Mapping the evolution of gender dysphoria research: a comprehensive bibliometric study

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Abstract

The definition of gender dysphoria has been the subject of extensive scientific debate in various fields. The Diagnostic and Statistical Manual of Mental Disorders, 5th edition (DSM-V) characterizes gender dysphoria as a psychological condition due to a discrepancy between perceived and assigned gender. The scientific community has engaged in an extensive debate over the years regarding the classification of gender dysphoria, initially characterizing it as a gender identity disorder and subsequently removing it from the category of mental disorder. This paper aims to use bibliometric techniques to analyze scientific productivity and study the evolution of content on gender dysphoria from 1991 to 2022. It provides to map the scientific research production in this field through the science mapping approach highlighting the changes that have taken place over the past three decades.

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1 Introduction

Gender dysphoria is a psychological condition characterized by a lack of alignment between the gender assigned to an individual at birth and the gender they identify with (APA 2013; Butler 2020). This leads to various levels of discomfort, as individuals may feel uncomfortable with their biological sex, primary and secondary sexual characteristics, and social gender roles. Over the years, the scientific debate to establish a clear definition of gender dysphoria and explore the social and psychological consequences for people who experience dysphoria has been varied and has covered different fields of interest (Lindley et al. 2022). This is due to several factors, such as the classification as a mental disorder, the diagnostic criteria used, the goals of therapeutic intervention, and its potential association with sexual orientation (Gonsalves 2020).

According to the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-V), a diagnosis requires a condition persisting for over six months with a presence of at least two of these symptoms:

1. Discomfort regarding the alignment of perceived sex and primary and secondary sexual characteristics.
2. A desire to change one's sexual characteristics.
3. A wish to acquire the sexual characteristics of the opposite gender.
4. An inclination to identify as the opposite gender.
5. A longing to be acknowledged and treated as the opposite gender by others.
6. A belief in possessing emotions and reactions typical of the opposite gender.

Additionally, the second criterion states that the condition must be associated with clinically significant distress or impairment in social, occupational, affective-relational, and other areas of life (Frew et al. 2021). People who experience gender dysphoria may identify themselves as transgender, nonbinary, or, more generally trans + (Galupo et al. 2021), but not all trans and intersex people experience gender dysphoria. The increasing interest in gender dysphoria and its evolving diagnosis is evident in publications by scientific communities worldwide. These documents emphasize the necessity for comprehensive research assessments using advanced approaches and strategies for knowledge discovering.

Mapping scientific knowledge is the main task for understanding a topic by reviewing the literature, synthesizing research findings, and identifying future research areas. Bibliometrics simplify this process by providing a transparent and repeatable methodology based on statistical measurements of scientific production, scientists, and activities (Cuccurullo et al. 2016). They are widely used to assess field impact, researchers, papers, and journals, as well as to identify research gaps, trends, and opportunities.

In this study we employ a prominent approach to highlight both structural and cognitive patterns within the research field, namely science mapping (Aria et al. 2020). Science mapping allow to identify, visualize, and analyze the themes and trends in a research domain, both synchronically and diachronically, without repetition (Callon et al. 1983; Cobo et al. 2011). With this approach, we aimed to map the gender dysphoria research field, evaluate its scientific productivity, and highlight its current and emerging frontiers over the past 30 years. Our proposal is to provide insights into the field of gender dysphoria research. To achieve this, we present the following research questions:

RQ1: How has the landscape of scientific productivity in the field of gender dysphoria research evolved over time?

RQ2: What are the key trends and advancements reflected in the current state of the scientific literature?

RQ3: What are the significant events that have influenced the shifting trends and understanding of gender dysphoria over time?

The paper is structured as follows: Sect. 2 outlines the materials and methods utilized for collecting and analyzing bibliographic data. In Sect. 3, we present the main findings of the study. Section 4 is dedicated to discussing the results obtained, emphasizing their implications for research. In the last section, we provide conclusions considering both the limitations and advantages of bibliometric analysis.

2 Materials and methods

2.1 Research design

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA- Liberati et al. 2009) diagram was used to describe the entire process of data collection (Fig. 1). It provides a detailed representation of all the inclusion and exclusion criteria used for retrieving documents, ensuring the selection process is replicable and transparent.

The Web of Science (WoS) indexing database—launched by the Institute for Scientific Information (ISI) and now maintained by Clarivate Analytics—and Science Citation Index Expanded (SCI expanded) and the Social Science Citation Index (SSCI) Web of Science Core Collections were used to find the documents. WoS is widely considered as the bibliographic source offering the highest quality of information, with a coverage comparable to that of other well-known databases (D'Aniello et al. 2022). In order to identify publications related to gender dysphoria, gender identity disorder, and gender incongruence topics, the followed structured-query was used: *((TS=("gender dysphoria") OR TS=("gender identit* disorder*") OR TS=("gender incongruenc*")))*. The TS tag searches for query terms in titles, abstracts, and keywords fields of indexed documents. Quotation marks are used to identify records containing exact term sequences, while asterisks are wildcards used to find possible term variations (e.g., "gender incongruenc*" for *gender incongruence* or *gender incongruences*). Documents were collected in March 2023. We refine our search by selecting only articles, proceedings papers, review articles, and book chapters in english published from 1991 to 2022. The main bibliographic data including titles, abstracts, author names, and keywords, as well as cited references, were collected. The collection was screened by two selectors (AS and LDA) to include only relevant and coherent documents. We manually removed 184 documents from the collection due to the absence of abstracts or their overly specific focus on medical aspects, such as surgical procedures. At the end of the process, the final collection included 1847 documents. The *bibliometrix* R open-source package (Aria and Cuccurullo 2017) for quantitative research in scientometrics and bibliometrics was used to perform bibliometric analyses on the whole collection.

2.2 Reference publication year spectroscopy (RPYS)

Reference Publication Year Spectroscopy (RPYS) was introduced by Marx et al. in (2014) as a tool to detect the seminal documents of a research field. By considering the metadata from the references, including books, handbooks, or theses not necessarily indexed in a bibliographic database (Ciavolino et al. 2022), RPYS enables the identification of seminal
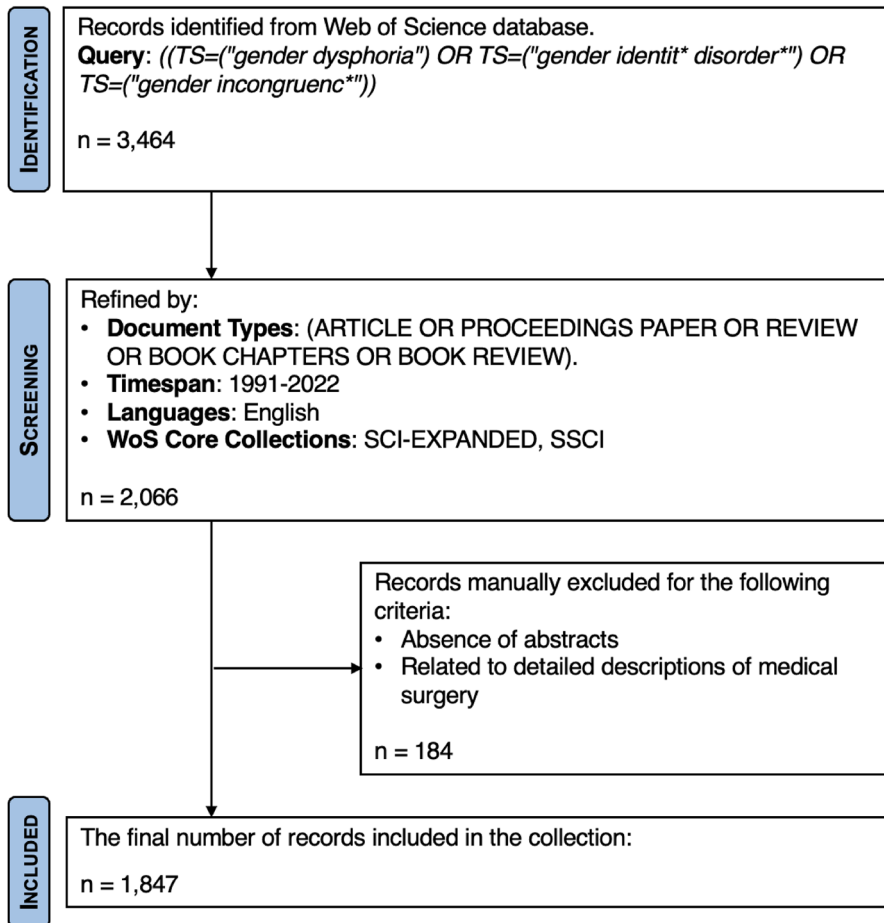
Fig. 1 PRISMA flow diagram

documents as crucial historical roots of a field. The distinctive features of RPYS make it an invaluable tool to find the most influential documents, offering insights into the development of theories and their applications. RPYS analysis is represented by a plot with two lines: a black line representing the number of cited references per year; a red line measuring the *deviation from the 5-year median* at the current time *t* compared to the previous four (*t-1, t-2, t-3,* and *t-4*). Peaks of the red line in publication years identify which papers have the greatest influence in a publication set (Thor et al. 2018).

2.3 Conceptual structure: mapping the thematic evolution

The conceptual structure of a collection provides a comprehensive view of a research domain (Börner et al. 2003). It describes a research field or themes derived from documents or terms, sourced from authors' keywords, titles, or abstracts, and examined using co-word network analysis (Wang et al. 2019). Starting from these terms, knowledge of a

document collection can be represented through a co-occurrence network. The frequency of two terms that co-occur is quantified and normalized by the association index (Eck and Waltman 2009). The result is a co-occurrence matrix presented as an undirected weighted network. Each node in the network corresponds to a term, with the size of a node typically proportional to the frequency of the associated term. The links between nodes and their strength measure the co-occurrence of terms. Once the analysis is employed, each cluster was then plotted on a two-dimensional graph call thematic map (Cobo et al. 2011) according to the *Callon centrality*, which quantifies the level of importance that a theme holds within a research field, and the *Callon density*, which serves as the degree of the theme's development (Callon et al. 1983). The thematic diagram allows identifying four typologies of topics based on their position on the map. In the first quadrant (upper-right), topics characterized by both high centrality and density are known as well-developed motor themes. Moving to the second quadrant (upper-left), topics represent isolated or niche themes, exhibiting low centrality but high density, indicating limited significance for the research field. In the third quadrant (lower-left), there are topics known as emerging or declining themes, reflecting weak or marginal trends. Lastly, the fourth quadrant (lower-right) identifies basic and transversal themes cutting across various research areas.

In this study, we mapped the conceptual structure of the collected scientific documents to identify topics and trends in the research field of gender dysphoria. Dividing the reference timespan into distinct slices allows for tracking the evolution of research over time, providing a thematic map for each time slice. We performed a thematic evolution analysis by partitioning the reference timespan (1991–2022) into three time slices: (1) 1991–2012, to explore the primary themes investigated by the scientific community on gender identity disorder; (2) 2013–2017, to trace the scientific output after the release of DSM-V and the definition of gender dysphoria; (3) 2018–2022, to examine how the research has evolved since the introduction of International Classification Disease (ICD-11) and the shift to gender incongruence. Within each temporal interval, the Walktrap community detection algorithm (Pons and Latapy 2006) was performed using 200 authors' keywords as unit of analysis. A minimum cluster frequency of 5 and an inclusion index weighted by word occurrences set to 0.1 were established. Each cluster in the maps was labeled with its top three most frequently keywords. In addition, to enhance the readability of findings, we reformulated some keywords by performing the followed text normalization process. We started by downloading all the author keywords used in the documents of the collection. Then, they were manually reviewing to identify any terms that needed to be remove if not informative for the study (e.g., clinical terms such as "patient" or "hospital") or combined if they are synonyms.

3 Results

3.1 Data descriptions: main information about the collection

As reported in Table 1, the 1,847 documents included the collection were published by 5,498 authors on 585 different sources such as Journals and Books. The average citation per document is 28.98. The annual growth rate of the publication is 15.52%. As shown by the annual scientific production (Fig. 2), two events highlight an evident growth in scientific productivity. From 2013, the publications become more consistent (534–28.91%) until a rapid growth in 2018 (864–46.78%), according to the introduction of gender dysphoria

Table 1 Main Information about the collection

Overview	
Timespan	1991:2022
Sources (Journals, Books, etc.)	585
Documents	1847
Annual growth rate %	15.52
Document average age	7.11
Average citations per doc	28.98
References	42,007
Document contents	
Keywords plus (ID)	2637
Author's keywords (DE)	2811
Authors	
Authors	5498
Authors of single-authored docs	204
Authors collaboration	
Single-authored docs	263
Co-authors per doc	4.9
International co-authorships %	19.22
Document types	
Article	1540
Book chapter	6
Proceedings paper	22
Review	279
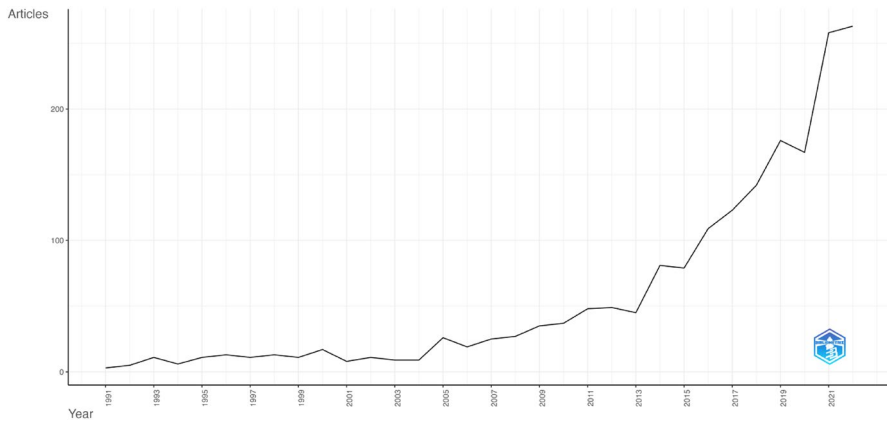
Fig. 2 The Trend of the annual scientific production from 1991 to 2022

as a psychological condition in DSM-V where an individual experiences a lack of alignment between gender identity and the sex assigned at birth. The World Health Organization (WHO) release the latest version of the ICD-11 in 2018 marking a notable moment in the research field, as it removes gender dysphoria from mental disorders and redefines it as

gender incongruence. This change contributes to an increase in attention to the topic in terms of scientific productivity.

3.2 Identification of relevant documents

To measure the citations of scientific articles, two indicators were considered. Global citation (GC) is an impact measure of a document provided by Clarivate, counting the citations of a document received by all the records indexed on WoS. Instead, Local citation (LC) measures the number of citations received by records within a specific collection. These two indicators provide information on the global influence of a document across multiple subject areas (e.g., psychology, social sciences, medicine) and its impact in a particular field described by a collection of documents (i.e., gender dysphoria), respectively. The ratio between LC and GC provides a measure of the specificity of the documents being analyzed in the research field of gender dysphoria. This specificity is likely influenced by the database, which was collected based on the PRISMA diagram described in Sect. 2.1 *Research Design*.

Based on the GC index, the most cited document is "*Endocrine treatment of transsexual persons: an Endocrine Society clinical practice guideline*" (Hembree et al. 2009)*,* followed by two other documents published by de Vries in 2014 and 2011. These papers are notable for developing clinical protocols. They highlight how the methodological developments are the primary references that incorporate puberty suppression, intersex hormones, and gender reassignment surgery to allow individuals to reassign their gender. The work by Wallien and Cohen-Kettenis (2008) also highlights the focus on pubertal treatment dysphoria and the psycho-social conditions of individuals. Furthermore, the most influential papers in terms of the LC/GC ratio (percentage) are Deogracias et al. (2007), Cohen-Kettenis (1997), and Cohen-Kettenis and Pfäfflin (2010). It is observed that the papers with a higher LC/GC ratio tend to approach dysphoria from a psychological perspective, while globally cited papers take a medical-treatment approach to dysphoria (Table 2).

To identify relevant documents considered seminal papers in scientific production, the Reference Publication Year Spectroscopy (RPYS) was used. Figure 3 displays two lines representing the Number of Cited References (NCRs) per year and the deviation from the 5-year median, while Table 3 lists the seminal documents that identify the historical scientific roots of gender dysphoria. The table includes the publication year, document identification, and a summary of the main theme. Documents published from 1948 to 1968 focused on the origin and development of sexuality, particularly in male subjects, and the psychological conditions that lead them to perceive themselves as the opposite gender. Later, Green's studies (1974; 1987) established the groundwork for the definition of gender identity disorder, treating the disorder from a medicalized perspective as well, through the definition of several criteria for the diagnosis (Zucker and Bradley 1990). Since the 2000 s, studies have emphasized the treatment of gender dysphoria through hormone therapies and surgery treatments (Hembree et al. 2009; Murad 2010). Additionally, attention has been given to the psycho-social difficulties experienced by individuals who experience dysphoria (Coleman 2012; Dhejene 2016).

3.3 Authors' scientific production

The top 10 authors (i.e., the most productive in terms of the number of published articles) are listed in Fig. 4, highlighting their scientific production over time. Three main

Table 2 Most relevant documents

Document	DOI	Publication Year	GC[a]	LC[b]	LC/GC Ratio (%)
HEMBREE WC, 2009, J CLIN ENDOCR METAB	10.1210/jc.2009–0345	2009	671	190	28.32
DE VRIES ALC, 2014, PEDIATRICS	10.1542/peds.2013–2958	2014	454	155	34.14
DE VRIES ALC, 2011, J SEX MED	10.1111/j.1743–6109.2010.01943.x	2011	301	129	42.86
WALLIEN MSC, 2008, J AM ACAD CHILD PSY	10.1097/CHI.0b013e31818956b9	2008	303	123	40.59
COHEN KETTENIS PT, 1997, J AM ACAD CHILD PSY	10.1097/00004583–199702000–00017	1997	232	114	49.14
MURAD MH, 2010, CLIN ENDOCRINOL	10.1111/j.1365–2265.2009.03625.x	2010	361	114	31.58
PACK NP, 2012, PEDIATRICS	10.1542/peds.2011–0907	2012	250	113	45.20
ARCELUS J, 2015, EUR PSYCHIAT	10.1016/j.eurpsy.2015.04.005	2015	250	111	44.40
DE VRIES ALC, 2010, J AUTISM DEV DISORD	10.1007/s10803–010–0935-9	2010	246	108	43.90
AITKEN M, 2015, J SEX MED	10.1111/jsm.12817	2015	226	106	46.90
SMITH YLS, 2005, PSYCHOL MED	10.1017/S0033291704002776	2005	221	104	47.06
DHEJNE C, 2016, INT REV PSYCHIATR	10.3109/09540261.2015.1115753	2016	275	103	37.45
DHEJNE C, 2011, PLOS ONE	10.1371/journal.pone.0016885	2011	284	100	35.21
DE VRIES ALC, 2012, J HOMOSEXUAL	10.1080/00918369.2012.653300	2012	224	98	43.75
DELEMARRE-VAN DE WAAL HA, 2006, EUR J ENDOCR	10.1530/eje.1.02231	2006	190	88	46.32
STEENSMA TD, 2013, J AM ACAD CHILD PSY	10.1016/j.jaac.2013.03.016	2013	216	87	40.28
DRUMMOND KD, 2008, DEV PSYCHOL	10.1037/0012–1649.44.1.34	2008	199	82	41.21
WIEPJES CM, 2018, J SEX MED	10.1016/j.jsxm.2018.01.016	2018	213	81	38.03
DEOGRACIAS JJ, 2007, J SEX RES	10.1080/00224490701586730	2007	144	80	55.56
COHEN-KETTENIS PT, 2010, ARCH SEX BEHAV	10.1007/s10508–009–9562-y	2010	160	80	50.00

[a]Local Citations;

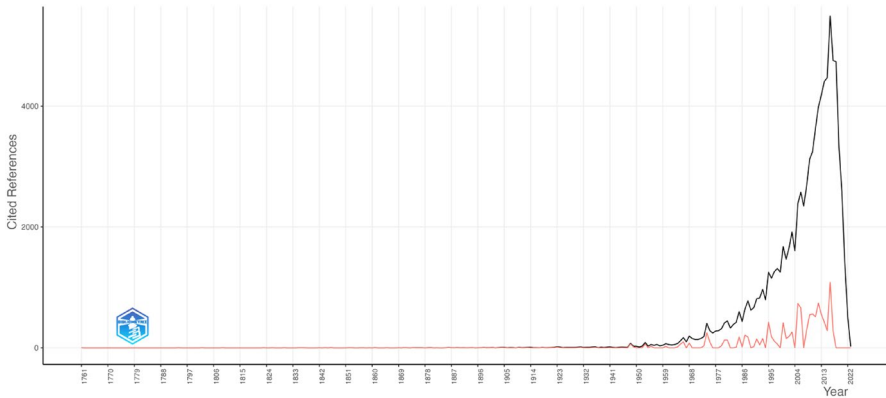[b]Global Citations; Top 20 documents by GC

Fig. 3 Reference publication year spectroscopy

information are summarized in this plot for each author: (1) the scientific timeline, which measures their research activities, traced by the red line; (2) the number of published articles indicated by the bubble size; and (3) the number of total citations per year proportional by the color intensity of bubble. In our collection, Zucker KJ and Bradley SJ had the most extended scientific timeline production (1992—2022), followed by Cohen-Ketten PT, which published more articles in 2016 than others and received almost 120 total citations. She is a Professor Emeritus of gender development and psychopathology at the Department of Child and Adolescent Psychiatry, University Medical Center Utrecht, leading the Group on Gender Identity Disorders (DIG), the only national reference center in the Netherlands for gender identity disorders. In addition, Cohen-Ketten PT is internationally recognized as one of the experts in transsexualism and holds membership in various scientific committees of the Harry Benjamin International Gender Dysphoria Association, a non-profit organization focused to advance evidence-based care, education, research, public policy, and respect in transgender health. Zucker KJ, instead, is a professor at the Department of Psychiatry and Psychology at the University of Toronto and editor-in-chief of Archives of Sexual Behavior since 2001. He published significant contributions about gender dysphoria, albeit with controversial implications for sex and gender minorities. Throughout his extensive career, Zucker has formulated disease models aimed at understanding the experiences of these minority population. Currently, he is Head of the Child and Adolescent Gender Identity Clinic and Psychologist-in-Charge at the Child and Family Studies Centre, Clarke Institute of Psychiatry (Toronto). He, also, collaborated with Bradley SJ, Professor Emeritus at the Department of Psychiatry at the University of Toronto, a fellow of the Royal College of Physicians, and chair of the DSM-IV Subcommittee on Gender Disorders, collecting clinical and research data over twenty years and became an international authority on gender dysphoria in children and adolescents. She has also contributed to the development of a specific therapeutic approach aimed at mitigating the progression of gender diverse youth towards transgender adulthood, commonly referred to as reparative therapy.

Table 3 Seminal documents

Year	Seminal document	Summary
1948	KINSEY AC, 1948, SEXUAL BEHAV HUMAN M	Kinsley et al. published pioneering work in the study of human sexuality. The study reveals that many participants have engaged in sexual activities with individuals of the same sex, which often begins during adolescence
1953	HAMBURGER C, 1953, J AM MED ASSOC	The study defines transvestism as the desire to wear clothes typically worn by the opposite gender and discusses its psychological and social effects. It also examines the psychiatric consequences for individuals and the effectiveness of hormone and surgery treatments
1960	GREEN R, 1960, J NERV MENT DIS	The paper carries out an analysis of five pre-pubertal boys who express a desire to feel female. Despite not having genitalia of the opposite sex – like hermaphrodites – they perform typically feminine actions
1966	BENJAMIN H, 1966, TRANSSEXUAL PHENOMEN	The author represents a groundbreaking approach in the field of medicine, as it views transsexualism not as a psychological issue, but rather as a somatic disorder that can be effectively addressed through medical intervention
1968	PAULY IB, 1968, J NERV MENT DIS	The author provides a summary of the current state of sex-change procedures, illustrating that individuals who have undergone these procedures (especially men) report contentment with their physical bodies
1974	GREEN R, 1974, SEXUAL IDENTITY CONF	The book covers sexual identities, including transsexualism, and is important in the scientific literature on dysphoria because it uses the term "gender identity disorder," which was later included in DSM-III
1987	GREEN R, 1987, SISSY BOY SYNDROME D	Green refers to the "sissy boy syndrome" as a label for boys who exhibit traditionally feminine behavior and desire to identify as female
1995	ZUCKER KJ, 1995, GENDER IDENTITY DISO	The article discusses the diagnosis of gender identity disorder (GID) in children and adolescents, suggesting that a diagnosis should only be made if symptoms persist for at least six months. It also addresses psychosexual issues associated with GID
2005	SMITH YLS, 2005, PSYCHOL MED	The study shows that gender reassignment therapy improves the mental health and overall satisfaction of transgender people, with post-treatment elimination of gender dysphoria
2009	HEMBREE WC, 2009, J CLIN ENDOCR METAB	The article offers a clinical guide that outlines the management of endocrine care in transsexual patients. It focuses on providing recommendations and contraindications for hormone therapy (HRT) for individuals who desire to undergo gender transition
2010	MURAD MH, 2010, CLIN ENDOCRINOL	The first systematic review conducted on hormone therapy and sex reassignment revealed that the existing studies have demonstrated enhancements in sexual satisfaction, self-esteem, and mental health

Table 3 (continued)

Year	Seminal document	Summary
2012	COLEMAN E, 2012, INT J TRANSGENDERISM	The guidelines are designed to ensure high-quality care and psychological support for transgender, trans-sexual, and gender non-conforming persons, and to reduce unequal treatment and discrimination in the field of health
2016	DHEJNE C, 2016, INT REV PSYCHIATR	A scientific literature review that delves into the link between gender dysphoria and the mental health. People who have gender dysphoria are more susceptible to developing mental illnesses, including depression, anxiety, and post-traumatic stress disorder
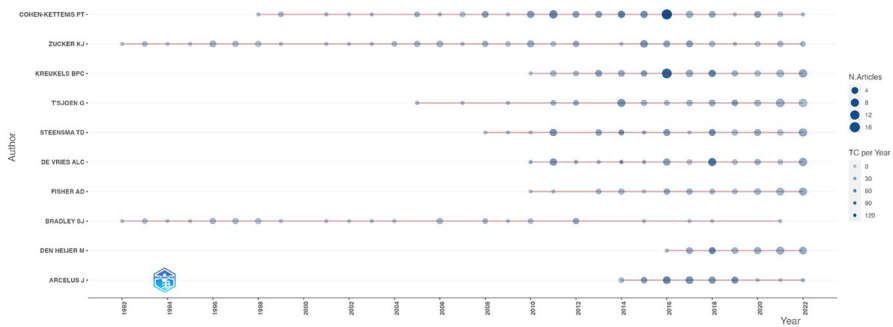
Fig. 4 Top authors' production over time

3.4 Country scientific collaboration and production

Countries' productivity and international collaboration were measured using the Single Country Production (SCP) and Multiple Country Production (MCP) indexes. SCP refers to articles with authors from one country, while MCP includes articles with co-authors from different countries. By dividing the MCP value by the total number of articles, the MCP Ratio is obtained, which measures the percentage of articles written by a country with at least one author from another country.

As reported in Table 4, among the top ten productive countries, Netherlands (MCP Ratio = 34.6%), Belgium (MCP Ratio = 40.4%), and Sweden (MCP Ratio = 30.4%) are the most open to international collaborations, while highly productive countries such as the USA, United Kingdom, Canada, and Australia have a lower propensity to international collaboration (MCP Ratio = 9.17%, 20.00%, 25.8%, and 19.10%, respectively). As highlighted from the country collaboration map (Fig. 5), the USA is the leading country in terms of publications and was mostly shared with Canada and Australia. In summary, European nations tend to collaborate more strongly, with the Netherlands and Norway especially having a dense network of collaborations. It is worth

Table 4 Country production

Country	Articles	SCP[a]	MCP[b]	MCP Ratio (%)[c]
USA	621	564	57	9.2
Netherlands	153	100	53	34.6
United Kingdom	145	116	29	20
Canada	143	106	37	25.9
Australia	89	72	17	19.1
Italy	74	59	15	20.3
Germany	70	50	20	28.6
Belgium	57	34	23	40.4
Sweden	56	39	17	30.4
Spain	49	42	7	14.3

[a]Single Country Production
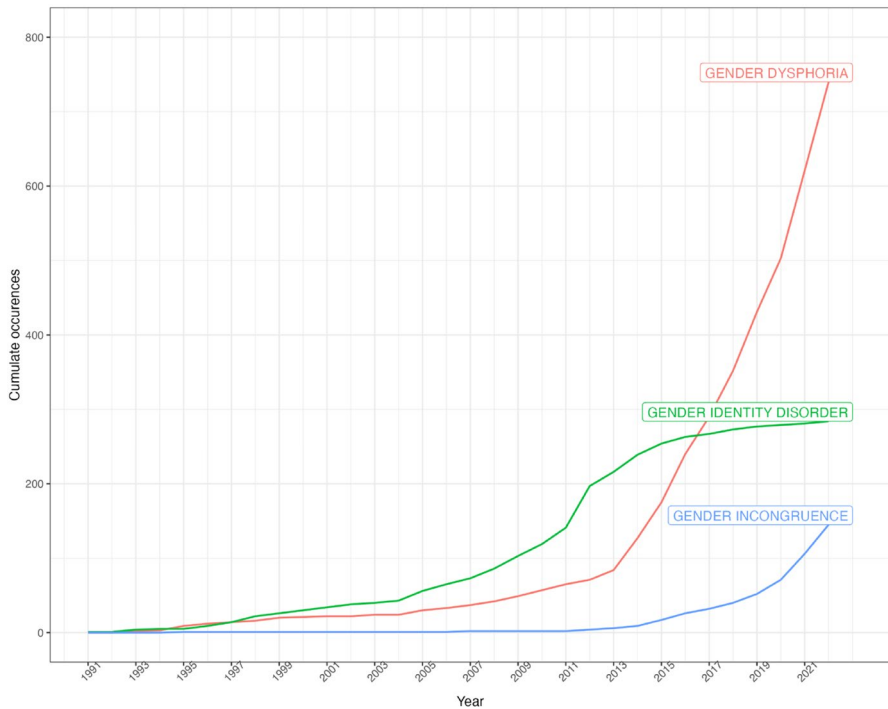[b]Multiple Country Production
[c]MCP/Articles

Fig. 5 Words DYNAMICS OCCURRENCES OVER TIME

noting that the Netherlands, Belgium, and Sweden have been recognized for their progressive and inclusive policies regarding gender identity and transgender rights. These countries have implemented laws and regulations that support transgender individuals, such as allowing legal gender recognition and providing access to healthcare services related to gender dysphoria. In particular, Netherlands is known for its long history of research and expertise in the field of gender identity and transgender healthcare. It has recognized as one of the European countries for their progressive and inclusive policies regarding gender identity and transgender rights, introducing laws and regulations that support transgender individuals, such as legal gender recognition and providing access to healthcare services related to gender dysphoria. In addition, this country provides specialized gender clinics and centers of excellence, such as the VU University Medical Center in Amsterdam, which have contributed significantly to the research and treatment of gender dysphoria. In recent years, the United States has experienced a significant increase in awareness and recognition of gender dysphoria and transgender rights. This has led to more acceptance and support from society for researching gender dysphoria. The growing visibility and better understanding of transgender individuals' experiences have likely sparked interest in studying and addressing the challenges they face. Additionally, having access to research funding is crucial for scientific productivity in any field, including gender dysphoria. The United States has various funding agencies, like the National Institutes of Health (NIH), that provide substantial financial support for medical and psychological research. These funding opportunities encourage researchers to study gender dysphoria and contribute to the overall progress of scientific knowledge.

3.5 Topic analysis: words frequency over time

In the DSM-IV (APA 1994), the diagnosis of gender dyspjotia was classified as "Sexual and Gender Identity Disorders", which referred to as gender identity disorder. Originally, the gender identity disorder described persistent identification with the opposite sex and discomfort with one's assigned gender role (Bradley and Zucker 1997). The focus was on the emotional distress caused by this incongruence rather than the individual's gender identity (Carroll 2007). Figure 5 shows the terminology evolution used to describe gender dysphoria from 1991 to 2022. The graph indicates the cumulative frequency of the following terms: gender dysphoria, gender identity disorder, and gender incongruence. Gender identity disorder was widely used in scientific literature until 2015, despite the use of gender dysphoria in earlier works. In 2013, there was a notable shift in the terminology used for gender dysphoria, following the change in the DSM-V to remove the term disorder and reduce the associated stigma. Gender dysphoria was redefined as a psychological condition characterized by an incongruity between one's gender identity and the sex assigned at birth. Then, the use of the term gender dysphoria increased significantly, surpassing that of gender identity disorder. Since 2018, the WHO has replaced gender dysphoria with gender incongruence to reduce the pathologization of gender dysphoria. Although the graph indicates an increase in the use of the term gender incongruence since 2018, gender dysphoria remains the most widely used term.

3.6 Conceptual structure: thematic evolution findings

3.6.1 Thematic map of 1991–2012 time slice

Findings of the first thematic map (1991–2012) are showed in Fig. 6. The motor themes highlight the scientific community's interest in psychological and psychic issues related to individuals experiencing dysphoria. In particular, the light red cluster focuses on psychiatric disorders, such as psychosis and schizophrenia, and their impact on body perception. The light green cluster summarizes themes related to twin studies examining genetic and environmental influences on physical and behavioral traits, while the green cluster refers to the spectrum of sexual development disorders, specifically gender dysphoria diagnoses in intersex individuals. The basic themes include different clusters related to defining criteria for the diagnosis of gender identity disorder and dysphoria, with a focus on transgender and transsexual subjects (Cohen-Kettenis et al. 1997). During this period, topics on sex steroids, such as estrogens and testosterone, were investigated. Paraphilias, including hebephilia, themes were also discussed. Kinship ties were considered concerning sexual orientation, particularly in men, founding a significant correlation between male sexual orientation and fraternal birth order. This indicates that the older brothers a male has from the same mother, the more likely he is to have a homosexual orientation. Moreover, prevalent research focused on body perception in individuals with gender dysphoria and its relationship with the onset of anorexia nervosa. Three clusters were identified as emerging or declining themes. The light green cluster pertains to primordial studies on same-sex physical attraction for both men and women. The light red cluster realted to eating disorders appears to be fundamental in individuals experiencing dysphoria, as well as early research testing the correlation between autism and gender identity disorders. Finally, clusters identified as niche themes, are related to psychological conditions topics that
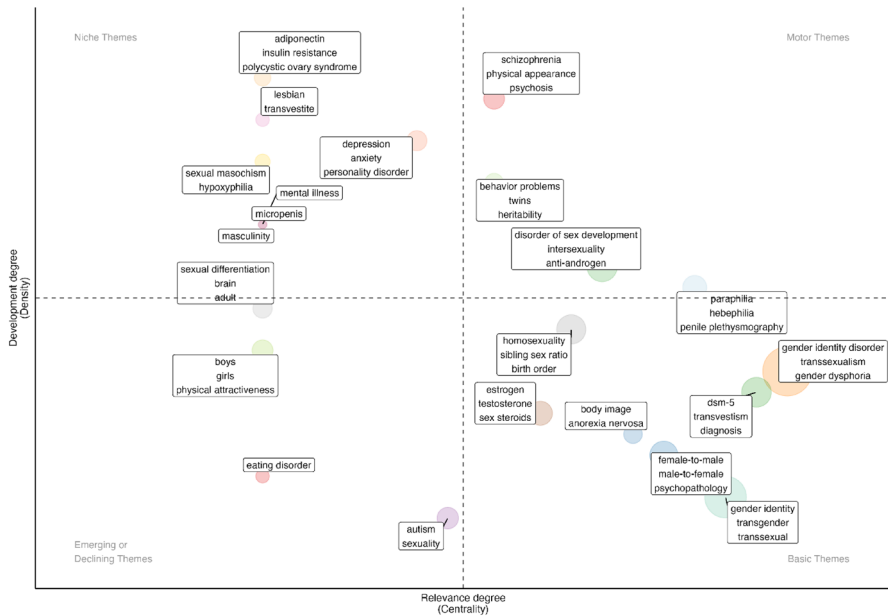
Fig. 6 Thematic map 1991–2012 time slice

dysphoric people experiences, such as anxiety and depression or the onset of personality disorders, but also to paraphilias related to masochism and transvestism.

3.6.2 Thematic map of 2013–2017 time slice

Figure 7 shows the thematic map for the period of 2013–2017. Based on the motor themes, the light grey cluster pertains to research on sexual identity and the LGBTQ+community, while the azure cluster focuses on the two major classification systems used in psychiatry (i.e., DSM-5 and ICD-11). The yellow cluster covers literature on kinship, sexual orientation, and sibling relations. These themes are being extensively developed over time. The basic themes, including gender-affirming surgery, gender dysphoria, gender, and transgender, are central to the scientific literature. Mental health aspects such as anxiety, depression, hormone studies, and paraphilias are also widely explored. The niche themes include different clusters that refer to studies on sexuality and sexual desire, as well as the redefinition of how gender roles are socially structured (Davis et al. 2016). Additionally, there are clusters related to the medical field, exploring the topic of castration, and numerous contributions that analyze visual-spatial abilities based on sex differences and gender identity. Among the emerging or declining themes, there is a growing interest in verifying whether individuals experiencing dysphoria abuse harmful substances such as alcohol and drugs, as well as analyzing risky sexual behavior.
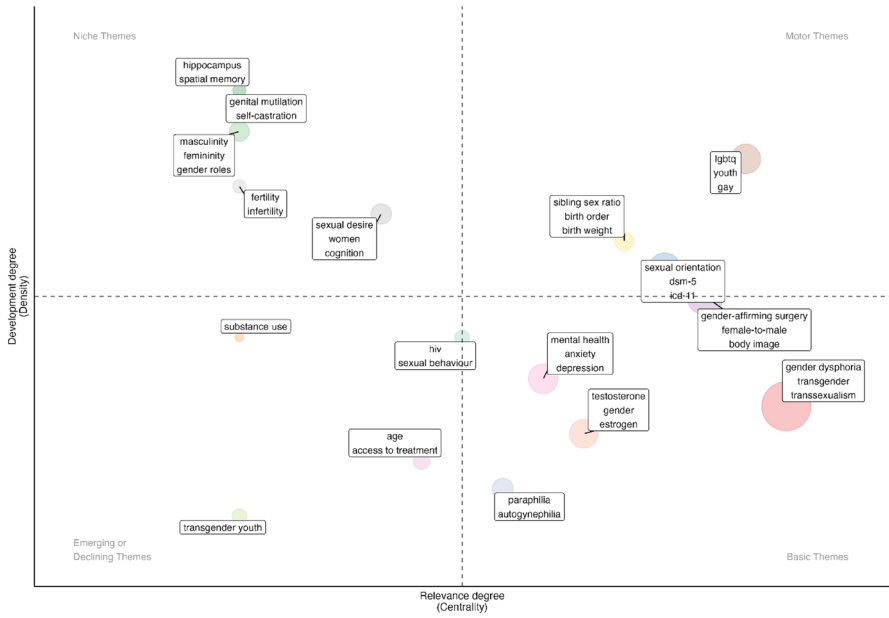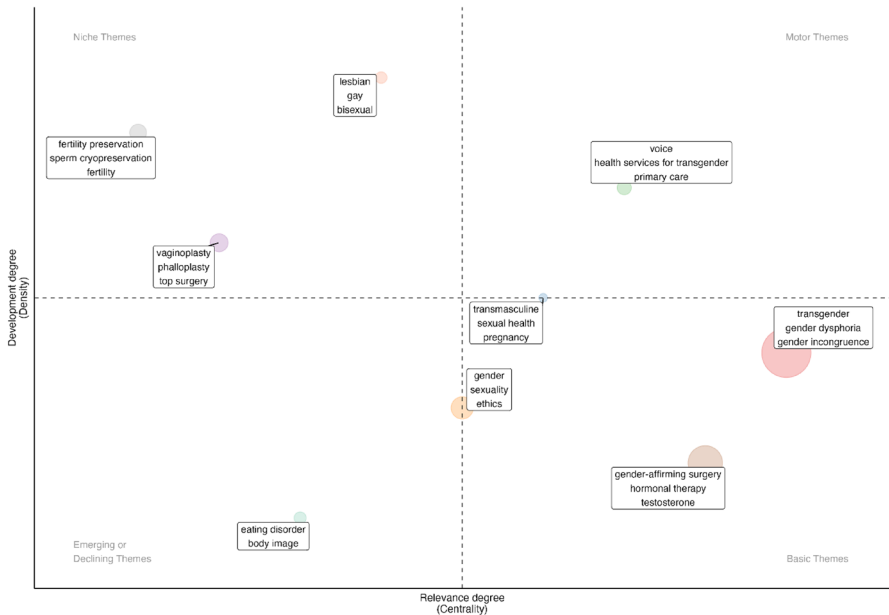
Fig. 7 Thematic map 2013–2017 time slice

Fig. 8 Thematic map 2018–2022 time slice

3.6.3 Thematic map of 2018–2022 time slice

Based on the thematic map of the period 2018–2022 (Fig. 8), the green cluster concerning access to health services for transgender people, emphasizing the challenges faced by transgender people in accessing medical care, was identified as motor theme. The basic themes in this timespan include gender dysphoria studies and gender affirmation operations. Two clusters are identified as emerging or declining themes. The light azure cluster pertains to the medical, economic, and social challenges that FtM individuals face when carrying a pregnancy, while the purple cluster specializes in surgical treatment therapies for individuals experiencing dysphoria, alongside hormone treatments including testosterone and other hormone variants. Regarding emerging or declining themes, topics related to eating disorder and body image, which refers to the way individuals experience their bodies on a psychological level, are identified. Body image is shaped by numerous factors and profoundly impacts individuals' perceptions and interactions within their environment. Disruptions in body image are commonly observed in both eating disorders and gender dysphoria, highlighting the intricate relationship between psychological well-being and self-perception. In the niche themes, there is a growing interest in innovative techniques for gender affirmation surgery and a debate on the implications of fertility and sperm preservation on personal health treatment.

4 Discussion

This study provides valuable insights into the current understanding and advancements in the field of gender dysphoria. By examining a wide range of scholarly works and research studies, a comprehensive landscape emerges regarding the complexities of this phenomenon. The findings underscore the substantial influence of gender dysphoria research on reshaping our comprehension of gender identity. The research delves into the psychological, social, and medical aspects of gender dysphoria, exploring factors like self-acceptance, social support, mental health outcomes, and the effectiveness of different interventions and treatments. Scholars and researchers have engaged in extensive debates regarding gender dysphoria since the 1970 s, leading to a transformative shift in understanding the condition. Initially categorized as a gender identity disorder in DSM-III (APA 1994), the term emphasized a pathologizing and identity-focused perspective. There has been a significant increase in scientific productivity related to dysphoria, with an evident surge since 2013.

By analyzing the annual growth rate of publications, two distinct periods of increased scientific productivity can be observed. Prior to 2012, the research field was characterized by a relatively constant annual publication trend with a lower number of documents. However, a shift of scientific productions occurred from 2013, marked by a significant advancement in the research domain, with the incorporation of the term gender dysphoria in the DSM-V. The inclusion of this term reflected a milestone in the field and has contributed to the heightened scholarly output. This revision signifies a fundamental shift in conceptualizing the condition, emphasizing the individual's experience of distress and removing the potentially stigmatizing connotation associated with the term disorder (Sennott 2010). By focusing on the distress arising from the incongruence between an individual's lived or expressed gender and their gender assigned at birth, the DSM-V adopted a more person-centered perspective. It acknowledges the distressing nature of the situation while

refraining from labelling the individual's entire gender identity as a disorder. Moreover, this change highlights progress in the understanding of gender and transgender experiences (Miscioscia et al. 2020), fostering greater social acceptance and promoting appropriate treatment for those experience gender dysphoria. Notably, the new version of the diagnostic manual has allocated a separate chapter for gender dysphoria, distinct from paraphiliac disorders and sexual dysfunctions, further facilitating focused assessment and interventions in this area. However, some contradictions emerge in the new approach. It is unclear how gender dysphoria is fully connected to distress when the latter is not always present and the diagnosis encompassed intersex individuals similarly to transgender individuals, but there is a lack of clarification on how symptomatic indicators can capture the experience of intersex individuals (Davy and Toze 2018). Additionally, the updated version acknowledged identities beyond the binary, marking a significant change in perspective (De Cuypere et al. 2010). If the DSM-V undoubtedly played a role in formal depathologization for individuals experiencing their gender identity differently from their assigned sex at birth, it was the decision by the WHO that is considered a true breakthrough (Dakic 2022). Removing gender dysphoria from the classification of mental disorders changed the designation to gender incongruence. With the recent change, individuals are no longer required to demonstrate severe discomfort or significant impairment in their ability to function effectively at work or in social situations. This means that people who feel uncomfortable with their assigned gender at birth, even if it's not severe, can now qualify for treatment in many countries. While this may improve accessibility to health care for transgender people seeking treatment, it also raises concerns about the potential pathologisation of individuals who do not experience discomfort in relation to their gender incongruence and may not seek treatment at all (Drescher et al. 2012).These changes in diagnostic criteria and the reclassification of gender dysphoria as gender incongruence not only reflect evolving understandings of gender identity but also drew increased attention to the topic within the scientific community (RQ1).

Recognizing the evolution of focus and related issues surrounding gender dysphoria is crucial for ongoing progress in the field and providing support to individuals experiencing this condition. Over time, there has been a significant shift in the understanding and approach to addressing gender dysphoria, reflecting an increasing awareness of gender identity. The first thematic map (1991–2012) indicates that scientific research primarily focused on the origin of physical and sexual attraction between individuals of the same sex, aiming to comprehend the genetic and environmental factors influencing sexual orientation, as demonstrated by the study conducted by Fridell et al. (1996). This research played a pivotal role in dispelling myths about sexual orientation, affirming that it is not a choice and is not influenced by psychological or social factors. These studies provided a foundation for further exploration of sexual development disorders (Furtado et al. 2012), such as sexual dysfunction, paraphilias, and gender identity disorders (Blanchard 1993; Freund and Watson 1993; Brad Ford 2001; Abdo et al. 2001), which are classified in the DSM-IV. These studies highlighted the intricate nature of gender dysphoria, emphasizing its biological basis and establishing the groundwork for evaluating the efficacy of gender-affirming treatments in enhancing the quality of life for individuals with gender dysphoria. Blanchard (1993) conducted a longitudinal study on a group of transgender men, revealing that gender dysphoria often manifests in childhood and tends to persist over time. In a complementary study, Abdo et al. (2001) explored gender dysphoria in children, establishing a greater likelihood of gender dysphoria in those who have a sibling experiencing the same condition.

Throughout this period, significant medical research was conducted on transvestism (Docter and Prince 1997) and transsexualism. Studies initially centered on children

diagnosed with gender identity disorders (Linday 1994; Zucker et al. 1999), as well as the utilization of steroid-based hormone therapy to facilitate the development of physical characteristics aligned with one's gender identity (Meyer-Bahlburg 2013). Additionally, scientific production during this time delved into the treatment of self-image and body image concerning individuals' experiences of their gender identity and the subsequent clinical and psychological implications that may arise (Kraemer et al. 2007). Research also focused on anorexia nervosa (Winston et al. 2004) and eating disorders (Vocks et al. 2009) to comprehend the impact of gender identity disorder on self-perception and body image.

With the publication of DSM-V in 2013, a significant turning point occurs in the scientific literature on gender dysphoria, replacing outdated categories such as transvestism and gender identity disorder. This period also highlighted a growing interest on social challenges experienced by individuals with gender dysphoria. Several studies investigated the psychological conditions related to psychosocial support (Reisner et al. 2015; Brown and Jones 2016; Durwood et al. 2017), risky sexual behavior (Cerwenka et al. 2014), and substance abuse, such as drugs and alcohol (Coleman et al. 2012; Drescher and Byne 2012), particularly among adolescents (Davey et al. 2014; Zucker et al. 2013). The psychosocial support is an important factor in protecting the mental health and well-being of transgender youth and highlight the importance of addressing social stigma to reduce the risk of substance abuse among transgender individuals.

The theme of access to health treatment and medical services for individuals with gender dysphoria, along with the social and health barriers that hinder such access, emerged prominently during the period from 2013 to 2017. The scientific literature demonstrated a shift towards a deeper understanding of the challenges faced by individuals with gender dysphoria, with a particular focus on providing support and access to appropriate health services (Dhejne et al. 2016). Overall, a growing recognition of the social challenges experienced by individuals with gender dysphoria, beyond just the medical aspects of the condition, was examined. The studies highlighted the need for greater support and access to appropriate health services for this population, emphasizing the psychosocial factors that may affect their well-being (Lindley et al. 2021). From 2018 to 2022, the literature on gender dysphoria has seen a notable shift towards ethical and medical considerations aimed at upholding patient dignity. Specific medical advancements, such as phalloplasty and vaginoplasty, have been developed to address the needs of transgender individuals, with a focus on understanding the implications of hormonal treatments on reproductive choices. Papadopulos et al. (2021) underscored the significant role of gender affirming surgery in providing comprehensive care for transgender individuals. Their research emphasizes that such surgical interventions not only enhance various aspects of daily life but also positively impact mental well-being and self-esteem. Additionally, there has been increasing attention to the possibility of transgender individuals becoming pregnant. Grin et al. (2021) examines the potential for transgender individuals to conceive after undergoing gender-affirming hormone therapy (GAHT), suggesting that those who have preserved sperm before beginning therapy may still have the ability to become pregnant. An attention was also directed towards primary care and medical assistance for transgender patients, promptly and effectively addressing their specific healthcare needs (Lindley and Galupo 2020; Sood et al. 2021) (RQ2).

Over the past two decades, shifts in trends and perceptions regarding gender dysphoria have been influenced by a multitude of events such as the LGBTQ+rights movements, the evolution of gender theories, and diagnostic revisions. One significant change in diagnosis involves a shift from a behavioral and sexual focus to a broader consideration of a person's identity. These developments led to a change in language and perception, emphasizing the

importance of self-identification and aiming to reduce stigmatization and discrimination of transgender people (Crapanzano et al. 2021). In 2018, the WHO removed transgender identities from mental disorders, introducing the diagnosis of gender incongruence. The new criteria for this diagnosis include the presence of a desire to transition, which involves seeking gender-confirming treatments such as hormone therapy or surgery.

This shift reflects the recognition that being transgender is not a mental disorder, with significant implications: reparative therapies, forced hospitalization, and sterilization, once aimed at altering or suppressing an individual's gender identity, are now acknowledged as harmful and are no longer endorsed by the WHO. Overall, these variations mark a significant step forward in recognizing and respecting transgender individuals, promoting the rights, and rejecting harmful approaches that deny the gender identities. Furthermore, there is the potential for convenient access to healthcare services, ensuring that these individuals receive assistance from qualified and well-trained healthcare professionals. By removing transgender identities as mental disorders and adopting a more inclusive and affirming approach, the WHO aims to promote respect, dignity, and equal rights for individuals whose gender identity differs from their assigned sex at birth (RQ3).

5 Conclusion

In this study, we aim to make a meaningful contribution to gender dysphoria research by employing various science mapping approaches, providing a comprehensive overview of the evolving scientific production over time. Despite outlining the evolution of gender dysphoria topics, this study present some limitations.

Firstly, the inclusion of articles exclusively from WoS does not allow for an understanding of the entire literature on the selected topic. The integration of metadata from different databases poses challenges due to inherent disparities in data formats and structures across platforms. It's important to note that databases such as Scopus or PubMed also have their respective strengths and weaknesses (Falagas et al. 2008). Numerous articles may have been published in journals not yet indexed, eluding detection by any database. Given these constraints, the publications analyzed in our study may not precisely represent global research activity on dysphoria studies. However, these data offer valuable insights into trends, especially concerning the approach employed to analyse the evolution of interest in the topic before and after specific events (Aria et al. 2022).

Transitioning to ethical considerations, we acknowledge the unique challenges associated with researching gender dysphoria—a subject deeply entwined with personal identity, social stigma, and mental health. Our approach is rooted in sensitivity and respect for the experiences of individuals with gender dysphoria. We are keenly aware of the potential for research findings to be misinterpreted or misused, posing harm to transgender and gender-diverse communities. To mitigate this risk, we carefully frame our findings within the context of promoting understanding, inclusivity, and the importance of evidence-based care and support for individuals with gender dysphoria. Our ethical approach to researching gender dysphoria is grounded in a commitment to do no harm, advance knowledge with compassion and respect, and contribute to a more inclusive and supportive society for all individuals, irrespective of their gender identity.

In conclusion, our work sets the base for future research efforts aiming to delve deeper into the phenomenon using other statistical approaches. This would provide a wider

understanding of the topic and encourage collaboration with experts and scholars, offering valuable insights and assessments of key concepts and methods.

Declarations

Conflict of interest No potential conflict of interest was reported by the author(s).

References

Abdo, C.H.N., Hounie, A., de Tubino Scanavino, M., Miguel, E.C.: OCD and transvestism: Is there a relationship? Acta Psychiatr. Scand. **103**(6), 471–473 (2001). https://doi.org/10.1034/j.1600-0447.2001.00294.x

Aitken, M., Steensma, T.D., Blanchard, R., VanderLaan, D.P., Wood, H., Fuentes, A., Zucker, K.J.: Evidence for an altered sex ratio in clinic-referred adolescents with gender dysphoria. J. Sex. Med. **12**(3), 756–763 (2015). https://doi.org/10.1111/jsm.12817

American Psychiatric Association: Diagnostic and statistical manual of mental disorders Washington: American Psychiatric Association. (1994)

American Psychiatric Association: Diagnostic and statistical manual of mental disorders Washington: American Psychiatric Association. (2013)

Arcelus, J., Bouman, W.P., Van Den Noortgate, W., Claes, L., Witcomb, G., Fernandez-Aranda, F.: Systematic review and meta-analysis of prevalence studies in transsexualism. Eur. Psychiatry **30**(6), 807–815 (2015). https://doi.org/10.1016/j.eurpsy.2015.04.005

Aria, M., Cuccurullo, C.: bibliometrix: An R-tool for comprehensive science mapping analysis. J. Informet. **11**(4), 959–975 (2017). https://doi.org/10.1016/j.joi.2017.08.007

Aria, M., Cuccurullo, C., D'Aniello, L., Misuraca, M., Spano, M.: Thematic analysis as a new culturomic tool: the social media coverage on COVID-19 pandemic in Italy. Sustainability **14**(6), 3643 (2022). https://doi.org/10.3390/su14063643

Aria, M., Misuraca, M., Spano, M.: Mapping the evolution of social research and data science on 30 years of Social Indicators Research. Soc. Indic. Res. **149**, 803–831 (2020). https://doi.org/10.1007/s11205-020-02281-3

Benjamín, H.: Transvestism and transsexualism. J. Am. Med. Assoc. **199**(2), 136–136 (1966)

Blanchard, R.: Varieties of autogynephilia and their relationship to gender dysphoria. Arch. Sex. Behav. **22**, 241–251 (1993). https://doi.org/10.1007/BF01541769

Brad Ford, J.M.: The neurobiology, neuropharmacology, and pharmacological treatment of the paraphilias and compulsive sexual behaviour. Can. J. Psychiatry **46**(1), 26–34 (2001)

Bradley, S.J., Zucker, K.J.: Gender identity disorder: a review of the past 10 YearsG. J. Am. Acad. Child Adolesc. Psychiatry **36**(7), 872–880 (1997). https://doi.org/10.1097/00004583-199707000-00008

Brown, G.R., Jones, K.T.: Mental health and medical health disparities in 5135 transgender veterans receiving healthcare in the veterans health administration: a case–control study. LGBT Health **3**(2), 122–131 (2016). https://doi.org/10.1089/lgbt.2015.0058

Butler, G.: Gender incongruence. Paediatr. Child Health **30**(12), 407–410 (2020). https://doi.org/10.1016/j.paed.2020.09.001

Börner, K., Chen, C., Boyack, K.W.: Visualizing knowledge domains. Ann. Rev. Inf. Sci. Technol. **37**(1), 179–255 (2003)

Callon, M., Courtial, J.P., Turner, W.A., Bauin, S.: From translations to problematic networks: an introduction to co-word analysis. Soc. Sci. Inf. **22**(2), 191–235 (1983). https://doi.org/10.1177/053901883022002003

Carroll, R. A.: Gender dysphoria and transgender experiences. Principles and practice of sex therapy, 477–508 (2007).

Cerwenka, S., Nieder, T.O., Cohen-Kettenis, P., De Cuypere, G., Haraldsen, I.R.H., Kreukels, B.P., Richter-Appelt, H.: Sexual behavior of gender-dysphoric individuals before gender-confirming interventions: a European multicenter study. J. Sex Marital Ther. **40**(5), 457–471 (2014). https://doi.org/10.1080/0092623X.2013.772550

Ciavolino, E., Aria, M., Cheah, J.H., Roldán, J.L.: A tale of PLS structural equation modelling: episode I—a bibliometrix citation analysis. Soc. Indic. Res. (2022). https://doi.org/10.1007/s11205-022-02994-7

Cobo, M.J., López-Herrera, A.G., Herrera-Viedma, E., Herrera, F.: Science mapping software tools: review, analysis, and cooperative study among tools. J. Am. Soc. Inform. Sci. Technol. **62**(7), 1382–1402 (2011). https://doi.org/10.1002/asi.21525

Cohen-Kettenis, P.T., Van Goozen, S.H.: Sex reassignment of adolescent transsexuals: a follow-up study. J. Am. Acad. Child Adolesc. Psychiatry **36**(2), 263–271 (1997). https://doi.org/10.1097/00004583-199702000-00017

Cohen-Kettenis, P.T., Pfäfflin, F.: The DSM diagnostic criteria for gender identity disorder in adolescents and adults. Arch. Sex. Behav. **39**, 499–513 (2010). https://doi.org/10.1007/s10508-009-9562-y

Coleman, E., Bockting, W., Botzer, M., Cohen-Kettenis, P., DeCuypere, G., Feldman, J., Zucker, K.: Standards of care for the health of transsexual, transgender, and gender-nonconforming people, version 7. Int. J. Transgenderism **13**(4), 165–232 (2012). https://doi.org/10.1080/15532739.2011.700873

Crapanzano, A., Carpiniello, B., Pinna, F.: Approccio alla persona con disforia di genere: dal modello psichiatrico italiano al modello emergente basato sul consenso informato. Riv. Psichiatr. **56**(2), 120–128 (2021). https://doi.org/10.1708/3594.35771

Cuccurullo, C., Aria, M., Sarto, F.: Foundations and trends in performance management. A twenty-five years bibliometric analysis in business and public administration domains. Scientometrics **108**, 595–611 (2016)

De Cuypere, G., Knudson, G., Bockting, W.: Response of the world professional association for transgender health to the proposed DSM 5 criteria for gender incongruence. Int. J. Transgenderism **12**(2), 119–123 (2010)

D'Aniello, L., Spano, M., Cuccurullo, C., Aria, M.: Academic health Centers' configurations, scientific productivity, and impact: Insights from the Italian setting. Health Policy **126**(12), 1317–1323 (2022). https://doi.org/10.1016/j.healthpol.2022.09.007

Dakić, T.: New perspectives on transgender health in the forthcoming 11th revision of the international statistical classification of diseases and related health problems: an overview of gender-depathologization, considerations and recommendations for practitioners. Psychiatr. Danub. **32**(2), 145–150 (2020)

Davey, A., Bouman, W.P., Arcelus, J., Meyer, C.: Social support and psychological well-being in gender dysphoria: a comparison of patients with matched controls. J. Sex. Med. **11**(12), 2976–2985 (2014). https://doi.org/10.1111/jsm.12681

Davis, G., Dewey, J.M., Murphy, E.L.: Giving sex: Deconstructing intersex and trans medicalization practices. Gend. Soc. **30**(3), 490–514 (2016)

Davy, Z., Toze, M.: What is gender dysphoria? A critical systematic narrative review. Transgender Health **3**(1), 159–169 (2018)

Van De Delemarre Waal, H.A., Cohen-Kettenis, P.T.: Clinical management of gender identity disorder in adolescents: a protocol on psychological and paediatric endocrinology aspects. Eur. J. Endocrinol. (2006). https://doi.org/10.1530/eje.1.02231

Deogracias, J.J., Johnson, L.L., Meyer-Bahlburg, H.F., Kessler, S.J., Schober, J.M., Zucker, K.J.: The gender identity/gender dysphoria questionnaire for adolescents and adults. J. Sex Res. **44**(4), 370–379 (2007). https://doi.org/10.1080/00224490701586730

Dhejne, C., Lichtenstein, P., Boman, M., Johansson, A.L., LandénLångström, N.. M.: Long term follow up of transsexual persons undergoing sex reassignment surgery cohort study in Sweden. PloS one (2011). https://doi.org/10.1371/journal.pone.0016885

Dhejne, C., Van Vlerken, R., Heylens, G., Arcelus, J.: Mental health and gender dysphoria: a review of the literature. Int. Rev. Psychiatry **28**(1), 44–57 (2016). https://doi.org/10.3109/09540261.2015.1115753

Docter, R.F., Prince, V.: Transvestism: a survey of 1032 cross-dressers. Arch. Sex. Behav. **26**, 589–605 (1997). https://doi.org/10.1023/A:1024572209266

Drescher, J., Byne, W.: Introduction to the special issue on "The treatment of gender dysphoric/gender variant children and adolescents." J. Homosex. **59**(3), 295–300 (2012). https://doi.org/10.1080/00918369.2012.653299

Drescher, J., Cohen-Kettenis, P., Winter, S.: Minding the body: Situating gender identity diagnoses in the ICD-11. Int. Rev. Psychiatry **24**(6), 568–577 (2012)

Drummond, K.D., Bradley, S.J., Peterson-Badali, M., Zucker, K.J.: A follow-up study of girls with gender identity disorder. Dev. Psychol. **44**(1), 34 (2008)

Durwood, L., McLaughlin, K.A., Olson, K.R.: Mental health and self-worth in socially transitioned transgender youth. J. Am. Acad. Child Adolesc. Psychiatry **56**(2), 116–123 (2017). https://doi.org/10.1016/j.jaac.2016.10.016

Eck, N.J.V., Waltman, L.: How to normalize cooccurrence data? An analysis of some well-known similarity measures. J. Am. Soc. Inform. Sci. Technol. **60**(8), 1635–1651 (2009). https://doi.org/10.1002/asi.21075

Falagas, M.E., Pitsouni, E.I., Malietzis, G.A., Pappas, G.: Comparison of PubMed, Scopus, web of science, and google scholar: strengths and weaknesses. FASEB J. **22**(2), 338–342 (2008)

Freund, K., Watson, R.J.: Gender identity disorder and courtship disorder. Arch. Sex. Behav. **22**, 13–21 (1993). https://doi.org/10.1007/BF01552909

Frew, T., Watsford, C., Walker, I.: Gender dysphoria and psychiatric comorbidities in childhood: a systematic review. Aust. J. Psychol. **73**(3), 255–271 (2021). https://doi.org/10.1080/00049530.2021.1900747

Fridell, S.R., Zucker, K.J., Bradley, S.J., Maing, D.M.: Physical attractiveness of girls with gender identity disorder. Arch. Sex. Behav. **25**(1), 17–31 (1996). https://doi.org/10.1007/BF02437905

Furtado, P.S., Moraes, F., Lago, R., Barros, L.O., Toralles, M.B., Barroso, U., Jr.: Gender dysphoria associated with disorders of sex development. Nat. Rev. Urol. **9**(11), 620–627 (2012). https://doi.org/10.1038/nrurol.2012.182

Galupo, M.P., Pulice-Farrow, L., Pehl, E.: There is nothing to do about it: nonbinary individuals experience of gender dysphoria. Transgender Health **6**(2), 101–110 (2021). https://doi.org/10.1089/trgh.2020.0041

Gonsalves, T.: Gender identity, the sexed body, and the medical making of transgender. Gend. Soc. **34**(6), 1005–1033 (2020)

Green, R., Money, J.: Incongruous gender role: Nongenital manifestations in prepubertal boys. J. Nerv. Ment. Dis. **131**(2), 160–168 (1960)

Green, R.: Sexual identity conflict in children and adults. Bloomsbury Academic (1974).

Green, R.: The" sissy boy syndrome" and the development of homosexuality. Yale University Press (1987).

Grin, L., Girsh, E., Harlev, A.: Male fertility preservation–methods, indications and challenges. Andrologia **53**(2), e13635 (2021). https://doi.org/10.1111/and.13635

Hamburger, C., Stürup, G.K., Dahl-Iversen, E.: Transvestism: hormonal, psychiatric, and surgical treatment. J. Am. Med. Assoc. **152**(5), 391–396 (1953). https://doi.org/10.1001/jama.1953.03690050015006

Hembree, W.C., Cohen-Kettenis, P., Van De Delemarre Waal, H.A., Gooren, L.J., Meyer, W.J., Spack, N.P., Montori, V.M.: Endocrine treatment of transsexual persons: an endocrine society clinical practice guideline. J. Clin. Endocrinol. Metab. **94**(9), 3132–3154 (2009). https://doi.org/10.1210/clinem/dgab315

Kinsey, A.C., Pomeroy, W.B., Martin, C.E.: Sexual behavior in the human male. J. Nerv. Ment. Dis. **109**(3), 283 (1948)

Kraemer, B., Delsignore, A., Schnyder, U., Hepp, U.: Body image and transsexualism. Psychopathology **41**(2), 96–100 (2007). https://doi.org/10.1159/000111554

Liberati, A., Altman, D.G., Tetzlaff, J., Mulrow, C., Gøtzsche, P.C., Ioannidis, J.P., Moher, D.: The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: explanation and elaboration. Anna. Intern. Med. (2009). https://doi.org/10.7326/0003-4819-151-4-200908180-00136

Linday, L.A.: Maternal reports of pregnancy, genital, and related fantasies in preschool and kindergarten children. J. Am. Acad. Child Adolesc. Psychiatry **33**(3), 416–423 (1994). https://doi.org/10.1097/00004583-199403000-00017

Lindley, L., Anzani, A., Galupo, M.P.: Gender dysphoria and sexual well-being among trans masculine and nonbinary individuals. Arch. Sex. Behav. **51**(4), 2049–2063 (2022). https://doi.org/10.1007/s10508-021-02242-y

Lindley, L., Bauerband, L., Galupo, M.P.: Using a comprehensive proximal stress model to predict alcohol use. Transgender Health **6**(3), 164–174 (2021). https://doi.org/10.1089/trgh.2020.0042

Lindley, L., Galupo, M.P.: Gender dysphoria and minority stress: Support for inclusion of gender dysphoria as a proximal stressor. Psychol. Sex. Orientat. Gend. Divers. **7**(3), 265 (2020). https://doi.org/10.1037/sgd0000439

Marx, W., Bornmann, L., Barth, A., Leydesdorff, L.: Detecting the historical roots of research fields by reference publication year spectroscopy (RPYS). J. Am. Soc. Inf. Sci. **65**(4), 751–764 (2014). https://doi.org/10.1002/asi.23089

Meyer-Bahlburg, H.F.: Sex steroids and variants of gender identity. Endocrinol. Metab. Clin. **42**(3), 435–452 (2013)

Miscioscia, M., Rigo, P., Spandri, M., Cerantola, D., Simonelli, A.: La disforia di genere in età evolutiva: questioni diagnostiche e aspetti relazionali. Una rassegna narrativa della letteratura. Giornale italiano di psicologia **47**(1), 231–262 (2020)

Murad, M.H., Elamin, M.B., Garcia, M.Z., Mullan, R.J., Murad, A., Erwin, P.J., Montori, V.M.: Hormonal therapy and sex reassignment: a systematic review and meta-analysis of quality of life and psychosocial outcomes. Clin. Endocrinol. **72**(2), 214–231 (2010). https://doi.org/10.1111/j.1365-2265.2009.03625.x

Papadopulos, N.A., Ehrenberger, B., Zavlin, D., Lellé, J.D., Henrich, G., Kovacs, L., Schaff, J.: Quality of life and satisfaction in transgender men after phalloplasty in a retrospective study. Annal. Plast. Surg. **87**(1), 91–97 (2021)

Pauly, I.B.: The current status of the change of sex operation. J. Nerv. Ment. Dis. **147**(5), 460–471 (1968)

Pons, P., Latapy, M.: Computing communities in large networks using random walks. J. Graph Algorithms Appl. **10**(2), 191–218 (2006)

Reisner, S.L., Vetters, R., Leclerc, M., Zaslow, S., Wolfrum, S., Shumer, D., Mimiaga, M.J.: Mental health of transgender youth in care at an adolescent urban community health center: a matched retrospective cohort study. J. Adolesc. Health **56**(3), 274–279 (2015). https://doi.org/10.1016/j.jadohealth.2014.10.264

Sennott, S.L.: Gender disorder as gender oppression: a transfeminist approach to rethinking the pathologization of gender non-conformity. Women Ther. **34**(1–2), 93–113 (2010). https://doi.org/10.1080/02703149.2010.532683

Smith, Y.L., Van Goozen, S.H., Kuiper, A.J., Cohen-Kettenis, P.T.: Sex reassignment: outcomes and predictors of treatment for adolescent and adult transsexuals. Psychol. Med. **35**(1), 89–99 (2005). https://doi.org/10.1017/S0033291704002776

Sood, R., Chen, D., Muldoon, A.L., Chen, L., Kwasny, M.J., Simons, L.K., Jordan, S.W.: Association of chest dysphoria with anxiety and depression in transmasculine and nonbinary adolescents seeking gender-affirming care. J. Adolesc. Health **68**(6), 1135–1141 (2021). https://doi.org/10.1016/j.jadohealth.2021.02.024

Steensma, T.D., McGuire, J.K., Kreukels, B.P., Beekman, A.J., Cohen-Kettenis, P.T.: Factors associated with desistence and persistence of childhood gender dysphoria: a quantitative follow-up study. J. Am. Acad. Child Adolesc. Psychiatry **52**(6), 582–590 (2013). https://doi.org/10.1016/j.jaac.2013.03.016

Thor, A., Bornmann, L., Marx, W., Mutz, R.: New analysis features of the CRExplorer for identifying influential publications. In STI 2018 Conference Proceedings 49–54. Centre for Science and Technology Studies (CWTS) (2018). https://hdl.handle.net/1887/65331

Vocks, S., Stahn, C., Loenser, K., Legenbauer, T.: Eating and body image disturbances in male-to-female and female-to-male transsexuals. Arch. Sex. Behav. **38**, 364–377 (2009). https://doi.org/10.1007/s10508-008-9424-z

de Vries, A. L., Steensma, T. D., Doreleijers, T. A., Cohen-Ketteneis, P. T.: Puberty suppression in adolescents with gender identity disorder: A prospective follow-up study. J Sexual Medicine **8**(8), 2276-2283. (2011). https://doi.org/10.1111/j.1743-6109.2010.01943.x

de Vries, A.L., Cohenkettenis, P.T.: Clinical management of gender dysphoria in children and adolescents the Dutch approach. J. Homosex. Treat. Transgender Child. Adolesc. **59**(3), 7–26 (2012). https://doi.org/10.1080/00918369.2012.653300

de Vries, A.L., McGuire, J.K., Steensma, T.D., Wagenaar, E.C., Doreleijers, T.A., Cohen-Kettenis, P.T.: Young adult psychological outcome after puberty suppression and gender reassignment. Pediatrics **134**(4), 696–704 (2014). https://doi.org/10.1542/peds.2013-2958

de Vries, A.L., Noens, I.L., Cohen-Kettenis, P.T., van Berckelaer-Onnes, I.A., Doreleijers, T.A.: Autism spectrum disorders in gender dysphoric children and adolescents. J. Autism Dev. Disord. **40**, 930–936 (2010). https://doi.org/10.1007/s10803-010-0935-9

Wallien, M.S., Cohen-Kettenis, P.T.: Psychosexual outcome of gender-dysphoric children. J. Am. Acad. Child Adolesc. Psychiatry **47**(12), 1413–1423 (2008). https://doi.org/10.1097/CHI.0b013e31818956b9

Wang, H., Zhao, Y., Dang, B., Han, P., Shi, X.: Network centrality and innovation performance: the role of formal and informal institutions in emerging economies. J. Bus. Ind. Market. (2019). https://doi.org/10.1108/JBIM-09-2017-0228

Wiepjes, C.M., Nota, N.M., de Blok, C.J.M., Klaver, M., de Vries, A.L.C., Wensing-Kruger, S.A., de Jongh, R.T., Bouman, M.B., Steensma, T.D., Cohen-Kettenis, P., Gooren, L.J.G., Kreukels, B.P.C., den Heijer, M.: The amsterdam cohort of gender dysphoria study (1972–2015): Trends in prevalence, treatment, and regrets. J. Sex. Med. **15**(4), 582–590 (2018). https://doi.org/10.1016/j.jsxm.2018.01.016

Winston, A.P., Acharya, S., Chaudhuri, S., Fellowes, L.: Anorexia nervosa and gender identity disorder in biologic males: a report of two cases. Int. J. Eat. Disord. **36**(1), 109–113 (2004). https://doi.org/10.1002/eat.20013

Zucker, K.J., Bradley, S.J.: Gender identity disorder and psychosexual problems in children and adolescents. Can. J. Psychiatry **35**(6), 477–486 (1990). https://doi.org/10.1177/070674379003500603

Zucker, K.J., Bradley, S.J.: Gender identity disorder and psychosexual problems in children and adolescents. Guilford Press, New York (1995)

Zucker, K.J., Bradley, S.J., Kuksis, M., Pecore, K., Birkenfeld-Adams, A., Doering, R.W., Wild, J.: Gender constancy judgments in children with gender identity disorder: evidence for a developmental lag. Arch. Sex. Behav. **28**, 475–502 (1999). https://doi.org/10.1023/A:1018713115866

Zucker, K.J., Wood, H., VanderLaan, D.P.: Models of psychopathology in children and adolescents with gender dysphoria. Gend. Dysphoria Disord. Sex Dev.: Prog. Care Knowl. (2013). https://doi.org/10.1007/978-1-4614-7441-8_9