 | **Accepted:** 3 February 2025**Funding:** This publication is funded by the Ministry of Science, Innovation and Universities through the University Teacher Training Program (reference FPU2022-02193) and by the Department of Research and Psychology in Education of the Faculty of Education, Teacher Training Center of the Complutense University of Madrid.**Keywords:** adaptive functioning | borderline intellectual functioning (BIF) | intellectual disability | scoping review

## ABSTRACT

**Background:** Borderline intellectual functioning (BIF) is a condition that involves limitations in cognitive skills that affect the daily functioning of people who present it. BIF has lost visibility in diagnostic manuals such as the DSM-5-TR and ICD-11, which relegate it to complementary categories of aspects requiring attention, rather than recognising it as a category of its own. This lack of recognition as well as unclear criteria for diagnosis underscores the need for a deeper understanding of BIF.

**Method:** The study conducted a scoping review to map the available evidence in the field of BIF. Following the PRISMA-ScR framework, ProQuest, WoS, SCOPUS and EBSCOhost databases were searched. Documents were selected based on inclusion criteria: date of publication (since 2012), study of BIF as a specific group and language (English or Spanish). A total of 138 documents were included, both academic and grey literature.

**Results:** The review mapped the literature into key categories: intellectual functioning, adaptive functioning and additions for a comprehensive evaluation. Most research focused on comorbid psychiatric, emotional and behavioural disorders associated with BIF, as well as cognitive aspects. Very few addressed adaptive functioning explicitly, a crucial area for diagnosing and supporting individuals with BIF, though many covered its domains (conceptual, social and practical). Studies predominantly used quantitative methodologies, with only a few incorporating qualitative methods and directly involving people with BIF.

**Conclusions:** The review emphasises the need for a clearer definition of BIF. Future studies should incorporate the perspectives of individuals with BIF to fully understand their needs and challenges across various life domains.

## 1 | Introduction

Borderline intellectual functioning (hereinafter referred to as BIF) is a condition that can affect the quality of life of those who present it, impacting many areas of their daily lives: education, work, social interactions and health. Some authors even describe individuals with BIF as being ‘in no man’s land’ or in the ‘grey area’, as they are on the threshold of intellectual disability.

In the mid-20th century, the first level of the five that comprised intellectual disability (ID) (then known as ‘mental retardation’) was situated within an intelligence quotient (IQ) range of 70–85

(American Psychiatric Association 1952, 1968). In the first manual published by the American Psychiatric Association, the DSM-I (1952), this classification was termed ‘mild mental deficiency’. After a decade, it was renamed in the DSM-II (1968) as ‘borderline mental retardation’ establishing new IQ limits between 68 and 85. However, since the publication of the DSM-III (1980) and onwards, it has been understood that the upper limit of intellectual disability is set at two standard deviations below the mean, specifically at an IQ of 70, and the classification of BIF was relegated to a V code, which are used to identify issues that are a focus of clinical attention or may affect diagnosis or treatment, but are not mental disorders as such.

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New versions of diagnostic manuals, such as the DSM-5-TR (American Psychiatric Association 2022) and ICD-11 (World Health Organisation 2019), do not recognise BIF as a diagnostic category. However, they do mention it as 'Additional Conditions or Problems That May Be a Focus of Clinical Attention' or 'Other Specified Symptoms and Signs Relating to Cognition', respectively, emphasising the need for a rigorous evaluation of intellectual and adaptive functioning to differentiate BIF from mild intellectual disability. Similarly, the AAIDD manual (12th ed., Schalock, Luckasson, and Tassé 2021) dedicates only a brief six lines to BIF, defining it as 'a group of individuals who do not technically meet the criteria for a diagnosis of ID but share many characteristics and support needs of those who do'. Nonetheless, none of these manuals provide information regarding the specific characteristics of this condition or how to evaluate it.

As a result, the category of BIF has gradually lost visibility and importance, even though the population with BIF has neither disappeared nor diminished. The exact prevalence of people with BIF is unknown, which could be due to the lack of precise criteria for its definition, making it really difficult to diagnose in this population. However, if we focus exclusively on IQ, the percentage could be as high as 13.6%, when considering the normal distribution curve (Salvador-Carulla, Ruiz Gutiérrez-Colosia, and Nadal Pla 2011). This indicates that the number of individuals with BIF is undoubtedly much higher than that of individuals with intellectual disability, which, according to the American Psychiatric Association (2022), is estimated to be 1%.

In 2009, a group of professionals from various disciplines (neuropsychiatry, psychology, medicine, law, education, etc.) came together to establish a consensus on BIF. They defined BIF as a 'health meta-condition that requires specific socio-health, educational, and legal attention, characterised by diverse cognitive dysfunctions associated with an Intelligence Quotient (IQ) between 71 and 85, which determine a deficit in the person's functioning concerning activity restrictions and limitations in social participation' (Salvador-Carulla, Ruiz Gutiérrez-Colosia, and Nadal Pla 2011).

Taking into account the historical progression of the concept of BIF and the lack of clarity from international official organisations, we wonder: What is our current understanding of BIF? What methods exist for its evaluation and detection? In which specific areas may this condition impact individuals?

In 2014, Peltopuro et al. published a systematic review that included a total of 49 articles related to BIF, aimed at summarising all the scientific knowledge generated until March 2012 on this condition. This review sheds light on the main difficulties faced by individuals with BIF, analysing it from a general perspective, highlighting challenges in social domains, mental health issues and economic difficulties. The article concludes by emphasising the invisibility of BIF and the necessity for further research on the topic.

In 2017, another systematic review was published (Contena and Taddei 2017). This time, instead of approaching BIF from a general perspective, the review focused on cognitive and

psychological aspects, including 37 articles. This study concluded with the urgency of clearly defining the concept of BIF, differentiating it from Mild Intellectual Disability and other developmental disorders, as well as truly understanding the executive and cognitive functioning of this population to design effective specific programs.

A year later, a new systematic review emerged, this time focusing on psychiatric comorbidity in individuals with BIF (Peña-Salazar et al. 2018). The results revealed common comorbid disorders such as personality disorders, post-traumatic disorders, psychotic disorders, ADHD and others. The importance of mental health professionals (and health professionals in general) being aware of the vulnerability of individuals with BIF was highlighted.

More recently, in 2023, Stathopoulou et al. conducted a new literature review investigating academic and socio-emotional deficits in children with BIF. They included 12 articles and concluded that children with BIF face significantly greater learning difficulties than their peers with 'typical development'. Furthermore, they also exhibit challenges in socialising at school, leading to a more 'isolated' life that may result in adult consequences such as work difficulties or elevated levels of stress and anxiety.

To the best of our knowledge, there are no further systematic or scoping reviews analysing any aspects of BIF.

Given the considerable variability of factors that can affect individuals with BIF and that require study, we consider it necessary to conduct a new analysis of the available scientific literature on this topic from a general perspective. Therefore, the aims of this study are (1) to present the results of a scoping review that collects studies published after 2012, using the date of a previous review on the field (Peltopuro et al. 2014) as a reference point, and (2) to analyse the body of studies on BIF and identify potential knowledge gaps (Munn et al. 2018). The results of this study might contribute to a better understanding of BIF. Moreover, it will subsequently offer a broad overview of the literature published in the last 14 years on this topic, potentially leading to a comprehensive profile of the BIF population across all vital areas.

## 2 | Method

### 2.1 | Design

Given the few research available in the field on BIF, our primary aim was to analyse the existing body of literature regarding this topic. For this reason, in this study, we opted for a scoping review design. This methodology allows, as its name suggests, to determine the scope of a body of literature while ensuring methodological rigour, and it is especially useful for research on emerging research topics (Fernández-Sánchez, King, and Enríquez-Hernández 2020; Munn et al. 2018).

We followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses-Scoping Review Extension

(PRISMA-ScR) (Tricco et al. 2018) and the framework proposed by the Joanna Briggs Institute (JBI) (Peters et al. 2020) to conduct a 7-stage strategy: (1) development of a scoping review protocol, (2) protocol registration, (3) search, (4) source of evidence screening and selection, (5) data extraction, (6) analysis and presentation of results and (7) discussions and conclusions. For transparency and following the first and second previously mentioned stages, we registered this study via the Open Science Framework (OSF), where the full research protocol is available (<https://osf.io/km2rp>).

The identified documents are presented in this article as follows. First, their main characteristics are identified, differentiating the type of document, study design, location and the population sample used. Subsequently, the documents are classified in order to map the literature. To this end, the diagnostic criteria for intellectual disability proposed by the major manuals (American Psychiatric Association 2022; Schalock, Luckasson, and Tassé 2021) have been used, given the lack of clear, specific criteria for BIF: intellectual functioning, adaptive functioning and additions for a comprehensive evaluation. Additionally, a category of more general documents that approach BIF in a holistic manner has also been included. This classification is explained in more detail in the following sections.

A quality assessment has not been done as this is a scoping review carried out with the aim of providing an overview of the existing evidence, regardless of methodological quality or risk of bias, so it is not necessary to perform a critical appraisal of the sources included (Tricco et al. 2018).

## 2.2 | Research Question and Objective

The primary research question developed to guide the scoping review was ‘what is the existing body of literature on borderline intellectual functioning like?’. Therefore, our objective is to map the available evidence in the field of BIF, paying attention to its focus and volume.

## 2.3 | Identifying Relevant Studies

The data search was carried out following the FDC Framework (Faceting, Derivation, Combination) (Codina 2020). To develop a search strategy, we first conduct a ‘faceting’ phase through an initial limited search of articles only in Web of Science and EBSCOhost using the following query string: ‘borderline Intellectual functioning’ OR ‘subaverage intellectual functioning’ OR ‘borderline developmental disability’ OR ‘borderline intellectual disability’ OR ‘borderline IQ’ OR ‘borderline learning disability’ OR ‘borderline mental retardation’ OR ‘minor intellectual disability’ OR ‘mild mental deficiency’. Then, keywords of these articles related to BIF or similar were identified, allowing us to move on to the ‘derivation’ phase, where we searched for synonyms of these words both in Spanish and English. Finally, all terms were combined using Boolean operators. Thus, the final query string used was the following: ‘funcionamiento intelectual límite’ OR ‘capacidad Intelectual límite’ OR ‘CI límite’ OR

‘cociente intelectual límite’ OR ‘coeficiente intelectual límite’ OR ‘retraso mental límite’ OR ‘borderline Intellectual functioning’ OR ‘subaverage intellectual functioning’ OR ‘borderline developmental disability’ OR ‘borderline intellectual disability’ OR ‘borderline IQ’ OR ‘borderline learning disability’ OR ‘borderline mental retardation’ OR ‘minor intellectual disability’.

Multiple literature sources were searched to ensure comprehensiveness. We systematically searched the following databases in January 2024: ProQuest, WoS, SCOPUS and EBSCOhost (including ERIC, MEDLINE, PSICODOC, Teacher Reference Center, APA PsycArticles, APA PsycInfo and APA PsycTherapy), filtering the results by date (published from 2012 onwards) and by language (only published in Spanish or English). In addition, grey literature was found through sources such as Google and Google Scholar. Articles found in the references of other articles and not identified previously were also searched and included in the review.

Our search result in:

- ProQuest: 1090 published works
- WoS: 978 published works
- SCOPUS: 1025 published works
- EBSCOhost (ERIC, MEDLINE, PSICODOC, Teacher Reference Center, APA PsycArticles, APA PsycInfo, APA PsycTherapy): 651 published works

All these documents were included in the Mendeley Desktop software (Version 1.19.8), and after eliminating duplicates, a total of 1819 results were obtained.

## 2.4 | Study Selection

The inclusion criteria defined for both title/abstract and full-text examination were

- Documents published from 2012 onwards, taking as a reference the date of a previous similar review (Peltopuro et al. 2014).
- Study of BIF as a specific group.
- No limits on age, gender, nationality or other characteristics of the sample.
- No restriction by document type.
- Documents published in English or Spanish.

On the other hand, the only exclusion criterion was documents that include BIF without differentiating from Mild Intellectual Disability (e.g., mid-to-borderline disability classification and grouping IQ between 50 and 85).

Subsequently, a pilot screening test was carried out examining title and abstract, in which the three authors of this article reviewed 10 documents and, following the inclusion criteria indicated above, selected those that would pass to the full-text

screening phase and those that would be excluded. There was 100% agreement, so the screening continued in the same way. A total of 169 documents passed the full-text screening phase. Two of them were not retrieved. The first author did the full-text examination, then, the second author verified the first half of the documents and the third author verified the second half. Overall, there was 87% agreement. Where there was disagreement, the three authors jointly reviewed the text again and reached a decision by consensus. Of the 167 published works fully examined, 121 were included. In addition, eight documents identified in the references of other papers, one law and four grey literature documents found through Google were also included. In cases where information from one document was duplicated in another, only the more extensive document was included, with the other being excluded (e.g., Blasi et al. 2017; Durán Guitérrez et al. 2015).

Furthermore, since we expected that the screening and data extraction stages would be lengthy, we set up search alerts in all the aforementioned databases, using the same query string as in the main search. Five articles found through these alerts, published between January and June 2024, were additionally included. Thus, a total of 138 documents were included in the scoping review. The data from each of the selected documents were collected manually by the first author of this article, without using automation tools and with several readings to confirm the information collected.

The PRISMA flow diagram of the study selection process is shown in Figure 1.

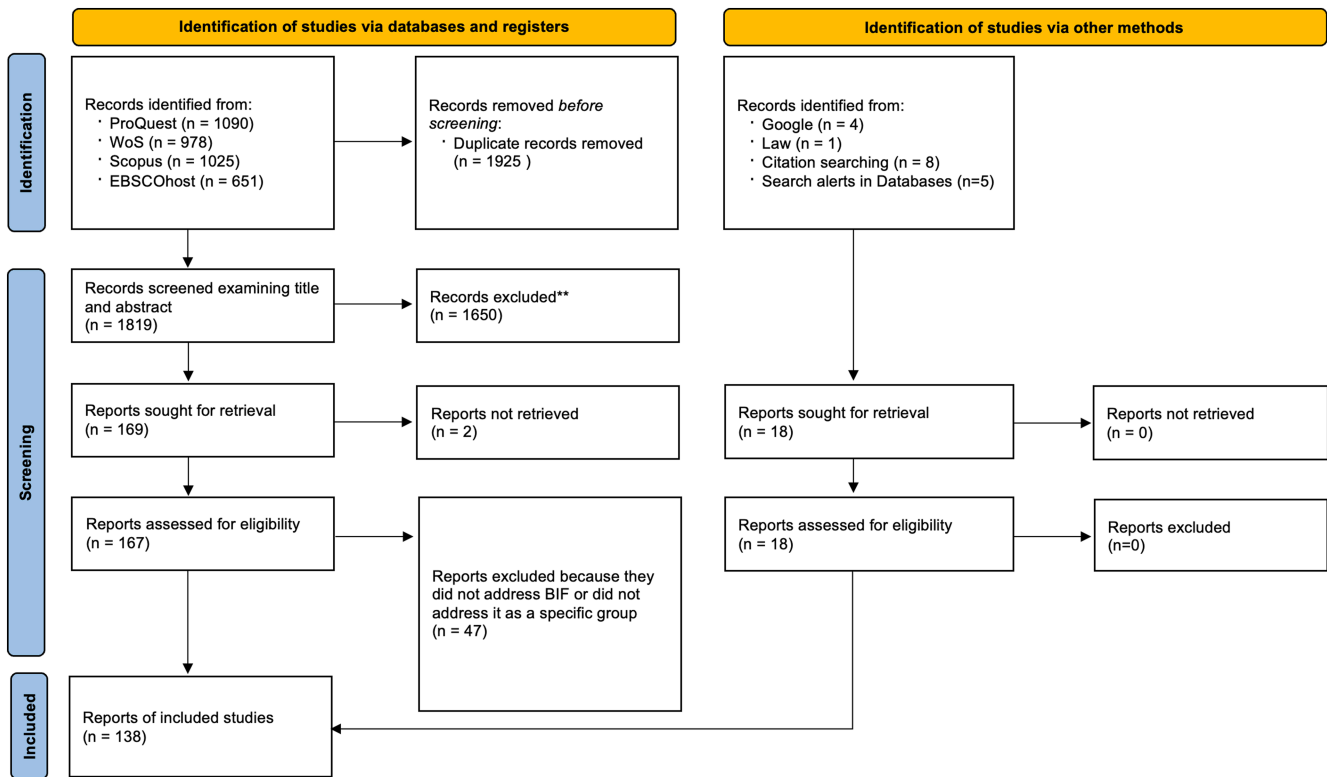
### 3 | Results

#### 3.1 | Main Study Characteristics

Among the documents included in the scoping review, a total of 108 (78%) were research articles published in academic journals, 16 (12%) were other academic literature (conference papers, conference paper abstracts, short communication, short report, chapter books, letter to the editor or project protocol), nine documents (7%) were grey literature (including documents published by the third sector or by other institutions and laws) and five (4%) were students thesis (doctoral, masters or degree). Additionally, another doctoral thesis was identified (Peltopuro 2022). However, it is not included in this scoping review, as its three main studies have already been covered in their published forms as academic articles (Peltopuro et al. 2014; Peltopuro et al. 2020; Peltopuro et al. 2023). Nevertheless, the depth of its introduction, discussion and conclusions makes it a worthwhile and highly recommended read.

Regarding the study designs and methods, these were not always clear in the documents. However, based on the data presented, the authors found that 90 (65%) were quantitative studies, three (2%) were qualitative studies, eight (6%) used mixed methods and 11 (8%) were case studies. Another 20 (14%) were literature reviews or theoretical studies and four (3%) were practical guides. Additionally, there were one law and a meta-analysis.

With respect to location, all continents are represented in this scoping review. Europe accounts for a total of 94 documents (68%), Asia for 25 (18%), North America for 11 (8%), South



**FIGURE 1** | Flow diagram of the study selection process. From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ* 2021;372:n71. doi: 10.1136/bmj.n71. For more information, visit: <http://www.prisma-statement.org/>.

America for four (3%), Oceania for three (2%) and Africa for one (1%). According to our study, the countries with the highest number of publications on BIF since 2012 are Italy, Spain and the Netherlands with 23, 19 and 16 documents published, respectively. The details for each country can be found in Figure 2 and in the table in Appendix I. When the article specified the country where the study was conducted, that country was recorded. If it did not, the country of the first author was noted.

Some of the documents used population samples with BIF (112 in total), whereas others were limited to conducting studies based on existing literature. Of the documents that used population samples, 33 (29%) included participants in childhood (ages 3–11), 29 (26%) included both children and adolescents, 16 (14%) focused exclusively on adolescence (ages 11–20), six (5%) specifically studied emerging and young adulthood (20–40 years old) and 15 (13%) included adult participants. Additionally, 13 (12%) documents included participants of all ages.

### 3.2 | Mapping the Literature on BIF

To map the available literature on BIF, the authors have organised all articles according to the diagnostic criteria provided by the DSM-5-TR (American Psychiatric Association 2022), as well as by the AAIDD (Schalock, Luckasson, and Tassé 2021), for intellectual disability. These criteria have been selected because, although the official diagnostic manuals do not provide specific guidelines on the evaluation or characteristics of BIF, both the AAIDD and the DSM-5-TR note that BIF shares many characteristics and support needs with intellectual disability. Therefore, its diagnosis requires a careful assessment to differentiate between them, as stated by the American Psychiatric Association (2022) in Section R41.83, referring to the BIF: ‘Differentiating borderline intellectual functioning and mild intellectual developmental disorder (intellectual disability) requires careful assessment of intellectual and adaptive functions and their discrepancies, particularly in the presence of co-occurring mental disorders

that may affect patient compliance with standardised testing procedures’ (p. 837).

In fact, there are countries such as the Netherlands where BIF is included within the classification of disabilities, ensuring access to services for this population (Nouwens, Lucas, Embregts, and van Nieuwenhuizen 2017; Wagemaker, van Hoorn, and Bexkens 2022; Wieland and Zitman 2016b; Woittiez et al. 2018). However, there are two opposing perspectives regarding the determination of a future classification for BIF. On the one hand, some argue that BIF should be recognised as a distinct disorder because of its specific characteristics that require specialised attention (Wieland and Zitman 2016b). On the other hand, others advocate for raising the threshold for Criterion A (intellectual functioning) in the diagnosis of intellectual disability from 70 to 85 (Greenspan 2017). Under this approach, a person would qualify for a diagnosis of intellectual disability if their IQ is below 85 and they also exhibit deficits in adaptive functioning, subsuming BIF as the highest level within intellectual disability.

Regardless of the perspective, it is evident that addressing the gap between the high prevalence and low recognition of BIF is urgent. Therefore, it is essential to incorporate BIF into diagnostic manuals in some form. In this article, we have organised the literature using the diagnostic criteria for intellectual disability, as these are the closest existing criteria to a diagnostic framework for BIF. However, it is crucial for the scientific community to continue researching, to delve deeper and to reach a consensus on the most appropriate criteria for diagnosing this population.

Moreover, thanks to this classification, it will be possible to identify the areas where research is most needed and, through a thorough study of each of these areas, to develop a profile of the population with BIF.

We found four major categories. The first one, *intellectual functioning*, corresponds to Criterion A for the diagnosis of intellectual disability according to the DSM-5-TR. The second

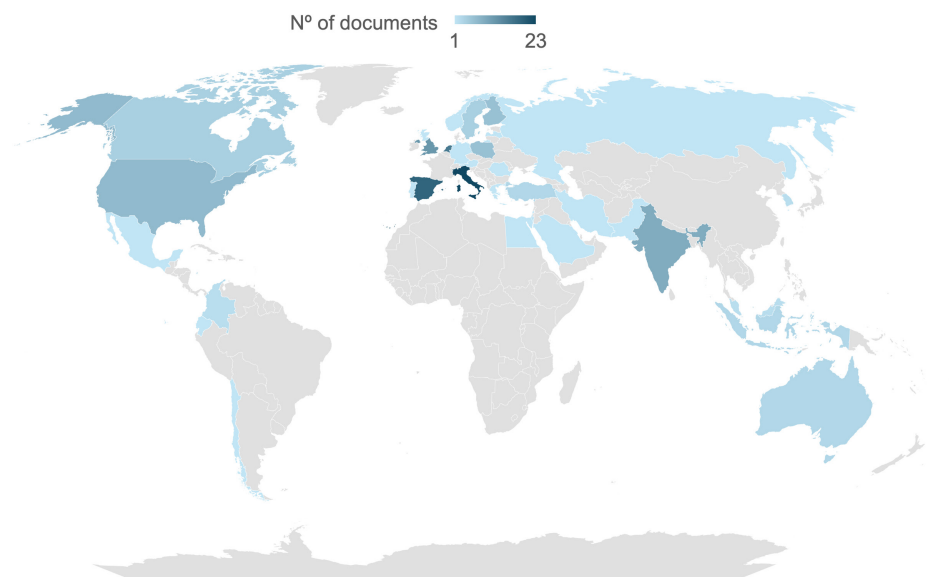


FIGURE 2 | Location of publications.

one, *adaptive functioning*, corresponds to Criterion B (p. 38). Additionally, a third category is identified, which includes other conditions that must be considered when making a diagnosis, following the guidelines of the manual published by the American Psychiatric Association (2022): ‘A comprehensive evaluation includes an assessment of intellectual capacity and adaptive functioning; identification of genetic and nongenetic etiologies; evaluation for associated medical conditions [...]; and evaluation for co-occurring mental, emotional, and behavioural disorders’ (p. 43). Finally, a *general* category has been created, which includes documents with a more holistic or general approach to BIF.

### 3.3 | Intellectual Functioning

The intellectual functioning category involves thematics such as reasoning, problem solving, planning, abstract thinking or judgement (American Psychiatric Association 2022; Schalock, Luckasson, and Tassé 2021). We found 34 documents meeting these criteria. Fourteen of them investigated the cognitive profile in general (Acosta Echavarría, Mejía Toro, and González Uribe 2022; Alvarán et al. 2016; Contena et al. 2017; Contena and Taddei 2017; Galletta et al. 2020; Galletta et al. 2024; Jankowska, Bogdanowicz, and Takagi 2014; Jankowska, Łockiewicz, and Łada-Maško 2021; Luque, Elósegui, and Casquero 2014; Pulina et al. 2019; Sättilä, Jolma, Meriläinen-Nipuli, and Koivu-Jolma 2022; Smirni et al. 2019; Stathopoulou, Papaioannou, and Driga 2023; Träff and Östergren 2021), whereas six specifically focused on executive functions (Água Dias, Albuquerque, and Simões 2017; Erostarbe-Pérez et al. 2022; Predescu et al. 2020; Van Rest et al. 2021; Roording-Ragetlie et al. 2022; Stefanelli and Alloway 2020). Four articles investigated the intellectual functioning from a neurophysiological point of view, describing the grey matter brain volume, brain network connectivity and so forth (Baglio et al. 2014; Blasi et al. 2019; Vaney, Khaliq, and Anjana 2015; Meza Salcido et al. 2019). Another four papers covered the language cognition area (Hesham, Afsah, and Baz 2024; Hosseini-Maasoum and Yar 2022; Muñoz-Oyarce et al. 2020; Nitz 2022). Other articles were also found that investigated various aspects of intellectual functioning, such as learning difficulties (Maltese et al. 2012; Torres et al. 2018), interventions in movement and cognition (Blasi et al. 2020), the evaluation process (Chevalier et al. 2016; Ozkan et al. 2018) or critical thinking (Rofiah et al. 2022).

### 3.4 | Adaptive Functioning

Adaptive functioning is defined by three domains: conceptual (academic) domain, social domain and practical domain. The American Psychiatric Association defines them as follows:

The *conceptual (academic) domain* involves competence in memory, language, reading, writing, math reasoning, acquisition of practical knowledge, problem solving, and judgment in novel situations, among others. The *social domain* involves awareness of others’ thoughts, feelings, and experiences; empathy; interpersonal communication skills; friendship

abilities; and social judgment, among others. The *practical domain* involves learning and self-management across life settings, including personal care, job responsibilities, money management, recreation, self-management of behavior, and school and work task organization, among others.

(American Psychiatric Association 2022)

On the other hand, the AAIDD (Schalock, Luckasson, and Tassé 2021) describes conceptual skills as ‘language and literacy; money, time, and number concepts; and self-direction’, social skills as ‘interpersonal skills, social responsibility, self-esteem, gullibility, naïveté (i.e., wariness), social problem solving, and the ability to follow rules/obey laws and to avoid being victimised’ and practical skills as ‘activities of daily living (personal care), occupational skills, healthcare, travel/transportation, schedules/routines, safety, use of money, use of the telephone’. Therefore, the different documents will be classified based on these two definitions provided by the official manuals.

We only found two articles that specifically addressed the evaluation of adaptive functioning in the population with BIF. Jonker et al. (2021) validate the *The ADaptive Ability Performance Test (ADAPT)* in people with intellectual disabilities and BIF, demonstrating a significant difference in adaptive functioning between the BIF population and the population with mild intellectual disability.

Additionally, Wexler, Pritchard, and Ludwig (2023) studied adaptive functioning in young people referred for neuropsychological care, comparing groups on the basis of IQ. Their main findings indicate that both the group with low-average IQ (80–89) and the group with below-average IQ (70–79) scored lower on adaptive functioning than the group with average IQ (90–109). In addition, the low-average IQ group scored higher in the conceptual domain than the below-average IQ group. These results show the need to assess adaptive functioning in neuropsychological assessments.

Although there were no additional articles specifically focusing on adaptive functioning in individuals with BIF, many other articles, in one way or another, addressed topics that fall within some of the domains of this concept.

In the ‘conceptual (academic) domain’, documents addressing topics such as literacy, math reasoning and academic experiences were included. We found 15 documents meeting these criteria. Three of them (Al-Mahdi and Abdul-Rahman 2020; Rahmah Zulkifli, Zin, and Majid 2019; Stefanelli and Alloway 2020) addressed the topic of mathematical skills, conducting interventions to develop mathematical thinking, designing methodologies based on gamification to teach the concept of numeracy and investigating the association between mathematical skills and working memory, respectively. Three articles investigated literacy, conducting an intervention in this area and exploring reading or vocabulary skills in children with BIF (Di Blasi et al. 2014; Di Blasi et al. 2019; Lee, Choi, and Ko 2023). Other articles approached the conceptual or academic domain in a more general way, addressing academic performance, functioning, skills or outcomes or investigating the memorisation

and learning process, compliance and task completion, or even incorporating technology for teaching (Acosta Echavarría, Mejía Toro, and González Uribe 2022; Sharma 2012; Träff and Östergren 2021; Varona Prevez 2015; Jankowska, Bogdanowicz, and Shaw 2012; Kusumah and Pudjiati 2017; Hassan, Mahmud, and Tap 2014). Finally, one article (Malik, Rehman, and Hanif 2012) aimed to assess the effectiveness of academic interventions on developmental skills, and another one (Murdiyanto, Wijayanti, and Sovia 2023) described how to quickly identify slow learners (a term used to refer to what we identify here as students with BIF) in rural schools. It is noteworthy that none of the articles within the conceptual domain have explored in depth the academic trajectories of individuals with BIF, nor have they addressed an inclusive education perspective that takes these individuals into account.

The ‘social domain’ includes topics such as interpersonal skills, social responsibility, obeying laws, friendship abilities, family relationships, awareness of other’s thoughts and so forth. We found 26 documents in this domain. Nine of them were related to the judicial world, prisons or crime (Athanassiou, Cale, and Dowse 2019; Bettenay et al. 2014; Catalano 2019; Fundación Magdalena Moriche 2021; Geijsen, Kop, and de Ruiter 2018; Gómez-Durán, Martí-Agustí, and Martín-Fumadó 2022; Herrington 2016; Miccio-Fonseca and Rasmussen 2013; Purzner and Weber 2014). Five of them were about life adversities (Blasi et al. 2019; Hassiotis et al. 2019; Sättilä, Jolma, Meriläinen-Nipuli, and Koivu-Jolma 2022; Valle et al. 2021; Vervoort-Schel et al. 2021). Two of them spoke about the theory of mind (Baglio et al. 2016; Vilenskaya and Lebedeva 2021). Other articles focused on family interactions (Fenning et al. 2014; Jankowska, Takagi, et al. 2014; Morgan 2016), and others dealt with social adaptability or functioning more in general (Galletta et al. 2016; Gigi et al. 2014; Wagemaker, van Hoorn, and Bexkens 2022; Wang et al. 2024). Finally, there was one article (Precenzano et al. 2016) that discussed the stress experienced by mothers of children with BIF and three others related to various topics within this domain (Varona Prevez 2015; Stathopoulou, Papaioannou, and Driga 2023; Mosquera-Gallego 2018).

In the ‘practical domain’, as indicated above, documents that address subjects such as job responsibilities or occupational skills, recreation and health care were included. In this case, 16 papers met the criteria. Most of them were about employment (Emerson, Hatton, and Baines 2018; Galletta et al. 2016; Marzo Campos et al. 2020; Palleró Soto, Petisco Rodríguez, and Huete García 2016; Peltopuro et al. 2020; Real Decreto 368/2021 2021), approaching this topic from various perspectives such as job placement or employers’ attitudes. One article was about homelessness (Pratt 2013), and another two talked about care services or access to services and supports (Karande et al. 2022; Woittiez et al. 2018; Strachan 2013). The remaining articles covered various topics included in the practical domain, like the economic burden (Karande, Ramadoss, and Gogtay 2019), the quality of life (Szumski et al. 2018), the identification of risk factors in girls consulting for early marriage (Nasıroğlu and Semerci 2017), behavioural control (Vilenskaya and Lebedeva 2021), the daily lives of young people with BIF in general (Segú and González 2024) and their vulnerability in day-to-day activities (Peltopuro et al. 2023).

### 3.5 | Additions for a Comprehensive Evaluation

To carry out a thorough assessment, there are other factors that also need to be considered, such as aetiologies, associated medical conditions and co-occurring mental, emotional and behavioural disorders (American Psychiatric Association 2022); likewise, the literature reflects this, also addressing these topics.

We found five articles that addressed the ‘aetiology’ of BIF, talking about genetics (Blasi et al. 2021; Choi et al. 2024; Cursio et al. 2023; Kolaitis et al. 2016) or primary aetiological causes (Sättilä, Jolma, and Koivu-Jolma 2022).

The category of ‘co-occurring mental, emotional and behavioural disorders’ is the one with the most papers, totalling 40. Of these, 26 were articles focused on comorbid mental health disorders (Alvarán et al. 2016; Barnevik Olsson et al. 2017; Christensen, Baker, and Blacher 2013; Galletta et al. 2020; Galletta et al. 2016; Galletta et al. 2024; Gigi et al. 2014; Hassiotis 2015; Hassiotis et al. 2017; Hassiotis et al. 2019; Hetland et al. 2021; Karande et al. 2023; King et al. 2019; Lim, Totsika, and Ali 2022; Melby et al. 2020; Mosquera-Gallego 2018; Panicker and Chelliah 2016; Peltopuro et al. 2020; Peña-Salazar et al. 2018; Ramsay 2016; Rudra et al. 2023; Saha, Singh, and Nischal 2015; Sanches Sequeira Mendes 2018; Wieland and Zitman 2016a; Wieland, Haan, and Zitman 2014; Wieland, Van Den Brink, and Zitman 2015), two were specifically centred on behaviour disorders (López Villalobos et al. 2012; Serenius et al. 2016) and two discussed other issues related to this topic, such as happiness (Ali et al. 2013) and dental anxiety (Fallea et al. 2016). Nine other articles focused on the emotion regulation or awareness (Alesi, Rappo, and Pepi 2015; Boulanger 2015; Handali and Primana 2017; Kashyap, Kiran Singh, and Arun 2020; Ozkan et al. 2018; Predescu et al. 2020; Smirni et al. 2019; Stathopoulou, Papaioannou, and Driga 2023; Bellemans et al. 2022). More generally, Jankowska (2016) proposes a model to promote psychological resilience in children and adolescents with BIF.

Only seven articles involving ‘associated medical conditions’ were found. Two of them described the sensory conduction in the auditory pathway in children with BIF (Khaliq, Anjana, and Vaney 2014) and the physical activity status and body composition (Kim and Baek 2024). Three articles were related to motor skills (Alesi et al. 2018; Bauer et al. 2021; Kaupuz and Larins 2017), and one was about power spectra analysis during sleep (Esposito and Carotenuto 2014). Finally, we included a practical guide for detecting BIF, aimed at healthcare staff (Fundación Magdalena Moriche 2022).

### 3.6 | General

Some articles were also found that discussed BIF in such a general way that they could not be included in any of the previous categories, such as the work by Peltopuro et al. (2014), already mentioned in the introduction, which conducted the general systematic review on BIF that precedes this scoping review. Two of them (Greenspan 2017; Wieland and Zitman 2016b)

provide a historical overview of the classification of BIF. Five articles (Fernell and Gillberg 2020; Frontera Sancho and Gómez Bahillo 2013; Hassiotis et al. 2022; Huete García, Pallero Soto, and Petisco Rodríguez 2015; Medina Gómez, Mercado Val, and García Alonso 2015) adopted a holistic approach to BIF, considering its definition, academic and cognitive functioning, mental health and comorbidity, assessment and diagnosis, aetiology, prevalence, social difficulties and population quantification. Two other articles (Nouwens, Lucas, Embregts, and van Nieuwenhuizen 2017; Nouwens, Lucas, Smulders, et al. 2017) described the background and characteristics of individuals with BIF who were referred to long-term services and conducted latent class analyses.

Three additional articles (BIF Consensus Group 2017; Salvador-Carulla et al. 2013; Martínez-Leal et al. 2020) are part of a series of actions carried out by the same group, known as the 'Borderline Intellectual Functioning Consensus Group', which brought together professionals from different countries and disciplines to establish a conceptual framework and consensus guidelines on criteria for interventions, attention measures and support for the comprehensive care of individuals with BIF. Other valuable documents produced by the same group, such as the one published by Salvador-Carulla, Ruiz Gutiérrez-Colosia, and Nadal Pla (2011), were not included in this scoping review because of their publication date, prior to 2012.

As shown in Appendix I, several studies explored the relationships between two or three of the categories proposed in this article. These studies have been included in each of the categories they address, specifying the particular topic in each case.

## 4 | Discussion

Thanks to the present scoping review, we answer our research objective: to provide an overview of the existing evidence around BIF, paying attention to its focus and volume. Thus, we can observe how the literature on BIF is organised, where the scientific community's focus lies, and, most importantly, the direction, methods, methodologies and techniques that should guide future research efforts.

### 4.1 | Research Approach

Regarding the research approach, we identified a strong presence of scientific articles employing quantitative methodologies to investigate various topics related to BIF. These methodologies can be particularly useful for conducting statistical analyses and obtaining objective data by analysing large population samples, as well as for validating instruments. This is the case, for example, in the study by Emerson, Hatton, and Baines (2018), where, through a national survey, they applied different tests to a total of 15 453 people (2108 of them with BIF) and investigated the association between employment status and health in two groups of people: people with BIF and people with ID, or, again, in the case of Bellemans et al. (2022), who, using quantitative methodologies, evaluated the psychometric properties of the adapted version for people with intellectual disabilities and BIF

of the ABSQ-id test, an instrument to assess bodily sensations of anger, using a sample of 208 people.

In this review, we found only three qualitative-only articles (Bettenay et al. 2014; Catalano 2019; Marzo Campos et al. 2020). And, except in the case of Bettenay et al. (2014), who interviewed children with BIF and ID to see how accurate their testimony was in a cross-examination, both Catalano (2019) and Marzo Campos et al. (2020) interviewed professionals (community practitioners and employees of companies in the industrial sector, respectively) about their opinion of people with BIF, not people with BIF themselves.

However, we must not overlook the significant potential of qualitative methodologies to provide a deeper understanding and conduct research on minorities or historically marginalised or excluded groups, such as individuals with BIF (McDuffie and Scruggs 2008). Additionally, qualitative approaches can help assess individual subjectivity and develop responses tailored to specific needs (Mertens 2015). For example, among the mixed methodology studies, we found three in which they directly interviewed people with BIF (in addition to their families or professionals) (Frontera Sancho and Gómez Bahillo 2013; Segú and Gonzalez 2024; Huete García, Pallero Soto, and Petisco Rodríguez 2015) with the objectives of identifying their needs. It is noteworthy that all three of these documents were published by or in collaboration with Spanish third-sector entities or associations. This shortage of in-depth studies interviewing individuals with BIF should prompt us to reflect on the research techniques we employ and the objectives we pursue in our investigations.

### 4.2 | Location

In terms of publication location, Italy, Spain and the Netherlands stand out. In Italy, certain authors, such as Valeria Blasi (Blasi et al. 2021; Blasi et al. 2019; Blasi et al. 2020) and Diana Galletta (Galletta et al. 2016; Galletta et al. 2020; Galletta et al. 2024), are highlighted for their contributions to the topic, significantly increasing the country's presence in this review. Spain's prominence is expected since the review included documents published in both English and Spanish. Among the documents from Spain, there is a notable presence of grey literature, with publications from third-sector organisations focused on BIF. Finally, the case of the Netherlands deserves mention. In addition to the contributions of prolific authors such as Jannelien Wieland (Wieland, Haan, and Zitman 2014; Wieland, Van Den Brink, and Zitman 2015; Wieland and Zitman 2016a, 2016b), the high volume of publications is also due to the fact that individuals with mild intellectual disabilities (IQ 50–70) and those with BIF (IQ 71–85) receive care from the same institutions. However, for that same reason, many Dutch articles were excluded from this review as they grouped individuals with MID-BIF and did not provide specific results on BIF (e.g., Hulsman et al. 2023; Seelen-de Lang et al. 2019).

### 4.3 | Age

Regarding the age of participants in studies that included population samples, most focus on children and adolescents. Although

this is crucial for understanding how BIF affects childhood and for establishing early intervention mechanisms, it overlooks research on young adults and adults, who could provide valuable information on the entire life cycle. This information can shed light on critical periods in the lives of these individuals, such as the transition from compulsory education to secondary education and from secondary education to the labour market (Peltopuro et al. 2014). Understanding these transitions allows for the design of interventions in educational, labour and social spheres that address the service gaps faced by individuals with BIF.

#### 4.4 | Thematic Areas

So, in which areas does the scientific community focus its attention regarding BIF? As illustrated in Figure 3, most publications focus on comorbid mental, emotional or behavioural disorders related to BIF, followed by cognitive research. This contrasts with the information provided by Peltopuro et al. (2014), who found only six studies on mental health aspects, with most of the included articles addressing topics such as neurocognitive functioning. Most studies investigating psychiatric disorders in individuals with BIF report a high comorbidity between these conditions (e.g., Lim, Totsika, and Ali 2022; Melby et al. 2020; Peña-Salazar et al. 2018). However, it cannot be concluded that all individuals with BIF have a high likelihood of developing mental health issues. It is essential to consider the sample type and its source. Some studies conducted in mental health services selectively include individuals with BIF referred for such problems, potentially overlooking those without mental health disorders. Nevertheless, we recognise the challenges in accessing representative samples of this population and identifying them in more 'neutral' environments, such as schools or workplaces.

It is important to note that, out of the 138 documents included in this scoping review, only two articles explicitly focus on adaptive functioning (Jonker et al. 2021; Wexler, Pritchard, and Ludwig 2023). However, when publications addressing the three domains of adaptive functioning (conceptual, social and practical) are considered collectively, a strong interest in this area becomes evident. Various aspects are explored, including academic performance, social and family relationships, delinquency, life adversities, employment, homelessness, access to services and support, economic expenditure, quality of life and vulnerability in daily activities, but no further papers directly mention adaptive functioning as their object of study.

Why are there not more publications explicitly focused on the adaptive functioning of individuals with BIF?

A possible explanation for this issue could be the absence of an official definition explicitly mentioning adaptive functioning, alongside intellectual functioning, as diagnostic criteria for BIF. This need may have been amplified by the decision made some time ago to exclude this condition from diagnostic categories, leaving individuals with BIF in a kind of limbo. Another hypothesis for the limited research in the very specific of adaptive functioning is the absence of psychopedagogical assessment tools specifically standardised for the BIF population.

Therefore, although there is undoubtedly interest in researching the conceptual, social and practical domains, as well as a clear need for support for individuals with BIF in these areas, it appears necessary to establish a terminological consensus within the scientific community. It is urgent to begin speaking clearly about adaptive functioning in BIF, in order to deepen research and develop a precise definition of this condition.

Expanding knowledge on the characteristics and assessment of adaptive functioning in individuals with BIF is crucial, not only because it would enable more individualised interventions, such as those following Person-Centered Planning approaches (Robertson et al. 2007) but also because BIF assessment undeniably requires evaluating both intellectual and adaptive functioning (American Psychiatric Association 2022; Salvador-Carulla, Ruiz Gutiérrez-Colosía, and Nadal Pla 2011; Schalock, Luckasson, and Tassé 2021; Wexler, Pritchard, and Ludwig 2023). Although these two constructs are related, they are distinct and equally important in diagnosis (Tassé and Kim 2023).

According to Mertens (2015), a possible solution in the absence of valid and reliable quantitative instruments to assess a specific construct (in this case, adaptive functioning in individuals with BIF) would be to expand research using qualitative methodologies. This approach could help deepen understanding and serve as a foundation for developing more suitable assessment tools.

Additionally, it would be beneficial to expand knowledge by creating new instruments or by standardising and validating existing tools for measuring adaptive functioning, such as the ICAP, ADAPT, ABAS II or DABS (Bruininks et al. 1986; Jonker et al. 2021; Oakland and Algina 2011; Tassé et al. 2016), ensuring that they are sensitive enough to differentiate between the

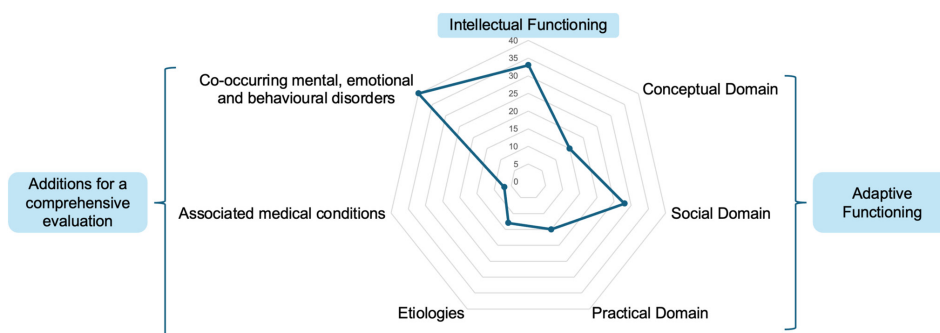


FIGURE 3 | Distribution of publications based on thematic categories.

adaptive functioning of individuals with intellectual disabilities, BIF and individuals with normotypical development.

As a limitation of this scoping review, we can note the lack of quality assessment of the included documents. Although the objective of the review was to provide an overview of the existing evidence and, therefore, it was not necessary to perform a critical appraisal of the sources included (Tricco et al. 2018), it would be interesting to conduct such assessments in future studies. Additionally, because of the large number of studies included in this scoping review, a detailed description and analysis of their content could not be addressed in this article. However, a thorough analysis of each category in this classification is planned for future publications.

## 5 | Conclusions

People with BIF fall between two stools: They do not meet the criteria for a diagnosis of intellectual disability, but they also lack the necessary skills to function in daily life as a person without disabilities. As a result, they face difficulties in various areas of life, unable to access specialised resources that could support them.

This scoping review presents the current state of the literature on BIF, mapping the documents published from 2012 to 2024. It can be observed a growing interest from the scientific community regarding this topic, with a total of 138 documents included, compared with the 49 included by Peltopuro et al. (2014) in their review of the literature published up to 2012. This increase in scientific output can be explained by the general rise in publications in recent years, but it could also reflect the genuine concern of professionals in this field, because of the daily challenges faced by individuals with BIF.

By categorising the publications based on the areas outlined in diagnostic manuals, we can deepen the research by thoroughly examining each of these categories. This approach will allow for the development of a comprehensive profile of individuals with BIF, addressing intellectual functioning, adaptive functioning and other conditions that must be considered to conduct a thorough evaluation.

However, the thematic mapping of the publications reveals an uneven distribution, with most studies concentrating on emotional, mental and behavioural comorbidities, as well as cognitive aspects. Furthermore, there is considerable interest in the conceptual, social and practical domains of adaptive functioning. However, this specific term is not used in the literature on BIF, which is an issue that must be addressed, as it is a key factor both for accurate diagnosis and for the implementation of effective intervention strategies.

Moreover, the techniques and methods used in the analysed publications tend to be primarily quantitative or mixed, focusing on the application of tests and neglecting qualitative methodologies. These could offer deeper insights, particularly into the needs and concerns expressed by individuals with BIF themselves.

Therefore, it is concluded that there is a need to further expand the knowledge base on BIF, with particular emphasis on

adaptive functioning, clarifying the terminology and establishing a clear definition of BIF. Future research should explicitly include the direct testimonies of these individuals. To truly understand the concerns and needs of individuals with BIF, we must listen to their voices.

## Conflicts of Interest

The authors declare no conflicts of interest.

## Data Availability Statement

Research data are not shared.

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The references of the documents included in this scoping review are marked with an asterisk (\*) at the beginning.

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## Appendix I

Author (year)	Document type	Location	Study design	Sample ages	Category
Acosta Echavarria, Mejia Toro, and Gonzalez Uribe (2022)	Art.	Colombia	Quant.	Adoles.	1, 2
Água Dias, Albuquerque, and Simões (2017)	Art.	Portugal	Quant.	Child. /Adoles.	1
Alesi, Rappo, and Pepi (2015)	Art.	Italy	Quant.	Child.	7
Alesi et al. (2018)	Art.	Italy	Quant.	Child.	6
Ali et al. (2013)	Art.	UK	Mix.	Adult.	7
Al-Mahdi and Abdul-Rahman (2020)	Art.	Saudi Arabia	Quant.	Adoles.	2
Alvarán et al. (2016)	Art.	Colombia	Lit.	Child. /Adoles.	1, 7
Athanassiou, Cale, and Dowse 2019	Art.	Australia	Quant.	Adult.	3
Baglio et al. (2014)	Art.	Italy	Case	Child. /Adoles.	1
Baglio et al. (2016)	Art.	Italy	Quant.	Child.	3
Barnevik Olsson et al. (2017)	Art.	Sweden	Mix.	Child. /Adoles.	7
Bauer et al. (2021)	Art.	Germany	Quant.	Adoles.	6
Bellemans et al. (2022)	Art.	Netherlands	Quant.	Adult.	7
Bettenay et al. (2014)	Art.	UK	Qual.	Child.	3
BIF Consensus Group (2017)	Grey	Spain	Theo.	NS	8
Blasi et al. (2019)	Art.	Italy	Quant.	Child.	1, 3
Blasi et al. (2020)	Art.	Italy	Quant.	Child.	1
Blasi et al. (2021)	Art.	Italy	Quant.	Child.	5
Boulanger (2015)	Mast.	Canada	Quant.	Child. /Adoles.	7
Catalano (2019)	Art.	Australia	Qual.	NS	3
Chevalier et al. (2016)	Art.	Canada	Quant.	Adult.	1
Choi et al. (2024)	Art.	Korea	Case	Child.	5
Christensen, Baker, and Blacher (2013)	Art.	USA	Quant.	Child.	7
Contena and Taddei (2017)	Art.	Italy	Lit.	NS	1
Contena et al. (2017)	Art.	Italy	Quant.	Child. /Adoles.	1
Cursio et al. (2023)	Art.	Italy	Case	Adoles.	5
Di Blasi et al. (2014)	Art.	Italy	Case	Child.	2
Di Blasi et al. (2019)	Art.	Italy	Quant.	Child. /Adoles.	2
Emerson, Hatton, and Baines (2018)	Art.	UK	Quant.	Young.	4
Erostarbe-Pérez et al. (2022)	Art.	Spain	Quant.	Adoles.	1
Esposito and Carotenuto (2014)	Art.	Italy	Quant.	Child. /Adoles.	6
Fallea et al. (2016)	Art.	Italy	Quant.	All	7
Fenning et al. (2014)	Art.	USA	Mix.	Child.	3
Fernell and Gillberg (2020)	Chapt.	Sweden	Theo.	NS	8
Frontera Sancho and Gómez Bahillo (2013)	Grey	Spain	Mix.	All	8
Fundación Magdalena Moriche (2021)	Grey	Spain	Pract.	NS	3
Fundación Magdalena Moriche (2022)	Grey	Spain	Pract.	NS	6
Galletta et al. (2016)	Conf.	Italy	Quant.	Adult.	3, 4, 7
Galletta et al. (2020)	Art.	Italy	Quant.	Young.	1, 7

Author (year)	Document type	Location	Study design	Sample ages	Category
Galletta et al. (2024)	Art.	Italy	Quant.	Young.	1, 7
Geijsen, Kop, and de Ruiter (2018)	Art.	Netherlands	Quant.	Adult.	3
Gigi et al. (2014)	Art.	Israel	Quant.	Adoles.	3, 7
Gómez-Durán, Marti-Agustí, and Martin-Fumadó (2022)	Art.	Spain	Quant.	Adult.	3
Greenspan (2017)	Art.	USA	Lit.	NS	8
Handali and Primana (2017)	Conf.	Indonesia	Case	Child.	7
Hassan, Mahmud, and Tap (2014)	Conf.	Malaysia	Lit.	NS	2
Hassiotis (2015)	Art.	UK	Lit.	NS	7
Hassiotis et al. (2017)	Short R.	UK	Quant.	All	7
Hassiotis et al. (2019)	Art.	UK	Quant.	All	3, 7
Hassiotis et al. (2022)	Chapt.	UK	Theo.	NS	8
Herrington (2016)	Art.	UK	Lit.	NS	3
Hesham, Afsah, and Baz (2024)	Art.	Egypt	Quant.	Child.	1
Hetland et al. (2021)	Art.	Norway	Quant.	Young.	7
Hosseini-Maasoum and Yar (2022)	Art.	Iran	Quant.	Adoles.	1
Huete García, Pallero Soto, and Petisco Rodríguez (2015)	Grey	Spain	Mix.	Adult.	8
Jankowska (2016)	Art.	Poland	Theo.	NS	7
Jankowska, Bogdanowicz, and Shaw (2012)	Art.	Poland	Theo.	NS	2
Jankowska, Łockiewicz, and Łada-Maško (2021)	Art.	Poland	Quant.	Child. /Adoles.	1
Jankowska, Bogdanowicz, and Takagi (2014)	Art.	Poland	Quant.	Child. /Adoles.	1
Jankowska, Takagi, et al. (2014)	Art.	Poland	Quant.	Child. /Adoles.	3
Jonker et al. (2021)	Art.	Netherlands	Quant.	Adult.	2, 3, 4
Karande, Ramadoss, and Gogtay (2019)	Art.	India	Quant.	Child. /Adoles.	4
Karande et al. (2022)	Art.	India	Quant.	Adult.	4
Karande et al. (2023)	Art.	India	Quant.	Child. /Adoles.	7
Kashyap, Kiran Singh, and Arun (2020)	Art.	India	Quant.	Child.	7
Kaupuzs and Larins (2017)	Art.	Latvia	Quant.	Child. /Adoles.	6
Khaliq, Anjana, and Vaney (2014)	Art.	India	Quant.	Child.	6
Kim and Baek (2024)	Let.	South Korea	Quant.	Adoles.	6
King et al. (2019)	Art.	Australia	Quant.	Adoles.	7
Kolaitis et al. (2016)	Art.	Netherlands	Case	Child.	5
Kusumah and Pudjiati (2017)	Art.	Indonesia	Case	Child.	2
Lee, Choi, and Ko (2023)	Art.	Korea	Quant.	Child.	2
Lim, Totsika, and Ali (2022)	Art.	UK	Quant.	Adult.	7
López Villalobos et al. (2012)	Art.	Spain	Quant.	Child.	7
Luque, Elósegui, and Casquero (2014)	Art.	Spain	Quant.	Child. /Adoles.	1
Malik, Rehman, and Hanif (2012)	Art.	Pakistan	Quant.	Child.	2
Maltese et al. (2012)	Art.	Italy	Quant.	Adoles.	1
Martínez-Leal et al. (2020)	Art.	Spain	Theo.	NS	8

Author (year)	Document type	Location	Study design	Sample ages	Category
Marzo Campos et al. (2020)	Art.	Spain	Qual.	NS	4
Medina Gómez, Mercado Val, and García Alonso (2015)	Art.	Spain	Pract.	NS	8
Melby et al. (2020)	Art.	Netherlands	Quant.	Adoles.	7
Meza Salcido et al. (2019)	Art.	Mexico	Quant.	Child. /Adoles.	1
Miccio-Fonseca and Rasmussen (2013)	Art.	USA	Quant.	Child. /Adoles.	3
Morgan (2016)	Chapt.	UK	Theo.	NS	3
Mosquera-Gallego (2018)	Art.	Spain	Case	Child.	3, 7
Muñoz-Oyarce et al. (2020)	Art.	Chile	Quant.	Child.	1
Murdiyanto, Wijayanti, and Sovia (2023)	Art.	Indonesia	Mix.	Child.	2
Nasiroğlu and Semerci (2017)	Art.	Türkiye	Quant.	Adoles.	4
Nitz (2022)	Doct.	USA	Quant.	Child. /Adoles.	1
Nouwens, Lucas, Embregts, and van Nieuwenhuizen (2017)	Art.	Netherlands	Quant.	All	8
Nouwens, Lucas, Smulders, et al. (2017)	Art.	Netherlands	Quant.	All	8
Ozkan et al. (2018)	Art.	Türkiye	Quant.	Child.	1, 7
Pallero Soto, Petisco Rodríguez, and Huete García (2016)	Grey	Spain	Pract.	NS	4
Panicker and Chelliah (2016)	Art.	India	Quant.	Child. /Adoles.	7
Peltopuro et al. (2014)	Art.	Finland	Lit.	NS	8
Peltopuro et al. (2020)	Art.	Finland	Quant.	All	4, 7
Peltopuro et al. (2023)	Art.	Finland	Quant.	All	4
Peña-Salazar et al. (2018)	Art.	Spain	Lit.	NS	7
Pratt (2013)	Doct.	USA	Meta-a.	Adult.	4
Precenzano et al. (2016)	Art.	Italy	Case	Child.	3
Predescu et al. (2020)	Art.	Romania	Quant.	Child.	1, 7
Pulina et al. (2019)	Art.	Italy	Quant.	Child. /Adoles.	1
Purzner and Weber (2014)	Conf. Abst.	Austria	Quant.	NS	3
Rahmah Zulkifli, Zin, and Majid (2019)	Art.	Malaysia	Theo.	Child.	2
Ramsay (2016)	Conf. Abst.	Finland	Quant.	Child. /Adoles.	7
Real Decreto 368/2021 (2021)	Law	Spain	Law	NS	4
Rofiah et al. (2022)	Art.	Türkiye	Quant.	Adoles.	1
Roording-Ragetlie et al. (2022)	Art.	Netherlands	Quant.	Child. /Adoles.	1
Rudra et al. (2023)	Art.	UK	Quant.	Adult.	7
Saha, Singh, and Nischal (2015)	Short C.	India	Case	Young.	7
Salvador-Carulla, Garcia-Gutierrez, et al. (2013)	Grey	Spain	Theo.	NS	8
Sanches Sequeira Mendes (2018)	Degr.	Spain	Quant.	Adult.	7
Sättilä, Jolma, and Koivu-Jolma (2022)	Art.	Finland	Quant.	Child. /Adoles.	5
Sättilä, Jolma, Merilänien-Nipuli, and Koivu-Jolma (2022)	Art.	Finland	Quant.	All	1, 3
Segú and Gonzalez (2024)	Art.	Spain	Mix.	Adoles.	4
Serenius et al. (2016)	Conf. Abst.	Sweden	Quant.	Child.	7
Sharma (2012)	Art.	India	Quant.	Child. /Adoles.	2

Author (year)	Document type	Location	Study design	Sample ages	Category
Smirni et al. (2019)	Art.	Italy	Quant.	Adoles.	1, 7
Stathopoulou, Papaioannou, and Driga (2023)	Art.	Greece	Lit.	NS	1, 3, 7
Stefanelli and Alloway (2020)	Art.	Italy	Quant.	Child.	1, 2
Strachan (2013)	Conf.	Scotland	Case	Young.	4
Szumski et al. (2018)	Art.	Poland	Quant.	All	4
Torres et al. (2018)	Proj.	Ecuador	Quant.	Child. /Adoles.	1
Träff and Östergren (2021)	Art.	Sweden	Quant.	Child.	1, 2
Valle et al. (2021)	Art.	Italy	Quant.	Child.	3
Van Rest et al. (2021)	Conf. Abst.	Netherlands	Quant.	Child. /Adoles.	1
Vaney, Khaliq, and Anjana (2015)	Art.	India	Quant.	Child.	1
Varona Prevez (2015)	Mast.	Canada	Quant.	Child. /Adoles.	2, 3
Vervoort-Schel et al. (2021)	Art.	Netherlands	Quant.	Child. /Adoles.	3
Vilenskaya and Lebedeva (2021)	Conf.	Russia	Quant.	Child.	3, 4
Wagemaker, van Hoorn, and Bexkens (2022)	Art.	Netherlands	Mix.	Adoles.	3
Wang et al. (2024)	Art.	UK	Quant.	All	3
Wexler, Pritchard, and Ludwig (2023)	Art.	USA	Quant.	Child. /Adoles.	2, 3, 4
Wieland and Zitman (2016a)	Art.	Netherlands	Quant.	All	7
Wieland and Zitman (2016b)	Art.	Netherlands	Theo.	NS	8
Wieland, Haan, and Zitman (2014)	Art.	Netherlands	Quant.	All	7
Wieland, Van Den Brink, and Zitman (2015)	Art.	Netherlands	Quant.	Adult.	7
Woittiez et al. (2018)	Grey	Netherlands	Lit.	NS	4

Abbreviations: Adoles. = adolescence; Adult. = adulthood; All = all ages; Art = research article; Case = case study; Chapt. = chapter book; Child. = childhood; Conf. Abst. = conference paper abstract; Conf. = conference paper; Degr. = degree thesis; Doct. = doctoral thesis; Grey = grey literature; Let. = letter to the editor; Lit. = literature review; Mast. = master thesis; Meta-a. = meta-analysis; Mix. = mixed methods; NS = no sample; Pract. = practical guide; Proj. = project protocol; Qual. = qualitative; Quant. = quantitative; Short C. = short communication; Short R. = short report; Theo. = theoretical study; Young = emerging and young adulthood; 1 = intellectual functioning; 2 = conceptual domain; 3 = social domain; 4 = practical domain; 5 = aetiologies; 6 = associated medical conditions; 7 = co-occurring mental, emotional and behavioural disorders; 8 = general.