VU Research Portal

Does gender role explain a high risk of depression? A meta-analytic review of 40 years of evidence

Lin, Jingyuan; Zou, Liye; Lin, Wuji; Becker, Benjamin; Yeung, Albert; Cuijpers, Pim; Li, Hong

published in

Journal of Affective Disorders
2021

DOI (link to publisher)

[10.1016/j.jad.2021.07.018](https://doi.org/10.1016/j.jad.2021.07.018)
[10.1016/j.jad.2021.07.018](https://doi.org/10.1016/j.jad.2021.07.018)

document version

Publisher's PDF, also known as Version of record

document license

Article 25fa Dutch Copyright Act

[Link to publication in VU Research Portal](#)

citation for published version (APA)

Lin, J., Zou, L., Lin, W., Becker, B., Yeung, A., Cuijpers, P., & Li, H. (2021). Does gender role explain a high risk of depression? A meta-analytic review of 40 years of evidence. *Journal of Affective Disorders*, 294, 261-278. <https://doi.org/10.1016/j.jad.2021.07.018>, <https://doi.org/10.1016/j.jad.2021.07.018>

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal ?

Take down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

E-mail address:

vuresearchportal.ub@vu.nl

Review article

Does gender role explain a high risk of depression? A meta-analytic review of 40 years of evidence

Jingyuan Lin^{a,b,c}, Liye Zou^d, Wuji Lin^{b,c}, Benjamin Becker^e, Albert Yeung^f, Pim Cuijpers^g, Hong Li^{b,c,a,*}

^a Center for Brain Function and Psychological Science, Shenzhen University; Shenzhen Institute of Neuroscience, Shenzhen 518060, Guangdong, China

^b Center for Studies of Psychological Applications, Guangdong Key Laboratory of Mental Health and Cognitive Science, Key Laboratory of Brain Cognition and Educational Science, Ministry of Education; School of Psychology, South China Normal University, Guangzhou 510631, Guangdong, China

^c Institute for Brain and Psychological Sciences, Sichuan Normal University, Chengdu 610054, Sichuan, China

^d Exercise Psychophysiology Laboratory; Institute of KEEF Collaborative Innovation, School of Psychology, Shenzhen University, 518060, China

^e The Clinical Hospital of Chengdu Brain Science Institute, MOE Key Laboratory for Neuroinformation, University of Electronic Science and Technology of China, Chengdu 610054, Sichuan, China

^f Depression Clinical and Research Program, Massachusetts General Hospital, Boston, MA 02114, USA

^g Department of Clinical, Neuro and Developmental Psychology, Amsterdam Public Health research institute, Vrije Universiteit Amsterdam, Van der Boerhorststraat 1, Amsterdam 1081 BT, the Netherlands

ARTICLE INFO

Keywords:

Depression
Gender role
Masculinity
Femininity
Androgyny
Human development index

ABSTRACT

Background: This meta-analytic review aimed to systematically evaluate associations of depression with multiple gender role dimensions (masculinity, femininity, androgyny, and undifferentiated traits) and to determine potential moderators (participant characteristics, study instruments and sociocultural factors) of the relationship. **Methods:** Of 4481 initially identified records in three electronic databases, 58 studies published 1978 to 2021 were included for meta-analysis.

Results: (1) Association of depression and gender role is moderated by study year and human development indices. (2) Masculinity is a protective factor for depression, while this dominance has declined as life expectancy increases. (3) A negative, weak but significant association between depression and femininity is observed in women, and college students, which starts to emerge with the gradual increase in the national education and income index from 1990 to 2019. (4) Androgynous individuals reported the lowest level of depression as compared with other gender role orientations (masculine, feminine, and undifferentiated trait group). This disparity is becoming more extreme with life expectancy and per capita income index increases.

Limitations: English-language studies were only included in this review.

Conclusions: Androgyny might be the most ideal gender role protecting both women and men from depression.

1. Introduction

Worldwide major depression is a leading cause of disability (James et al., 2018). World Health Organization (2017) indicates that the number of people with depression worldwide has reached 322 million. Notably, sex disparity in the prevalence of depression is commonly reported, with women nearly twice as likely to develop depression than men. Furthermore, during the last decades, the higher risk of women developing depression has been primarily linked to sex differences in the biological susceptibility, genetic and hormonal factors as well as sex differences in physiological stress responsivity or the exposure to

environmental risk factors, including higher exposure to (sociocultural) stressors (Hyde and Mezulis, 2020) and aversive early life experiences in women and differences in the access to mental health-related resources such as economic success and social status (for a detailed overview see e. g., Kuehner, 2017).

Whereas people also grow up in a societal environment where individual socio-sexual behavior, personalities, and beliefs are formulated in terms of social roles including gender roles with corresponding masculine and feminine traits being a subject of change over time (Reilly, 2019). Since 1970, researchers have started to investigate associations between depression and gender role across different age groups,

* Corresponding author at: School of Psychology, South China Normal University, Guangzhou 510631, Guangdong, China.

E-mail addresses: lihong_psych@m.scnu.edu.cn, lihongworm@vip.sina.com (H. Li).

<https://doi.org/10.1016/j.jad.2021.07.018>

Received 2 January 2021; Received in revised form 11 July 2021; Accepted 13 July 2021

Available online 16 July 2021

0165-0327/© 2021 Published by Elsevier B.V.

however, findings remained inconsistent such that depending on the specific sample and different methodological approaches have been reported (Cheng, 1999; Dyson and Renk, 2006). Thus, based on the pieces of evidence from individual studies it remains unclear if gender role could explain depression risk across the lifespan. To the best of our knowledge, only two previous meta-analyses addressed this topic over the last three decades (Bassoff and Glass, 1982; Whitley, 1985). Of note, the previous two reviews focused on the association between masculinity/femininity and depression without consideration of potential moderators, and firm conclusions were impeded by the small number of original studies. As the number of primary studies has increased considerably over the past years, it is now a suitable time for a systematic re-evaluation of the relationship between depression with gender role and to determine potential moderators in terms of three dimensions, including participants' characteristics (sex, age, college student status, health status), study instruments and sociocultural factors (study location, study year, national life expectancy, education, and income index) (specific moderators will be detailed below).

1.1. Masculinity, femininity, gender role traits, and depression

Gender role (also known as sex role) refers to a socially constructed role determining behaviors and cultural values that are stereotypically acceptable and appropriate for women and men. It is different from sex which is assigned at birth and determined by biological and physiological factors, such as genes, anatomy, hormones, and gonads (Juster et al., 2011). In contrast, gender role is shaped by societal contexts and upbringing where beliefs about gender-specific values are developed through cultural socialization in families, schools, and workplaces (Stockard, 2006). Gender socialization already starts during early childhood and strongly influences the development of gender role identity and/or personality stereotypes (Knaak, 2004). In the early literature, gender role involves two clusters of independent and orthogonal trait predispositions (masculinity and femininity) (Bem, 1974; Spence et al., 1975), which is often measured by the Bem Sex-Role Inventory (BSRI) and the Personal Attributes Questionnaire (PAQ). Notably, both questionnaires include two sub-scales in which self-attribution of traits is socially desirable and stereotypical for men (masculinity scale/instrumentality) and women (femininity scale/expressiveness), respectively. For example, the sub-scale for masculinity contains instrumental features such as 'dominant', 'has leadership abilities', and 'competitive'; the sub-scale for femininity contains expressive features such as 'understanding', 'warm', and 'compassionate'. Researchers further proposed that such gender role orientations can be transformed into four gender role traits (masculine = high in masculinity and low in femininity, feminine = high in femininity and low in masculinity, androgynous = both high in masculinity and femininity, and undifferentiated = both low in masculinity and femininity) based on the median of distributions of masculinity and femininity scales (Bem, 1979; Spence et al., 1975; Spence and Helmreich, 1981).

Since the 1970s, researchers have applied the aforementioned instruments or their modified versions to measure gender role and to determine associations with depression changes over decades in terms of societal changes. An early attempt to quantitatively evaluate the existing evidence regarding associations of gender role orientations with multiple mental health was made by Whitley (1985), but only 13 studies published between 1978 and 1983 were included to explore associations between depression and two gender roles orientations only. The results suggested a negative association of depression with masculinity but not femininity, which was supported by the *Masculinity Hypothesis* emphasizing the protective functions of such socially desirable masculine traits (e.g., dominance, confidence, sexual success, and physical and emotional self-control) on remitting the threat of depressive mood, irrespective of one's sex (Gonzalez et al., 2012; Whitley, 1985). The *Androgynous Hypothesis*, on the other hand, argues that androgynous individuals are psychologically healthier and less likely to develop

depression because their equally distributed traits of both masculinity and femininity are associated with more adaptive and flexible coping strategies in stressful situations (Cheng, 2005). Feminine traits have been found beneficial for mental health by bringing higher social supports (Pilar Matud, 2019). However, the *Congruence Hypothesis*, a most long-standing model referring to gender role and mental health, suggests that appropriately sex-typed individuals (males with greater masculinity and females with greater femininity) are mental healthier because their behavior and attitude are consonant with cultural stereotypes and expectations, which might protect them from social pressures (Holahan and Spence, 1980; Pleck, 1975; Whitley, 1985). Given that only masculinity and femininity were included in the past meta-analysis, it thus remains elusive if depression is associated with androgynous and undifferentiated traits.

Moreover, during the last three decades since the above-mentioned meta-analysis was published, a considerable amount of original literature has accumulated and associations between gender role orientation (s) and depression could have additionally changed due to societal development. Thus, the larger number of more recent studies may allow a more robust estimation of the associations. Additionally, it remains unclear whether such associations can be moderated by other factors, such as sex, age, health status, education level, cultural background, instruments used, year of data collection, and the degree of social development in the regions where the data was collected.

1.2. Potential moderators of the associations between gender role and depression

1.2.1. Sex

Differences between women and men in terms of their susceptibility to depression have long been recognized and increasingly examined (Salk et al., 2017). Determining factors that render women more susceptible than men to depression can not only reveal important insights on the pathogenesis of the disorder but also inform the awareness of depression risk and appropriate management of these mental disorders. In line with the *Masculinity Hypothesis*, the level of the masculine trait in both men and women may serve as a protective factor for the development of depression across the lifespan (Hermann and Betz, 2004; Marcotte et al., 2002; Wilson and Cairns, 1988). Recently, however, a growing number of studies showed that rigid conformity to traditional masculine norms led to male mental health problems, such as violence, restrictive emotionality, substance abuse, even higher suicidal ideation, and less help-seeking for depression (Coleman et al., 2020; Cook, 1993; Seidler et al., 2016; Sung, 2020). Together, it remains unclear whether variations in the association between gender role and depression vary as a function of sex.

1.2.2. Age

In general, it is widely accepted that gender differences in depression manifest already during puberty such that the number of adolescent girls with depression outnumbers those of adolescent boys. The gender difference reaches a peak between preadolescence and young adulthood (Hankin et al., 1998) but narrows down and remains stable during later adulthood (Salk et al., 2017). Notably, results from another meta-analysis including non-clinical populations have indicated that smaller gender differences in depression first began to emerge in adolescents and young adults, but the greatest increase occurred in the elderly (Wang et al., 2016). Given the conflicting findings from previous studies, it requires further investigation on this topic, specifically to determine whether sample age plays a role in predicting gender role differences in depression.

1.2.3. College student status

College student status as a predictor for depression has been extensively studied, with empirical data strongly suggesting that higher educational attainment represents a protective factor for the

development of depression (Viinikainen et al., 2018). On the other hand, epidemiological studies have consistently revealed a high prevalence of depression among college students (Ibrahim et al., 2013), which has inspired studies examining associations between gender role and depression in this specific group (Chevron et al., 1978; Lam and McBride-Chang, 2007; Moller-Leimkuhler and Yucel, 2010). Meanwhile, individuals in other educational stages, including kindergarten, primary school, and secondary school were investigated as well (Hart and Thompson, 1996; Lyons et al., 2006; Marcotte et al., 1999; Marusic and Bratko, 1998). For example, Lyons et al. (2006) enrolled children from kindergarten to primary school, did not observe significant associations of masculinity/femininity and depression. While the significant results appeared in the studies recruited adolescents from secondary school (Li et al., 2006). Given that gender difference in depression appears from early puberty, it can be proposed that college student status may moderate associations between gender role and depression.

1.2.4. Health status

Given that individuals with poor health are more susceptible to depression as compared to healthy individuals, researchers have begun to investigate associations of gender role with the level of depressive symptoms in healthy and/or clinical samples, including college students seeking psychological counseling (Holahan and Spence, 1980), patients with major depressive disorder (Szpitalak and Prochwicz, 2013) and older adults with physiological and/or mental disorders (Vafaei et al., 2016). For instance, healthy college students with a higher level of masculinity reported lower levels of depression than those with lower masculinity in counseling contexts (Holahan and Spence, 1980). While, major depression patients tended to be more masculine but less androgynous (Szpitalak and Prochwicz, 2013). Collectively, the inconsistent findings on the potential role of health status on the associations between gender role and depression require further investigation.

1.2.5. Assessment of gender role and depression

Early studies that investigated associations between masculinity/femininity and depression, the BSRI and PAQ are the most commonly used instruments to measure gender role, however, results vary greatly across studies (Roos and Cohen, 1987; Russo et al., 1993). Zeldow et al. (1985) found a moderate negative association of depression and masculinity (as measured by the PAQ) among freshmen, which was inconsistent with findings from an earlier study in a similar age group suggesting a weak association between masculinity and depression as measured by the BSRI (DeGregorio and Carver, 1980). Moreover, Whitley and Gridley (1993) investigated the effects of the instrument type on masculinity/femininity-depression (as measured by Beck Depression Inventory, Self-Rating Depression Scale, and Depression Check List) associations, suggesting that stronger masculinity-depression associations were consistently observed while using the PAQ as compared to the BSRI.

The level of depression has been assessed by several different instruments, such as the Beck Depression Inventory (BDI), the Zung's Self-Rating Depression Scale (SDS), and the Center for Epidemiological Study Depression Scale (CES-D). Whitley and Gridley (1993) observed a weaker negative association of masculinity with depression measured with the BDI as compared to the SDS. However, in a similar age group, relatively equivalent strength for associations of masculinity with depression as measured by the BDI and the CES-D (Wong and Whitaker, 1993). Notably, the aforementioned instruments share common depressive factors, including 'depressed mood' and 'sadness', but also assess different facets of depression. For example, the BDI specifically assesses functional impairments (i.e., social withdrawal, functional impairments in occupational context), whereas interpersonal problems are only considered as facet in the CES-D (Shafer, 2006). Collectively, the previous findings suggest that the associations between gender role and depression are influenced by the specific instruments employed to assess gender role as well as depression.

1.2.6. Periods and human development across nations or regions

Social desirability and support are generally different across countries or regions and are subject to sociocultural changes over time. For instance, many women entered high-status and traditionally male-dominated occupations, including business and law, as well as medicine and academic occupations (Catalyst, 2020; World Economic Forum, 2020). Moreover, a strong increase from 1974 to 1994 in women's masculinity was observed that coincides with their entrance into the workforce (Twenge, 1997). In their further expanded analyses of data from 1974 to 2012, the level of masculinity in women continued to increase, but with a smaller overall change than those reported in the initial survey reported in 1997. On the other hand, a decline in femininity in women was found between 1992 and 2012 (Donnelly and Twenge, 2017). Overall, women have become less likely to endorse feminine traits, while men have become less masculine (Donnelly & Twenge, 2016). Despite an increasing number of nations aiming to promote gender equality and to foster educational and occupational opportunities for women (Kabeer, 2012), the recent Human Development Report (2019) suggest that females are still discriminated worldwide in the domains of health and education, as well as participation in the labor market and politics (United Nations Development Programme, 2019). Given the fact that gender inequality might have changed over time and/or vary by nations or regions, the present meta-analysis additionally explored survey year, study location, and three sub-indices of the national human development indices (life expectancy index, education index, and income index) to determine whether the association of gender role and depression is modulated by time and nations/regions.

1.2.7. The current meta-analysis

Based on the accumulated and inconsistent literature to date, there is a clear need to synthesize the findings. To this end, we first reviewed the existing evidence to quantitatively summarize associations between levels of depression and gender role orientations (masculinity and femininity), respectively. Secondly, we attempted to determine whether significant differences in depression existed among individuals with four different gender role traits (masculine, feminine, androgynous, and undifferentiated). Thirdly, we aimed to explore whether masculinity/femininity-depression associations were moderated by participant characteristics (sex, age, college student status, and health status), study instruments (gender role: BSRI and PAQ; depression: BDI, SDS, CES-D, and BDI-II), and societal factors and their development over time (study year, study location, life expectancy index, education index, and income index). Finally, for further interpreting the gender difference in depression through gender role, we additionally investigated differences in terms of effect size between females and males on levels of depression, masculinity, and femininity, respectively.

2. Methods

This meta-analytic review was conducted following the statement of the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines (Liberati et al., 2009).

2.1. Literature search strategy

Electronic databases (PubMed, PsycINFO, and Web of Science) were systematically searched from inception to November 2019. The following key terms were utilized in the search strategy and combined: (depress*) AND ("sex role" OR "gender role" OR "sex identity" OR "gender identity" OR "masculinity" OR "femininity" OR "masculine" OR "feminine" OR "androgyny" OR "androgynous" OR "undifferentiated"). Reference lists for the included articles have been further reviewed to determine additional articles of relevance.

2.2. Inclusion criteria

Studies were included if they meet the following criteria: (1) English-language studies published in peer-reviewed journals; (2) Studies investigating the association between gender role orientations and/or identities and depression; (3) Inclusion of human subjects with mixed gender and clear reporting of psychological gender role (e.g., masculinity, femininity, androgyny, masculine, feminine, androgynous, undifferentiated); (4) Depressive symptoms measured by a validated instrument (5) Extractable data (e.g., mean, standard deviation/standard error, and sample size). No restrictions concerning LGBTQ groups (e.g., lesbian, gay, bisexual, transgender or questioning) and health status were applied.

2.3. Data extraction

Two authors (JL and LZ) independently extracted the data, including the name of the first author, publication year and/or survey year; study location (nation or region); characteristics of participant (sex, age, college student status, physical and/or mental health status; whether belong to LGBTQ groups, or not); instruments used for assessment of gender role and depression, the corresponding mean scores; and effect sizes or any available information for effect size calculations. In cases that involved identical or overlapping samples, only the first publication or test will be considered. If an article provides insufficient information for effect size calculations, survey year, and/or location(s) for data collection, the leading and/or corresponding authors of the study were contacted by e-mail with a request for corresponding unpublished data. All together 47 researchers were contacted directly. As a result, we received 17 replies to our request, and of those, 14 scholars provided previously unpublished data.

2.4. Methodological quality assessment

All of the studies underwent a methodological quality assessment, based on the Meta-analysis of Observational Studies in Epidemiology (MOOSE) guidelines (Stroup et al., 2000), the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist (Von Elm et al., 2014), and literature suggestions (Sanderson et al., 2007), in which four domains in each study were considered: (1) Appropriate design of the study (i.e. cross-sectional with/without adequately balance of gender groups; longitudinal with/without details of follow-up procedure); (2) Appropriate selection of participants (i.e. giving matching criteria and methods of selection of participants; sample size); (3) Appropriate instruments of gender role and depression; (4) Appropriate control of confounding variables (e.g., anxiety; self-esteem; physical and/or mental health status of participants). A score from 0 to 2 was given for each domain, and then a total quality score was calculated, ranging from a score of 0 to a maximum score of 8. Classifications of quality were determined as follows: 0–2 = *low quality*, 3–5 = *reasonable quality*, 6–8 = *good quality*. All identified studies were coded independently by two authors (JL, LZ), and discrepancies were discussed and resolved by a third author (HL).

2.5. Effect size computation

The Pearson Correlation Coefficient (r) was the effect size when associations of gender role orientations (masculinity and femininity) were measured with depression: (1) *small*: $0.1 \leq r < 0.3$, *moderate*: $0.3 \leq r < 0.5$; *large*: $r \geq 0.5$ (Cohen, 1988). Additionally, Cohen's d was used to determine the categorical gender role traits differences in depression. Likewise, we calculated Cohen's d for gender differences in depression, masculinity, and femininity. Effect sizes of d followed the power criteria (*trivial*: $d < 0.2$, *small*: $0.2 \leq d < 0.5$; *moderate*: $0.5 \leq d < 0.8$; *large*: $d \geq 0.8$), with a positive value indicating a higher level of depression, masculinity or femininity showed in the former group (see details in

Results section). All effect sizes were calculated using the Practical Meta-Analysis Effect Size Calculator (Wilson, 2017). Data were entered in the calculator by two authors to ensure accuracy.

2.6. Coding of variables

2.6.1. Categorical moderators

To better estimate whether the association between gender role and depression varies by the categorical moderators, some variables were operationally defined in this review. Firstly, sex refers to traditional and binary 'male' and 'female'. If a study included both sex groups, but the authors did not present results separately for female and male participants, it was coded as mixed. Secondly, studies clearly reported the health status of participants, which were categorized into either 'health' or 'unhealth' (e.g., participants were clearly diagnosed with depression or seeking mental health services). Of note, studies that included both a healthy population and individuals with physical or mental disorders were marked as 'mixed'. Thirdly, the college student status includes three conditions. Studies were coded as 'college students' if they recruited undergraduate and/or graduate students, while studies that included populations from kindergarten (only one study) to high school were coded as 'pre-college student'. Besides, studies were coded as 'other adults' if authors reported a mixed sample including middle-aged adults or the elderly with or without a college degree. Fourth, given that nationality of participants and/or the location of data collection in most selected studies have not been declared, we contacted the leading authors for confirmation. If we could not access the required data, the study location (where the protocol was approved) and affiliation of the leading author were reasonably assumed as a proxy for the country of original data. Fifth, in selected studies where authors used different instruments to measure gender role and depression, the name of their measurement was coded for each study.

2.6.2. Continuous moderators

Two continuous moderators were included in the analysis. First, the mean age or midpoint of the age range was typically reported in selected studies, this information was used for meta-regression. Such descriptive data were not reported in some studies where education level as a categorical variable was converted to numerical data, as recommended by a previous study (19-year-old college freshmen and 6-year-old grade 1 student) (Voyer et al., 1995; Voyer and Voyer, 2014). The year of conducting the survey was preferably used for meta-regression, followed by the modified year of publication (the number (year) obtained by subtracting five years from year of publication).

2.6.3. Human development indicators

We selected the following three sub-indices as indices of human developmental moderators of regions: life expectancy index (an indicator of life expectancy at birth), education index (an indicator of expected years of schooling and mean years of schooling), and income index (an indicator of gross national income (GNI) per capita). Data for each nation/region were downloaded from the website of the United Nations Development Programme. Each index was extracted based on the year and location where the data was collected. If the exact year and/location could not be available after contacting the leading authors, the publication year and the affiliation of the leading author were used instead, respectively. Of note, data for one study was collected in 1983 and another one in 2020 thus did not fall into the range of the Human Development Data (the Year 1990 to 2019) was not included in the meta-regression. One study was excluded for using four data sets collected from 2002 to 2019 with a too large span of years. Regarding other studies conducted less than the five-year range period, we used the first (two-year) or the median year of the range (> two-year). See Tables 1 and 2 for a list of each data and its associated indicators.

Table 1.
Studies included estimating the association of depression and gender role orientations.

(First author, Year)	Survey Year	MDr	FDr	N	Sex	Age	Study location	College	Health	G scale	D scale	LEI	EI	PII
(Chevron et al., 1978)	NR	−0.51	−0.06	39	male	19	the US	college	health	SRSQ	SDS	NR	NR	NR
(Chevron et al., 1978)	NR	−0.2	−0.22	82	female	19	the US	college	health	SRSQ	SDS	NR	NR	NR
(DeGregorio and Carver, 1980)	NR	−0.15	0.01	317	mixed	19	the US	college	health	BSRI-40	BDI	NR	NR	NR
(Holahan and Spence, 1980)	NR	−0.15	0.21	60	male	19	the US	college	unhealth	PAQ-16	TSBI	NR	NR	NR
(Holahan and Spence, 1980)	NR	−0.42	−0.22	94	female	19	the US	college	unhealth	PAQ-16	TSBI	NR	NR	NR
(Feather, 1985)	1982	−0.25	0.13	83	male	23.99	Australia	college	health	PAQ-16	BDI	NR	NR	NR
(Feather, 1985)	1982	−0.24	0.03	109	female	23.99	Australia	college	health	PAQ-16	BDI	NR	NR	NR
(Flett et al., 1985)	1984	−0.46	NR	444	mixed	20.1	Canada	college	health	PAQ-40	BDI	NR	NR	NR
(Welkowitz et al., 1985)	NR	−0.31	−0.06	55	male	19	the US	college	health	BSRI-40	BDI	NR	NR	NR
(Welkowitz et al., 1985)	NR	−0.24	−0.26	76	female	19	the US	college	health	BSRI-40	BDI	NR	NR	NR
(Zeldow et al., 1985)	NR	−0.55	−0.09	115	mixed	23.6	the US	college	health	PAQ-16	BDI	NR	NR	NR
(Feather, 1987)	1982	−0.37	NR	257	mixed	22.93	Australia	college	health	PAQ-16	BDI	NR	NR	NR
(Roos and Cohen, 1987)	NR	−0.4	−0.05	109	mixed	18.2	the US	college	health	PAQ-16	BDI	NR	NR	NR
(Stoppard and Paisley, 1987)	NR	−0.31	−0.06	402	mixed	19.3	Canada	college	health	BSRI-40	BDI	NR	NR	NR
(Wilson and Cairns, 1988)	NR	−0.51	−0.12	94	male	16.0	the UK	pre-college	health	PAQ-16	GHQ	NR	NR	NR
(Wilson and Cairns, 1988)	NR	−0.42	−0.04	116	female	16.0	the UK	pre-college	health	PAQ-16	GHQ	NR	NR	NR
(Wilson and Cairns, 1988)	NR	−0.197	NR	54	mixed	8.5	the UK	pre-college	health	CPAQ-36	GHQ	NR	NR	NR
(Wilson and Cairns, 1988)	NR	−0.484	NR	49	mixed	14.8	the UK	pre-college	health	PAQ-16	GHQ	NR	NR	NR
(Craighead and Green, 1989)	1980	−0.25	−0.13	215	male	13.5	the US	pre-college	health	PAQ-16	CDI	NR	NR	NR
(Craighead and Green, 1989)	1980	−0.4	−0.14	248	female	13.5	the US	pre-college	health	PAQ-16	CDI	NR	NR	NR
(O'Heron and Orlofsky, 1990)	NR	−0.28	−0.16	94	male	19	the US	college	health	BSRI-40	BDI	0.850	0.839	0.894
(O'Heron and Orlofsky, 1990)	NR	−0.32	−0.01	141	female	19	the US	college	health	BSRI-40	BDI	0.850	0.839	0.894
(Hunt, 1993)	NR	−0.275	−0.29	159	mixed	20.3	the US	college	health	SBSRI-20	BDI	0.857	0.863	0.897
(Russo et al., 1993)	NR	−0.47	NR	235	male	19.5	the US	college	health	PAQ-16	BDI	0.857	0.863	0.897
(Russo et al., 1993)	NR	−0.4	NR	219	female	19.5	the US	college	health	PAQ-16	BDI	0.857	0.863	0.897
(Russo et al., 1993)	NR	−0.35	NR	581	male	19.5	the US	college	health	PAQ-16	BDI	0.857	0.863	0.897
(Russo et al., 1993)	NR	−0.38	NR	721	female	19.5	the US	college	health	PAQ-16	BDI	0.857	0.863	0.897
(Whitley and Gridley, 1993)	NR	−0.26	−0.01	200	mixed	19	the US	college	health	BSRI-40	BDI	0.857	0.863	0.897
(Wong and Whitaker, 1993)	NR	−0.03	−0.16	56	male	20.9	the US	college	health	SBSRI-20	BDI	0.857	0.863	0.897
(Wong and Whitaker, 1993)	NR	−0.27	−0.26	115	female	20.9	the US	college	health	SBSRI-20	BDI	0.857	0.863	0.897
(Sanfilippo, 1994)	NR	−0.35	−0.16	63	male	19.4	the US	college	health	PAQ-16	SDS	0.860	0.866	0.901
(Sanfilippo, 1994)	NR	−0.44	−0.27	77	female	19.4	the US	college	health	PAQ-16	SDS	0.860	0.866	0.901
(Waelde et al., 1994)	1989–1991	−0.43	−0.06	537	mixed	24.5	the US	college	health	PAQ-16	BDI	0.860	0.866	0.901
(Wong and Whitaker, 1994)	NR	−0.55	−0.52	23	male	25.4	the US	college	health	SBSRI-20	BDI	0.860	0.866	0.901
(Wong and Whitaker, 1994)	NR	−0.17	−0.42	57	female	25.4	the US	college	health	SBSRI-20	BDI	0.860	0.866	0.901
(Hart and Thompson, 1996)	NR	−0.39	−0.28	33	male	14.5	Canada	pre-college	health	BSRI-40	BDI	0.897	0.825	0.869
(Hart and Thompson, 1996)	NR	−0.11	−0.22	33	female	14.5	Canada	pre-college	health	BSRI-40	BDI	0.897	0.825	0.869
	NR	−0.16	−0.14	773	mixed	19.5	the US	college	health		BDI	0.865	0.867	0.907

(continued on next page)

Table 1. (continued)

(First author, Year)	Survey Year	MDr	FDr	N	Sex	Age	Study location	College	Health	G scale	D scale	LEI	EI	PII
(Kopper and Epperson, 1996)										SBSRI-20				
(Marusic and Bratko, 1998)	1994	−0.47	0.14	232	male	18.0	Croatia	pre-college	health	BSRI-40	NEO-N-D	0.821	0.553	0.718
(Marusic and Bratko, 1998)	1994	−0.31	0.19	232	female	18.0	Croatia	pre-college	health	BSRI-40	NEO-N-D	0.821	0.553	0.718
(Sappington et al., 1998)	NR	−0.5	0.22	115	male	19	the US	college	health	MMPI-2	MMPI-2	0.870	0.867	0.916
(Sappington et al., 1998)	NR	−0.54	0.07	219	female	19	the US	college	health	MMPI-2	MMPI-2	0.870	0.867	0.916
(Wilhelm et al., 1998)	1983	0	0.1	156	mixed	29.0	Australia	other adults	health	BSRI-40	WLS	NR	NR	NR
(Cheng, 1999)	1995	−0.32	−0.12	170	mixed	20.0	Hong Kong	other adults	health	SBSRI-20	BDI	0.907	0.665	0.884
(Marcotte et al., 1999)	NR	−0.21	0.03	142	male	15.3	Canada	pre-college	health	BSRI-40	BDI	0.906	0.805	0.885
(Marcotte et al., 1999)	NR	−0.13	0.07	164	female	15.3	Canada	pre-college	health	BSRI-40	BDI	0.906	0.805	0.885
(Lengua and Stormshak, 2000)	NR	0.01	−0.03	109	male	18.8	the US	college	health	BSRI-40	BDI	0.874	0.845	0.926
(Lengua and Stormshak, 2000)	NR	−0.35	0.01	141	female	18.8	the US	college	health	BSRI-40	BDI	0.874	0.845	0.926
(Aube' and Saltaris, 2000)	NR	NR	−0.08	339	mixed	13.5	Canada	pre-college	health	SCSRI-20	CES-D	0.910	0.805	0.892
(Price and Lavercombe, 2000)	NR	−0.09	0.27	151	mixed	14.5	Australia	pre-college	health	PDQ	RADS	0.917	0.895	0.883
(Marcotte et al., 2002)	NR	−0.15	−0.1	268	male	14.5	Canada	pre-college	health	BSRI-40	BDI	0.916	0.822	0.896
(Marcotte et al., 2002)	NR	−0.14	−0.12	279	female	14.5	Canada	pre-college	health	BSRI-40	BDI	0.916	0.822	0.896
(Hermann and Betz, 2004)	NR	−0.31	−0.27	161	male	19	the US	college	health	BSRI-40	BDI-II	0.884	0.859	0.935
(Hermann and Betz, 2004)	NR	−0.2	−0.1	209	female	19	the US	college	health	BSRI-40	BDI-II	0.884	0.859	0.935
(Dyson and Renk, 2006)	NR	−0.35	0.06	23	male	18.5	the US	college	health	BSRI-40	BDI-II	0.891	0.865	0.941
(Dyson and Renk, 2006)	NR	−0.14	−0.31	51	female	18.5	the US	college	health	BSRI-40	BDI-II	0.891	0.865	0.941
(Li et al., 2006)	1997–1998	−0.137	NR	242	mixed	16.0	the US	pre-college	health	SBSRI-20	RADS	0.867	0.867	0.926
(Lyons et al., 2006)	2002–2003	−0.07	−0.01	34	mixed	6.02	the US	pre-college	health	CSRI-40	CDI	0.879	0.853	0.942
(Wupperman and Neumann, 2006)	2002–2003	−0.37	−0.07	589	mixed	19	the US	college	health	PAQ-16	CES-D	0.879	0.853	0.942
(Lam and McBride-Chang, 2007)	NR	−0.19	−0.07	291	mixed	21.3	Hong Kong	college	health	CBSRI-12	GHQ	0.959	0.783	0.931
(Moller-Leimkuhler and Yucel, 2010)	2003–2004	−0.37	−0.12	1018	mixed	23.5	Germany	college	health	PAQ-16	GSMD	0.904	0.871	0.914
(Coleman, 2015)	1990–1995	−0.26	NR	2412	mixed	18.5	the US	college	health	PAQ-16	MHI	0.850	0.839	0.909
(Juster et al., 2011)	NR	−0.18	−0.11	204	mixed	19	Canada	other adults	mixed	BSRI-40	BDI-II	0.956	0.830	0.915
(Vafaei et al., 2016)	2012	−0.19	−0.10	1955	mixed	69.1	mixed	other adults	mixed	SBSRI-12	CES-D	NR	NR	NR
(Price et al., 2018)	NR	−0.29	NR	36	male	73.6	the US	other adults	health	BSRI-40	CES-D	0.905	0.899	0.956
(Price et al., 2018)	NR	−0.28	NR	67	female	73.6	the US	other adults	health	BSRI-40	CES-D	0.905	0.899	0.956
(Price et al., 2018)	NR	−0.24	NR	117	male	20.0	the US	other adults	health	BSRI-40	CES-D	0.905	0.899	0.956
(Price et al., 2018)	NR	−0.19	NR	356	female	73.6	the US	other adults	health	BSRI-40	CES-D	0.905	0.899	0.956
(Kotera et al., 2019)	2018	0.07	NR	155	mixed	40.28	UK	other adults	health	MBS	DASS21	0.942	0.918	0.925
(Arcand et al., 2020)	2002–2019	−0.23	−0.07	50	male	22.32	Canada	college	health	SBSRI-20	BDI-II	NR	NR	NR
(Arcand et al., 2020)	2002–2019	−0.25	0.016	58	female	22.97	Canada	college	health	SBSRI-20	BDI-II	NR	NR	NR
(Arcand et al., 2020)	2002–2019	−0.05	−0.23	75	male	36.89	Canada	other adults	health	SBSRI-20	BDI-II	NR	NR	NR
(Arcand et al., 2020)	2002–2019	−0.08	−0.29	76	female	34.65	Canada	other adults	health	SBSRI-20	BDI-II	NR	NR	NR
(Lin et al., 2020)	2020	−0.27	−0.17	220	male	20.73	China	college	health	CSRI-50	CES-D	NR	NR	NR

(continued on next page)

Table 1. (continued)

(First author, Year)	Survey Year	MDr	FDr	N	Sex	Age	Study location	College	Health	G scale	D scale	LEI	EI	PII
(Lin et al., 2020)	2020	−0.31	−0.15	405	female	19.87	China	college	health	CSRI-50	CES-D	NR	NR	NR
(Nagoshi et al., 2020)	2000	0.11	0.08	450	male	10.37	Mexico	pre-college	health	AMGR	Single Item	0.836	0.544	0.779
(Nagoshi et al., 2020)	2000	−0.04	−0.06	505	female	10.26	Mexico	pre-college	health	AMGR	Single Item	0.836	0.544	0.779
(Sterner et al., 2020)	2014	−0.12	0.01	516	male	70	Sweden	other adults	mixed	PN-SRI	MADRS	0.956	0.909	0.942
(Sterner et al., 2020)	2014	−0.12	0.03	596	female	70	Sweden	other adults	mixed	PN-SRI	MADRS	0.956	0.909	0.942
(Kerr et al., 2021)	2011	−0.17	−0.15	192	mixed	40.39	Canada	other adults	health	SBSRI-20	BDI-II	0.946	0.842	0.923

Note. MDr = correlation coefficient of masculine orientation and depression; FDr = correlation coefficient of feminine orientation and depression; Gscale = gender-role instrument; Dscale = Depression instrument; LEI, EI and PII are three sub-dimensions of human development indices, which were downloaded from the website of Human Development Reports (retrieval from: <http://hdr.undp.org/en/data>), LEI = life expectancy index; EI = education index; PII = per capita income index; NR = not reported; SRSQ = Sex-Role Stereotype Questionnaire; BSRI-40 = Bem Sex-Role Inventory (1974); PAQ-16 = Personal Attributes Questionnaire; CPAQ-36 = Children's Personal Attributes Questionnaire; SBSRI-20 = short version of BSRI, in which 10 masculine related items and 10 feminine related items; MMPI-2 = the Minnesota Multiphasic Personality Inventory-2; SCSRI-20 = short version of Child Sex-Role Inventory; PDQ = Personal Description Questionnaire; CSRI-40 = Children's Sex-Role Inventory; SDS = Zung Self-Rating Depression Scale; BDI = Beck Depression Scale; TSBI = Texas Social Behavior Inventory; GHQ = General Health Questionnaire; CDI = Childhood Depression Inventory; NEO-N-D = NEO Personality Inventory-Neuroticism-Depression; MMPI-2D = the Minnesota Multiphasic Personality Inventory-2 Depression; WLS = Wilson Lovibond Scale; CES-D = Community Epidemiological Survey for Depression; RADS = Reynolds Adolescent Depression Scale; BDI-II = Beck Depression Scale-II; GSMD = the Gotland Scale for Male Depression; MHI = the 4-item depression subscale from Mental Health Inventory; MBS = Masculine Behavior Scale; DASS21 = Depression Anxiety Stress Scale 21; CBSRI-12 = Chinese version of BSRI; AMGR = Adaptive and maladaptive gender roles (the adaptive gender role item were used in the meta-analysis); Single Item = a self-design single proxy variable on 5-point scales; PN-SRI = The Positive-Negative Sex-Role Inventory (the positive items were used in the meta-analysis); MADRS = Montgomery-Åsberg Depression Rating Scale.

2.7. Statistical analysis

The random-effects model was applied as a pooling method given that this method provides a comparably conservative estimation (Field, 2001). Subgroup analyses of the associations (r) and group differences (Cohen's d) in six pairwise comparisons of gender role traits (AM pair, AF pair, AU pair, MF pair, MU pair, and FU pair)¹ were conducted on various potential categorical moderators including sex, college student status, health status, study location, and instrument type. Meta-regression analyses employed the DerSimonian-Laird method for continuous variables including sample age, survey year, and three sub-dimensions (life expectancy index, education index, and income index) of human development indices. We adopted Q -statistic together with I^2 to determine the level of heterogeneity (Higgins and Thompson, 2002), and I^2 values of 0%, 25%, 50%, and 75% represent *no*, *low*, *moderate*, and *high* heterogeneity, respectively (Higgins et al., 2003). Publication bias was assessed with a visual inspection of the funnel plots along with Egger's linear regression test (Egger et al., 1997). The trim-and-fill procedure (Duval and Tweedie, 2000) was conducted to account for potential publication bias. Sensitivity analyses using the inverse variance method were conducted to reveal possible changes in effect size estimates as the extent of selection bias.

All statistical analyses were performed using R Studio Version 1.2.1335 with the meta-package, metafor-package, ggplot2-package. Statistical tests were conducted 2-sided and employed a significance threshold of $p < 0.05$.

3. Results

Data-based literature search and cross-reference checks resulted in

¹ Note. AM pair = androgynous vs masculine; AF pair = androgynous vs feminine; AU pair = androgynous vs undifferentiated trait; MF pair = masculine vs feminine; MU pair = masculine vs undifferentiated trait; FU pair = feminine vs undifferentiated trait. In each pair, only two groups of people's data were included. For example, AM pair refers to group comparison only between androgynous and masculine group (feminine and undifferentiated group were excluded from the test).

6290 records. Of the initially retrieved documents, 1809 were eliminated due to duplication, and 4223 after screening the title and abstract. Full-text articles ($k = 258$) were further evaluated against the pre-determined eligible criteria, which led to further exclusion of 200 articles (e.g., 19 review articles, 10 single-gender studies, 5 published in non-English journals, 2 papers that involve data reuse across multiple publications, 1 conference proceeding, 30 studies with not suitable data). Likewise, 133 studies focused on irrelevant topics and were excluded after reviewing the full texts. As a result, 58 articles published between 1978 to 2021 were included, based on the available data 47 and 37 respectively were used for data analyses to estimate the correlation between depression with masculinity and femininity, respectively, while data from 19 studies were meta-analyzed to determine the difference in depression between every two gender role traits. Literature search, screening, and evaluation are presented in Fig. 1.

3.1. Characteristics of the original studies

The mean age of participants across included studies ranges from 6.02 to 73.6 years old. Among 58 studies, 31 (59%) were conducted in the United States (US), 10 (17%) in Canada, 4 (7%) in Australia, 3 (5%) in Hong Kong (HK), 2 (5%) in the United Kingdom (UK), while China, Croatia, Germany, Mexico, Poland, Sweden, and mixed countries (Albania, Brazil, Canada, and Colombia) had only one study. For more details, please see Tables 1 and 2.

3.2. Study quality

The methodological quality of the included studies was classified as ranging from reasonable to good quality (6.17 ± 1.15). All studies fall within $3 \pm SD$ of mean scores and, consequently were included in the present meta-analysis.

3.3. Masculinity, femininity, and depression

Our main meta-analysis revealed a nearly moderately significant and negative association between depression with masculinity ($r = -0.27$, $p < 0.001$, $k = 79$, $N = 20,576$, see Fig. 2), and a significant and weak negative association between femininity and depression ($r = -0.07$, $p <$

Table 2.

Studies included estimating depression difference among four gender role traits.

(First author, Year)	Survey year	Sex	AMd	AFd	AUd	MFd	MUd	FUd	AN	MN	FN	UN	Age	Health	G scale	D scale	Location	College	LEI	EI	PII
(Burchardt and Serbin, 1982)	1976–1977	male	−0.09	0.26	−0.91	0.41	−0.99	−1.13	14	35	8	24	18.8	health	BSRI	FAM	the US	college	NR	NR	NR
(Burchardt and Serbin, 1982)	1976–1977	female	−0.02	−0.70	−1.81	−0.62	−1.54	−1.16	29	13	42	21	18.8	health	BSRI	FAM	the US	college	NR	NR	NR
(Elpern and Karp, 1984)	NR	male	0.23	−0.49	−0.55	−0.76	−0.79	−0.06	12	8	8	12	30.0	health	BSRI	CES-D	the US	college	NR	NR	NR
(Elpern and Karp, 1984)	NR	female	−0.33	−1.31	−0.40	−0.90	−0.01	1.02	12	8	12	12	30.0	health	BSRI	CES-D	the US	college	NR	NR	NR
(Small et al., 1984)	NR	mixed	−0.52	−0.36	−0.61	0.12	−0.12	−0.22	88	82	86	83	19	health	BSRI	DACL-A	the US	other adults	NR	NR	NR
(Nezu, 1987)	NR	male	−0.14	−1.51	−1.92	−1.62	−2.08	0.08	19	27	21	25	25.3	health	BSRI	BDI	the US	college	NR	NR	NR
(Nezu, 1987)	NR	female	−0.33	−1.83	−1.81	−1.42	−1.29	0.18	38	16	44	21	25.3	health	BSRI	BDI	the US	college	NR	NR	NR
(Wilson and Cairns, 1988)	NR	male	−0.20	−1.21	−1.01	−0.81	−0.79	−0.07	23	32	9	30	16.0	health	PAQ	GHQ	the UK	pre-college	NR	NR	NR
(Wilson and Cairns, 1988)	NR	female	0.16	−0.57	−0.56	−0.75	−0.76	0.01	32	13	40	31	16.0	health	PAQ	GHQ	the UK	pre-college	NR	NR	NR
(Oliver and Toner, 1990)	NR	male	NR	NR	NR	−0.23	NR	NR	NR	19	12	NR	21.5	health	SBSRI-20	BDI	Canada	college	0.882	0.806	0.864
(Oliver and Toner, 1990)	NR	female	NR	NR	NR	−0.25	NR	NR	NR	53	105	NR	21.5	health	SBSRI-20	BDI	Canada	college	0.882	0.806	0.864
(Cook, 1993)	NR	male	0.59	1.29	−0.56	0.74	−0.91	−1.12	4	8	6	12	32.0	health	BSRI	BDI	the UK	other adults	0.866	0.736	0.845
(Cook, 1993)	NR	female	1.00	0.08	0.30	−0.87	−1.39	0.19	14	7	25	12	32.0	unhealth	BSRI	BDI	the UK	other adults	0.866	0.736	0.845
(Hunt, 1993)	NR	mixed	−0.59	−0.42	−0.56	0.08	−0.45	−0.47	43	41	42	12	20.3	health	SBSRI-20	BDI	the US	college	0.857	0.863	0.897
(Sanfilipo, 1994)	NR	mixed	−0.37	−0.60	−1.10	−0.21	−0.52	−0.30	39	30	30	33	19.4	health	PAQ	SDS	the US	college	0.860	0.866	0.901
(Cheng, 1999)	1995	mixed	−0.02	−0.64	−0.97	−0.70	−0.52	0.14	39	46	45	41	20.0	health	CSBSRI	BDI	Hong Kong	college	0.907	0.665	0.884
(Broderick and Korteland, 2002)	NR	mixed	−0.12	0.00	−0.48	0.14	−0.45	−0.62	27	52	58	37	9	health	CSRT	CDI	the US	pre-college	0.879	0.853	0.927
(Broderick and Korteland, 2002)	NR	mixed	0.04	−0.36	−0.49	−0.42	−0.17	0.26	18	38	57	35	10	health	CSRT	CDI	the US	pre-college	0.879	0.853	0.927
(Broderick and Korteland, 2004)	NR	mixed	−0.81	−0.69	−0.13	−0.09	0.17	0.22	17	19	23	34	9	mixed	CSRT	CDI	the US	pre-college	0.884	0.859	0.935
(Cheng, 2005)	1997	mixed	−0.74	−1.95	−0.60	−1.09	NR	NR	25	25	25	NR	19.1	health	BSRI	BDI	Hong Kong	college	0.919	0.673	0.889
(Szpitalak and Prochwicz, 2013)	NR	male	1.84	−1.80	−1.69	−2.79	−2.25	−0.38	1	2	3	8	48.2	unhealth	IPP	BDI	Poland	other adults	0.881	0.853	0.820
(Szpitalak and Prochwicz, 2013)	NR	female	0.61	−1.17	−1.86	−1.85	−2.80	−0.56	6	1	27	13	48.2	unhealth	IPP	BDI	Poland	other adults	0.881	0.853	0.820
(Vafaei et al., 2016)	NR	mixed	−0.24	−0.26	−0.49	−0.04	−0.27	−0.22	629	399	406	521	69.1	health	SBSRI-12	CES-D	mixed	other adults	NR	NR	NR
(Arcand et al., 2020)	2002–2019	mixed	−0.21	−0.18	−0.52	−0.01	−0.33	−0.29	58	66	64	71	29.22	health	BSRI-20	BDI-II	Canada	other adults	NR	NR	NR
(Lin et al., 2020)	2002–2019	male	−0.2	−1.29	−0.65	−1.05	−0.44	0.52	101	38	12	69	20.73	health	CSRI-50	CES-D	China	college	NR	NR	NR
(Lin et al., 2020)	2020	female	0.01	−0.52	−0.61	−0.52	−0.60	−0.10	141	54	68	142	19.87	health	CSRI-50	CES-D	China	college	NR	NR	NR

Note. AMd = Cohen's *d* of comparing androgynous with masculine identity; AFd = Cohen's *d* of comparing androgynous with feminine identity; AUd = Cohen's *d* of comparing androgynous with undifferentiated identity; MFd = Cohen's *d* of comparing masculine with feminine identity; MUd = Cohen's *d* of comparing masculine with undifferentiated identity; FUd = Cohen's *d* of comparing feminine with undifferentiated identity; BSRI = Bem Sex-Role Inventory; PAQ = Personal Attributes Questionnaire; SBSRI-20 = short version of BSRI, including 10 masculine related items and 10 feminine related items; SBSRI-12 = short version of BSRI, including 6 masculine related items and 6 feminine related items; CSBSRI = Chinese version of shorten BSRI; CSRT = Children's Sex-Role Test; IPP = Inventory for Psychological Gender Assessment; FAM = short form of MMPI; CSRI-50 = Chinese version of sex role inventory; CES-D = Community Epidemiological Survey for Depression; DACL-A = Depression Adjective Check List, Form A; BDI = Beck Depression Scale; GHQ = General Health Questionnaire; SDS = Zung Self-Rating Depression Scale; CDI = Childhood Depression Inventory; BDI-II = The second version of Beck Depression Scale; CES-D = Community Epidemiological Survey for Depression.

Fig. 1.. The flowchart of literature search, screening, and evaluation.

0.001, $k = 64$, $N = 14,397$, see Fig. 3). Results from the Egger's tests did not reveal evidence for a significant impact of publication bias for both masculinity-depression ($t(77) = -0.66$, $p = 0.51$) and femininity-depression associations ($t(62) = -0.53$, $p = 0.60$). The effect sizes furthermore passed the sensitivity tests by means of the inverse variance method, and no outlier was observed that may bias the pooled results.

Results from the subsequent subgroup analyses are presented in Tables 3 and 4. For the masculinity-depression association, significant negative correlations were observed in all subgroups across sex, college student status, health status, study location, and instrument type (gender role and depression). Notably, regarding health status, the magnitude of significant negative correlations was comparable in healthy as well as groups with elevated pathological symptom load. For college student status, a significantly weaker negative correlation was observed in middle-aged and older adults than those in the college student group, while no difference between pre-college and college students was found.

For the femininity-depression association, the significant but weak negative correlation was influenced by the following moderators. Regarding sex, significant negative correlations were found in female and mixed-sex groups, but not in the male group. For college student status and health status, a significant negative correlation was detected in the two groups (college student and healthy condition group), but not in other groups (pre-college, other adults; mixed health status, and unhealthy group). For instrument type, significant results were only found when authors used the PAQ and the BSRI (shorten and revised versions), with pronounced effects when the short version of BSRI was used. With

regard to the scales used to assess depression, significant results were found for all scales except for others (e.g., the self-design depressive questionnaire). Notably, in contrast to the pattern of associations observed in the pooled data, significant positive correlations of femininity and depression were observed in the samples from Australia and Croatia. No significant negative correlation was observed in samples from HK, Mexico, Sweden, and the UK, but the US, Canada, China, and 'mixed countries' group.

Meta-regression analyses revealed that the negative masculinity-depression association was significantly moderated by survey year ($\beta = 0.0051$, $R^2 = 15.58$, $p < 0.001$) and life expectancy index ($\beta = 1.50$, $R^2 = 2.82$, $p < 0.05$). Specifically, the more recent year and greatest life expectancy weakened the negative associations between masculinity and depression. In contrast, the meta-regression with mean age, education index, and income index did not moderate significant associations between masculinity and depression. For the femininity-depression association, significant predictor effects of education index ($\beta = -0.40$, $R^2 = 8.1$, $p < 0.05$) and income index ($\beta = -0.96$, $R^2 = 18.94$, $p < 0.01$) were observed, specifically these variables negatively predicted this association, indicating that nations with higher educational attainment and per capita income would facilitate the protective effect of femininity against depression. Also, no moderator effect was found for the variable sample age (see Supplementary Appendix 1 and 2 for details).

3.4. Gender role traits and depression

Examining differences in depression across gender role traits

Fig. 2.. The Forest Plot (a), the Funnel Plot (b), and the Egger's test Plot (c) of Masculinity-Depression Association.

revealed significant differences in each pairwise comparison, with a negative value indicating a lower level of depression showed in the former group (androgyny vs. masculinity (AM), $d = -0.21$, $z = -3.71$, $p < 0.001$; androgyny vs. femininity (AF), $d = -0.65$, $z = -6.33$, $p < 0.001$; androgyny vs. undifferentiated trait (AU), $d = -0.76$, $z = -9.17$, $p < 0.001$; masculinity vs. femininity (MF), $d = -0.42$, $z = -4.31$, $p < 0.001$; masculinity vs. undifferentiated trait (MU), $d = -0.61$, $z = -6.75$, $p < 0.001$; femininity vs. undifferentiated trait (FU), $d = -0.17$, $z = -2.55$, $p < 0.05$).

Results from the Egger's test showed that publication bias was not obvious in two pairs (AM: $t(23) = 1.62$, $p = 0.12$; FU: $t(23) = 0.06$, $p = 0.95$, Fig. 4). Therefore, the trim-and-fill method was employed for the other four pairs and the revised pooled effects in three pairs were consistent with the original results (AF: $d = -0.35$, $z = -3.09$, $p < 0.01$; AU: $d = -0.58$, $z = -6.25$, $p < 0.001$; MU: $d = -0.36$, $z = -3.52$, $p < 0.001$). While, in the pair of MF, the significant difference disappeared

($d = -0.15$, $z = -1.42$, $p = 0.16$). However, each effect size in all pairs passed sensitivity test, no outlier was observed which may have biased the pooled results.

Similar subgroup analyses and meta-regression analyses (detailed results are presented in Supplementary Appendix 3 and 4) were also conducted to estimate moderation effects. Concerning results of subgroup analyses, all pairs (except for the AU pair) were moderated by sex, health status, college student status, study location, and instrument type. Results from meta-regression analyses showed that sample age did not moderate the original pooled effect sizes ($ps > 0.05$). Notably, the positive predict effect of survey year was found in the AU pair ($\beta = 0.0116$, $R^2 = 16.85$, $p < 0.05$). For the human development indices, the life expectancy index could negatively predict the differences in AF ($\beta = -20.93$, $R^2 = 25.55$, $p < 0.05$) and MF pairs ($\beta = -15.33$, $R^2 = 46.52$, $p < 0.05$), and the latter was also positively predicted by the education index ($\beta = 3.27$, $R^2 = 43.86$, $p < 0.05$). Meanwhile, the income index can

Fig. 3.. The Forest Plot (a), the Funnel Plot (b), and the Egger's test Plot (c) of Femininity-Depression Association.

negatively predict the difference in AM pair ($\beta = -10.82$, $R^2 = 22.42$, $p < 0.05$) and positively predict the difference in MU pair ($\beta = 12.14$, $R^2 = 100$, $p < 0.001$). Totally, the most stable difference was found in the AU pairs (higher level of depression in undifferentiated group vs. androgynous group), nearly without any moderation effect (except for survey year).

3.5. Additional analyses

With regard to the male and female differences in depression, we conducted an additional analysis using available data from the included studies. Results indicated a significant difference ($d = -0.19$, $z = -2.55$, $p < 0.05$) between the two gender such that females ($N = 4744$) exhibited higher levels of depression compared to males ($N = 3666$). Similarly, gender differences were observed in both masculinity ($d = 0.38$, $z = 4.93$, $p < 0.001$) and femininity ($d = -0.56$, $z = -7.66$, $p < 0.001$), suggesting that women tended to be more feminine but less masculine as compared to men. Overall, the main findings in the current

study are outlined in Fig. 5.

4. Discussion

4.1. Associations between gender role orientations and depression

Employing a quantitative analysis in this review, we observed a robust negative association between masculinity and depression. Furthermore, individuals with higher self-reported masculinity experienced lower levels of depression compared with individuals reporting lower levels of masculinity. The present results resonate with findings from a previous meta-analysis review (Whitley, 1985), indicating that masculinity may have a protective effect against the development of depression. However, it is worth emphasizing that this negative association has the greatest magnitude in studies ($k = 24$) using the PAQ. This result may be attributed to that PAQ has unique masculine trait items (e.g., stand up well, never give up, active, and decisive), which could be candidate traits to protect against depression (Spence, 1991).

Table 3.
Subgroup analysis results of masculinity-depression association.

Moderators	Subgroups	<i>k</i>	<i>N</i>	<i>r</i>	95% C.I.	Heterogeneity analyses <i>Q</i>	<i>I</i> ²
Sex	Males	27	4145	−0.27	−0.35; −0.20	149.83	82.6
	Females	27	5446	−0.27	−0.33; −0.21	115.94	77.6
	mixed (females, males)	25	10,985	−0.26	−0.31; −0.21	162.27	85.2
College student status	pre-college students (children, teenagers)	19	3541	−0.23	−0.32; −0.14	124.59	85.6
	college students	49	13,007	−0.32	−0.35; −0.28	165.42	71.0
	mixed sample (other adults, elderly people)	11	4028	−0.13	−0.17; −0.08	16.87	40.7
Health status	Health	73	17,151	−0.27	−0.31; −0.24	380.97	81.1
	Unhealth	2	154	−0.30	−0.54; −0.02	3.08	67.6
	mixed (health, unhealth)	4	3271	−0.16	−0.19; −0.13	2.66	0
Study location	the US	43	10,342	−0.31	−0.35; −0.27	151.78	72.3
	Canada	14	2420	−0.21	−0.29; −0.13	45.78	71.6
	the UK	5	468	−0.32	−0.54; −0.23	32.24	87.6
	Australia	5	756	−0.19	−0.34; −0.04	17.24	76.8
	Croatia	2	464	−0.39	−0.54; −0.23	4.11	75.7
	Hong Kong, China	2	461	−0.24	−0.37; −0.12	2.05	51.3
	Mainland, China	2	625	−0.30	−0.37; −0.22	0.27	0
	Mexico	2	955	0.03	−0.11; 0.18	5.35	81.3
	Sweden	2	1112	−0.12	−0.18; −0.06	0	0
	mixed (Albania, Brazil, Canada, Colombia)	2	2973	−0.28	−0.45; −0.08	28.8	96.5
Gender-role scale	BSRI	27	4298	−0.23	−0.27; −0.19	54.58	52.4
	PAQ	22	8001	−0.38	−0.41; −0.34	58.85	64.3
	SBSRI	13	2046	−0.19	−0.24; −0.14	14.58	17.7
	TBSRI	3	2280	−0.18	−0.22; −0.14	0.42	0
	TPAQ	2	498	−0.36	−0.58; −0.09	4.05	75.3
	Others	12	3453	−0.21	−0.32; −0.09	129.12	91.5
Depression scale	BDI	33	6768	−0.29	−0.34; −0.25	128.3	75.1
	CES-D	8	3745	−0.26	−0.33; −0.19	23.73	70.5
	BDI-II	10	1099	−0.19	−0.25; −0.14	6.15	0
	SDS	4	261	−0.36	−0.49; −0.23	4.32	60.5
	CDI	3	497	−0.29	−0.43; −0.13	5.42	63.1
	Others	21	7757	−0.25	−0.32; −0.17	224.52	91.1

Table 4.
Subgroup analysis results of femininity-depression association.

Moderators	Subgroups	<i>k</i>	<i>N</i>	<i>r</i>	95% C.I.	Heterogeneity analyses <i>Q</i>	<i>I</i> ²
Sex	Males	23	3176	−0.05	−0.12; 0.01	59.02	62.7
	Females	23	4083	−0.09	−0.15; −0.04	66.14	66.7
	mixed (females, males)	18	7138	−0.07	−0.11; −0.03	41.94	59.5
College student status	pre-college students (children, teenagers)	17	3551	−0.01	−0.08; 0.05	52.29	69.4
	college students	39	7076	−0.10	−0.14; −0.06	81.04	53.1
	mixed sample (other adults, elderly people)	8	3770	−0.07	−0.14; 0.003	22.17	68.4
Health status	Health	58	10,972	−0.08	−0.11; −0.04	155.21	63.3
	Unhealth	2	154	−0.01	−0.41; 0.39	6.69	85
	mixed (health, unhealth)	4	3271	−0.04	−0.12; 0.04	10.68	71.9
Study location	the US	32	4783	−0.11	−0.16; −0.06	71.61	56.7
	Canada	14	2315	−0.09	−0.13; −0.05	14.37	9.5
	Australia	4	499	0.14	0.03; 0.24	4.30	30.2
	Croatia	2	464	0.17	0.07; 0.25	0.3	0
	Hong Kong, China	2	461	−0.09	−0.18; 0.00	0.27	0
	Mainland, China	2	625	−0.16	−0.23; −0.08	0.08	0
	Mexico	2	955	0.009	−0.13; 0.15	4.65	0
	Sweden	2	1112	0.02	−0.04; 0.08	0.11	0
	the UK	2	210	−0.08	−0.21; 0.06	0.33	0
	Mixed (Albania, Brazil, Canada, Colombia, Germany)	2	2973	−0.11	−0.14; −0.07	0.33	0
Gender-role scale	BSRI	23	3722	−0.05	−0.1; 0.01	52.32	57.9
	PAQ	14	2938	−0.09	−0.14; −0.04	18.08	28.1
	SBSRI	12	1804	−0.19	−0.26; −0.13	15.81	30.4
	TBSRI	4	2635	−0.09	−0.13; −0.05	0.58	0
	MMPI-2	2	334	0.13	−0.02; 0.27	1.74	42.5
	Others	9	2964	−0.02	−0.10; 0.06	35.51	77.5
Depression scale	BDI	27	4760	−0.09	−0.13; −0.05	48.65	46.6
	BDI-II	10	1099	−0.16	−0.22; −0.09	9.39	4.1
	SDS	4	261	−0.20	−0.31; −0.08	1.28	0
	CDI	3	513	−0.12	−0.21; −0.04	0.69	0
	CES-D	4	2919	−0.11	−0.14; −0.07	2.09	0
	Others	16	4845	0.04	−0.02; 0.10	62.4	76

Fig. 4. The Egger's Test Plot of AM (a), the Egger's Test Plot of FU (b), and Trim-and-Fill Method Test Plots of AF, AU, MU and MF Pair (c).

Note. AF = androgynous group vs feminine group; AU = androgynous group vs undifferentiated group; MF = masculine group vs feminine group; MU = masculine group vs undifferentiated group; In each pair, only two groups of people's data were included. For example, AM pair refers to group comparison only between androgynous and masculine group (feminine and undifferentiated group were excluded from the test).

Notably, the present study revealed for the first time that the important influence of additional moderators on this association, such that with increasing life expectancy, this negative masculinity-depression association appeared to be attenuated over the period studied. Different factors may explain this pattern of effects. Firstly, in a higher life expectancy society with more accessible public health treatments and resources, individuals with high-level masculinity may be increasingly willing to communicate and/or disclose their symptoms of depression. Given that depressive disorders have received greater attention worldwide, more effective treatments and diagnostic tools are developed for this population (Cuijpers, 2018; Weisel et al., 2019), which may lead to individuals with higher levels of masculine traits being more willing to see clinical psychologists and/or psychiatrists respectively. Although adherence to traditional masculine gender norms (e.g., stoicism, self-reliance, and restrictive emotionality) may deter depressed individuals from help-seeking behaviors (Cleary, 2012), men with masculine ideals would seek help for their depressive symptoms if treatments are being accessible, action-oriented, and problem-solving (e.g., cognitive behavioral therapy, short-term therapy, and group-based workshops) (Seidler et al., 2016). Conversely, a stronger masculinity-depression negative association in the past time and low life expectancy environment may be an illusion due to individuals with a high level of the masculine trait are likely to conceal their negative emotions and experience of depression so that self-reported level of depression is low. Secondly, a more competitive environment in school and workplace as compared to 40 years ago has created increased levels of stress which may lead to a higher depressive risk for high-masculinity people. A recently published study suggesting the increased prevalence of depression from 2005 to 2015, with a global increase of 18.4% (World Health Organization, 2017). Additionally, an increasing number of people are diagnosed with severe clinically relevant depression (Mata

et al., 2015; Rotenstein et al., 2016). Meanwhile, a high level of masculinity as assessed by the scales reflects that an individual with high scores on these scales undertakes a higher level in leadership power, risk-taking, self-supporting, and confidence, which is associated with a greater possibility of achieving orientation tasks (Cheng, 2005). Admittedly, task achievement activities might render more social stress, resulting in a higher risk of being depressed, rendering a descended dominance in masculinity. Collectively, although this association tends to be weaker, its magnitude remains moderate, suggesting that socially desirable masculinity may still be a protective factor against depression.

Results from this review have also indicated a weak negative femininity-depression association, suggesting that feminine traits may also be able to protect against depression. Although this result contrasts with results in the previous meta-analysis, in which no correlation of femininity and depression was found (Whitley, 1985), more recent studies found a positive effect of femininity on reducing depressive risk as well as masculinity. High-level femininity was found to be associated with better life satisfaction and less self-reported depression in women regardless of educational attainment (Dyson and Renk, 2006; Gibson et al., 2016; Hunt, 1993) and in male college students (Gibson et al., 2016; Hermann and Betz, 2004). Those findings reinforced the notion that femininity might be well adapted to deal with psychological stress in contemporary society, in which the importance of interpersonal or relationship-building behavior and traits associated with femininity were encouraged (Gibson et al., 2016).

Moreover, the advantage of femininity in depression could be moderated by education and national per capita income level. Our findings confirmed that attending college and higher national income levels highlighted the benefits of femininity against depression in the entire sample. Therefore, improving education levels (expected years of schooling and mean years of schooling) could amplify the protective

Fig. 5. Outline of main findings in the current study.

Note. (a) Level of self-reported depression varied greatly across four different gender-role traits, with ascending order of androgynous < masculine < feminine < undifferentiated trait group. Life expectancy and income positively predict benefits of androgyny; education and income index positively predict benefits of femininity; life expectancy negatively predict benefits of masculinity, but positively predict the benefits of masculinity comparing with femininity; study year negatively predict the benefits of masculinity. (b) Women tended to be more femininity but less masculinity as compared to men, and females showed higher level of depression than males.

effect of femininity. A high level of education provides greater access to higher education for all, including women. It might reduce gender role stereotyping and gender inequality, as the university environment encourages students to generate more open and egalitarian beliefs and attitudes to gender roles (Calvo-Salguero et al., 2008). One of the most direct impacts is that women are more likely to be enrolled in tertiary education (e.g., diploma, associate degree, and bachelor and graduate degree) so that they are qualified to pursue more traditionally masculine positions (e.g., doctor, lawyer, president) and consequently obtain a higher socioeconomic status (Catalyst, 2020; Wood and Eagly, 2012). A cross-national world mental health survey also confirmed that gender role equality (i.e., equal employment opportunities) had a positive influence on female depression by reducing exposure to stressors and increasing access to effective coping resources (Seedat et al., 2009). In other words, women with feminine traits might thus experience less hopelessness and stress (Abramson et al., 1989; Mac Giollabhui et al., 2018), rendering an emerging protective effect of femininity against depression. Meanwhile, the benefits of femininity were observed in college students (include males) in line with the assumption of the construction of masculinity, which suggested that highly educated men benefit from feminine traits because education gives them greater freedom to construct their gender role orientation (Courtenay, 2000). A recent survey conducted in Spain in men aged 21 to 64 years with high educational attainment (9.5% students, 32.7% white-collar workers,

and 20.7% professionals), revealed that femininity was found to associate with lower psychological distress as compensation to low social support (Pilar Matud, 2019). Accordingly, male college students may also feel less stress from their atypical gender role traits (conform to feminine gender role) and access good social connection and support, thus reducing the risk of depression. Furthermore, individuals living in feminine nations (both women and men are allowed to be more feminine) reported higher subjective well-being (Arrindell and Veenhoven, 2002) and less depression (Arrindell et al., 2003) than those living in more masculine nations (women are expected to be more femininity and men to be more masculinity). Indeed, economic development (income level) and education attainment are mutually influenced (Reynolds and Ross, 1998), with improvement in these two variables having a positive impact on femininity, especially feminine women. Such results may be mainly due to the process of gender role equalization through reducing or releasing the psychological stress from traditional typical gender role expectation to those with more feminine traits.

Furthermore, studies ($k = 12$) using the Short version of BSRI (SBSRI) to measure gender role consistently found prominent and significant negative correlations compared to studies using other scales (including original BSRI). In order to balance social desirability between masculine and feminine sub-scales, Bem (1979) revised the BSRI by retaining the clusters of both masculine and feminine traits of higher social desirability. Therefore, individuals' feelings may be positively affected by the

high social desirability of feminine traits in the SBSRI (e.g., warm, tender, gentle, affectionate, sympathetic, and understanding). A recent study found that the feminine traits with lower but not higher socially desirability would lead to poorer depression (Sterner et al., 2020). Additionally, the significant femininity-depression association in the present study is possibly due to those individuals with a high level of femininity may also tend to be more masculine so that their reduced level of depression would be a result of a conjunction of femininity and masculinity (discussed below).

4.3. Depression across four gender role trait groups

The level of self-reported depression varied greatly across four different gender role traits, with ascending order of androgynous < masculine < feminine < undifferentiated group. Given androgynous individuals exhibit both masculine and feminine traits, the above-mentioned finding - to some extent - indirectly confirmed the beneficial effect of both, masculinity, as well as femininity as a protective factor for developing depression. This finding is in accordance with the *Androgyny Hypothesis* emphasizing that androgynous individuals might be free of traditional social stereotypes about gender norms and tend to apply more flexible and effective coping strategies under stressful and changing situations (Cheng, 2005; Juster et al., 2016). As a result, they are less likely to suffer from depression. Conversely, undifferentiated individuals present socially desirable masculinity and femininity at rather low levels and exhibit a more negative self-concept (a common symptom of depressed patients (Lou et al., 2019)). Although the gap between androgynous and undifferentiated individuals witnesses a narrow trend over time (might be a consequence of the decrease in the protective effect of masculinity), it is the most obvious and stable comparison, hardly moderated by other potential variables.

Notably, we found that the life expectancy index can negatively moderate the tendency of the AF (androgynous group vs. feminine group) and MF (masculine group vs. feminine group) pairs, indicating that with the advance in life expectancy, the dominance of androgyny and masculinity is more significant than femininity. However, as the level of education index increased, differences between the MF pair got smaller. And the income index negatively moderated the development of the AM (androgynous group vs. masculine group) pair but positively predicted the MU (masculine group vs. undifferentiated group) pair, which suggested that as contextual education level and per capita income increased, the androgynous dominance would be stronger, but the advantage of masculinity would be weaker. Totally, all human development sub-index positively influenced the advantage of androgyny. It is possible that people who live in the context of high life expectancy, education, and income countries might benefit more in terms of mental health literacy (more effective help) and gender role equality. Consistent with the findings of a recent meta-analysis, authors found that gender difference in depression symptoms is smaller in the high-income nations than in low-to-middle income nations (Salk et al., 2017). It might be particularly beneficial for women to be released from traditional gender role expectations, and meanwhile, the benefits of traditionally considered typical feminine traits are widely recognized in high education and income nations. Interestingly, a cross-cultural study that included persons from 36 countries also found that the national economic level moderates the benefits of masculinity and femininity. Specifically, high masculine nations (masculinity as ideal) positively predicted the national levels of subjective well-being in the context of poor countries, while, in high-income countries and high feminine nations (unisex and androgyny as ideals) were associated with high national levels of subjective well-being (Arrindell et al., 1997). Therefore, using what we do know leads us to assume that perhaps human development in life expectancy, education, and economy moderate associations between gender role and depression by promoting national mental health literacy, regulating individuals' subjective well-being as well as the perception of gender role equality. Overall, the results of the present

study support the *Androgynous Hypothesis*.

4.4. Practical implications

Results of this meta-analytic review revealed important patterns that may inform healthcare decisions and education on the global mental health level. It was observed that androgynous gender role traits can protect against depression, regardless of sex and age. Conversely, conformity to traditional and typical gender role norms may promote distress and some mental disorders, particularly depression. For example, both female and male individuals who strongly endorse masculine traits are less susceptible to depression, while feminine traits may allow men to benefit from social support as protective factors for depression. Accordingly, the development of individual androgynous traits is expected to be an effective process to reduce the global prevalence of depression and gender disparity. Given that gender difference in depression starts to emerge during adolescence (Salk et al., 2017), a stronger focus on effective educational activities (including K-12 education, community, and family) should be implemented to promote and encourage androgynous gender role (both masculine and feminine) traits before people enter colleges and even across the life-span. National life expectancy and per capita income are directly predictive of benefits of androgyny, while education level (especially college education) could indirectly strengthen androgyny through consolidating the protective effects of femininity. In other words, the level of human development determines the necessity of androgyny. Therefore, firstly, increased life expectancy or healthy conditions, improved mental health literacy, and more effective diagnosis and intervention programs are important to increase mental health and counteract the increasing levels of depression. Additionally, considering that undifferentiated individuals are found to associate with a higher risk of developing depression, more attention should be paid to the prevention of depression for the undifferentiated persons (both women and men) and help them develop androgynous traits. Secondly, greater educational attainment should be encouraged, especially with respect to values (attitude and beliefs) promoting gender equality in the entire education system. Thirdly, gender equality urgently needs to be supported and proactively implemented in terms of employment and occupation so that women can create their social value that might partially increase the national economic (income) level. With regard to the instrument type, a negative association was observed between masculinity and depression across the selected studies using the PAQ measuring gender role, whereas a negative association of depression with femininity was measured by the SBSRI. We suggested that the masculine traits (e.g., stands up well, never give up, active, and decisive,) included in PAQ and the feminine traits (e.g., warm, tender, gentle, affectionate, sympathetic, understanding) included in the SBSRI might be candidate traits to protect individuals against depression. Such results would also allow health professionals to engage in early educational intervention programs for disease prevention.

4.5. Limitations and prospect for future research

Associations between gender role and depression were substantiated in the present review, but results need to be considered prudently due to the following approaches: First, English-language studies were only included in this review. Thus, studies published in the non-English language (except for studies published in Chinese due to no result from our preliminary search) may be missed. Second, in this review, because the exact year of conducting the survey was not reported in a large number of included studies, the modified survey year (if the survey year was not provided by authors, the number (year) obtained by subtracting five years from year of publication) was considered as a modulating variable to perform meta-regression inevitably restricted the reliability of findings. Under this condition, results should be interpreted with caution. Third, the synthesized data in this review are extracted

from cross-sectional studies, which may not provide firm information about cause-and-effect relationships. More longitudinal studies are encouraged to further warrant the findings of the present review. Fourth, large parts of included studies were conducted in the developed countries (the USA and Canada) so that results of this review may be hard to generalize to other developing nations and economically disadvantaged countries or regions. Fifth, participants in most of the selected studies were college students, while a relatively small number of studies contained children, adolescents, and older adults. Notably, the middle-aged group typically experiences heavy social pressure (so-called middle-age crisis), which may contribute to a higher risk of depression also need more attention. Furthermore, only one study focused on depressed patients on this topic, which may not be very convincing evidence for clinical samples like patients with physical and/or mental disorders. Thus, in this review, associations between gender role and depression have been understudied in terms of the age range (especially middle-aged adults) and clinical populations, which requires further investigation. Sixth, in the current meta-analysis, we mainly focused on the trait-based gender role with high social desirability, but not the other broader concepts of gender role (e.g., conformity to traditionally masculine norms, positive and negative aspects of gender role, etc.). It leads to another limitation that hardly summarizes the relationship between depression and more comprehensive gender roles.

5. Conclusions

Socially desirable masculinity traits seem to be a robust protective factor for depression regardless of sex. A negative weak association between femininity and depression was observed in women, college students, and/or healthy people. Women are reported to be associated with a greater possibility of developing depression, which may be legitimately attributed to that this sex group is less masculine as compared to men. The dominance of masculinity has declined from 1978 to 2021 as life expectancy increases. Femininity has changed over time, with a gradual increase in educational attainment and income level from 1990 to 2019, its role has transited from a risk factor to a more powerful protective factor for depression. Androgynous individuals are less likely to suffer depression while undifferentiated individuals are more susceptible to depression. In conclusion, the present findings reinforce that *the Androgynous Hypothesis* in interpreting sex disparity in depression is a promising prospect as human social development.

Authorship contributions statement

JL, LZ and HL contributed to the overall design, data curation, and original draft preparation; WL, BB, AY, PC, and HL contributed to reviewing and editing; HL contributed to the ideas and supervision.

Author statement

This study is supported by the following: Shenzhen-Hong Kong Institute of Brain Science-Shenzhen Fundamental Research Institutions [grant number 2019SHIBS0003]; National Natural Science Foundation of China [grant number 31671150]; Guangdong Key Project [grant number 2018B030335001]; Guangdong Major Program [grant number 2016KZDXM009]; Innovative Team Program in Higher Education of Guangdong [grant number 2015KCXTD009]; Shenzhen Basic Research Scheme [grant number JCYJ20150729104249783]; Shenzhen Peacock Plan [grant number KQTD2015033016104926]; Start-up Research Grant of Shenzhen University [grant number 20200807163056003]; Start-Up Research Grant [Peacock Plan: 20191105534C].

Role of the Funding Source. The funders of the study had no role in study design, data collection, data analysis, data interpretation, or writing of the report. The corresponding author had full access to all the data in the study and had final responsibility for the decision to

submit for publication.

Declaration of Competing Interest

None

Acknowledgments

We are deeply appreciative of all the authors who provided us with data to be included in the meta-analyses and two reviewers who gave us constructive feedback and encouragement for promoting this study.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.jad.2021.07.018](https://doi.org/10.1016/j.jad.2021.07.018).

References

- Arcand, M., Juster, R.P., Lupien, S.J., Marin, M.F., 2020. Gender roles in relation to symptoms of anxiety and depression among students and workers. *Anxiety Stress Coping* 33, 661–674. <https://doi.org/10.1080/10615806.2020.1774560>.
- Aubé, F., Saltaris, Koestner, 2000. Gender differences in adolescent depressive symptomatology: towards an integrated social-developmental model. *J. Soc. Clin. Psychol.* 19, 297–313. <https://doi.org/10.1521/jscp.2000.19.3.297>.
- Broderick, C.P., Korteland, C., 2002. Coping style and depression in early adolescence: relationships to gender, gender role, and implicit beliefs. *Sex Role.* 46, 201–213. <https://doi.org/10.1023/A:1019946714220>.
- Broderick, C.P., Korteland, C., 2004. A Prospective study of rumination and depression in early adolescence. *Clin. Child Psychol. Psychiatry* 9, 383–394. <https://doi.org/10.1177/1359104504043920>.
- Burchardt, J.C., Serbin, A.L., 1982. Psychological androgyny and personality adjustment in college and psychiatric populations. *Sex Role.* 8, 835–851. <https://doi.org/10.1007/BF00287854>.
- Cheng, C., 1999. Gender-role differences in susceptibility to the influence of support availability on depression. *J. Pers.* 67, 439–467. <https://doi.org/10.1111/1467-6494.00061>.
- Cheng, C., 2005. Processes underlying gender-role flexibility: do androgynous individuals know more or know how to cope? *J. Pers.* 73, 645–673. <https://doi.org/10.1111/j.1467-6494.2005.00324.x>.
- Chevron, E.S., Quinlan, D.M., Blatt, S.J., 1978. Sex roles and gender differences in the experience of depression. *J. Abnorm. Psychol.* 87, 680–683. <https://doi.org/10.1037/0021-843X.87.6.680>.
- Coleman, D., 2015. Traditional masculinity as a risk factor for suicidal ideation: cross-sectional and prospective evidence from a study of young adults. *Arch. Suicide Res.* 19, 366–384. <https://doi.org/10.1080/13811118.2014.957453>.
- Cook, R., 1993. The relationship between sex role and emotional functioning in patients undergoing assisted conception. *J. Psychosom. Obstet. Gynaecol.* 14, 31–40. <https://doi.org/10.3109/01674829309084428>.
- Craighead, L.W., Green, B.J., 1989. Relationship between depressed mood and sex-typed personality characteristics in adolescents. *J. Youth Adolesc.* 18, 467–474. <https://doi.org/10.1007/bf02132781>.
- DeGregorio, E., Carver, C.S., 1980. Type A behavior pattern, sex role orientation, and psychological adjustment. *J. Pers. Soc. Psychol.* 39, 286–293. <https://doi.org/10.1037/0022-3514.39.2.286>.
- Dyson, R., Renk, K., 2006. Freshmen adaptation to university life: depressive symptoms, stress, and coping. *J. Clin. Psychol.* 62, 1231–1244. <https://doi.org/10.1002/jclp.20295>.
- Elpern, S., Karp, S.A., 1984. Sex-role orientation and depressive symptomatology. *Sex Role.* 10, 987–992. <https://doi.org/10.1007/BF00288519>.
- Feather, N.T., 1985. Masculinity, femininity, self-esteem, and subclinical depression. *Sex Role.* 12, 491–500. <https://doi.org/10.1007/bf00288171>.
- Feather, N.T., 1987. The rosy glow of self-esteem: depression, masculinity, and causal attributions. *Aust. J. Psychol.* 39, 25–41. <https://doi.org/10.1080/00049538708259033>.
- Flett, G.L., Vredenburg, K., Pliner, P., Krames, L., 1985. Sex roles and depression: a preliminary investigation of the direction of causality. *J. Res. Pers.* 19, 429–435. [https://doi.org/10.1016/0092-6566\(85\)90010-8](https://doi.org/10.1016/0092-6566(85)90010-8).
- Hart, B.I., Thompson, J.M., 1996. Gender role characteristics and depressive symptomatology among adolescents. *J. Early Adolesc.* 16, 407–426. <https://doi.org/10.1177/0272431696016004003>.
- Hermann, K.S., Betz, N.E., 2004. Path models of the relationships of instrumentality and expressiveness to social self-efficacy, shyness, and depressive symptoms. *Sex Role.* 51, 55–66. <https://doi.org/10.1023/b:Sers.0000032309.71973.14>.
- Holahan, C.K., Spence, J.T., 1980. Desirable and undesirable masculine and feminine traits in counseling clients and unselected students. *J. Consult. Clin. Psychol.* 48, 300–302. <https://doi.org/10.1037/0022-006X.48.2.300>.
- Hunt, M.G., 1993. Expressiveness does predict well-being. *Sex Role.* 29, 147–169. <https://doi.org/10.1007/BF00289933>.

- Juster, R.P., Pruessner, J., Bisson Desrochers, A., Bourdon, O., Durand, N., Wan, N., Tourjman, V., Kouassi, E., Lesage, A., Lupien, S., 2016. Sex and Gender Roles in Relation to Mental Health and Allostatic Load. *Psychosom. Med.* 78 <https://doi.org/10.1097/PSY.0000000000000351>.
- Kerr, P., Barbosa Da Torre, M., Giguère, C., Lupien, S.J., Juster, R.P., 2021. Occupational gender roles in relation to workplace stress, allostatic load, and mental health of psychiatric hospital workers. *J. Psychosom. Res.* 142, 110352 <https://doi.org/10.1016/j.jpsychores.2020.110352>.
- Kopper, B.A., Epperson, D.L., 1996. The experience and expression of anger: relationships with gender, gender role socialization, depression, and mental health functioning. *J. Couns. Psychol.* 43, 158–165. <https://doi.org/10.1037/0022-0167.43.2.158>.
- Kotera, Y., Green, P., Sheffield, D., 2019. Mental Health Shame of UK Construction Workers: relationship with Masculinity, Work Motivation, and Self-Compassion. *Journal of Work and Organizational Psychology-Revista De Psicologia Del Trabajo Y De Las Organizaciones* 35, 135–143. <https://doi.org/10.5093/jwop2019a15>.
- Lam, C.B., McBride-Chang, C.A., 2007. Resilience in young adulthood: the moderating influences of gender-related personality traits and coping flexibility. *Sex Role.* 56, 159–172. <https://doi.org/10.1007/s11199-006-9159-z>.
- Lengua, L.J., Stormshak, E.A., 2000. Gender, gender roles, and personality: gender differences in the prediction of coping and psychological symptoms. *Sex Role.* 43, 787–820. <https://doi.org/10.1023/a:1011096604861>.
- Li, C., Digiseppe, R., Froh, J., 2006. The roles of sex, gender, and coping in adolescent depression. *Adolescence* 41, 409–415.
- Lin, J.Y., Guo, T.Y., Becker, B., Yu, Q., Chen, S.T., Brendon, S., Hossain, M.M., Cunha, P. M., Soares, F.C., Veronese, N., Yu, J.J., Grabovac, I., Smith, L., Yeung, A., Zou, L.Y., Li, H., 2020. Depression is Associated with Moderate-Intensity Physical Activity Among College Students During the COVID-19 Pandemic: differs by Activity Level, Gender and Gender Role. *Psychol. Res. Behav. Manag.* 13, 1123–1134. [10.2147/prb.m.277435](https://doi.org/10.2147/prb.m.277435).
- Lyons, A.L., Carlson, G.A., Thurman, A.E., Grant, K.E., Gipson, P.Y., 2006. Gender differences in early risk factors for adolescent depression among low-income urban children. *Cultur. Divers. Ethn. Minor. Psychol.* 12, 644–657. <https://doi.org/10.1037/1099-9809.12.4.644>.
- Marcotte, D., Alain, M., Gosselin, M.J., 1999. Gender differences in adolescent depression: gender-typed characteristics or problem-solving skills deficits? *Sex Role.* 41, 31–48. <https://doi.org/10.1023/a:1018833607815>.
- Marcotte, D., Fortin, L., Potvin, P., Papillon, M., 2002. Gender differences in depressive symptoms during adolescence: role of gender-typed characteristics, self-esteem, body image, stressful life events, and pubertal status. *J. Emot. Behav. Disord.* 10, 29–42. <https://doi.org/10.1177/106342660201000104>.
- Marusic, I., Bratko, D., 1998. Relations of masculinity and femininity with personality dimensions of the five-factor model. *Sex Role.* 38, 29–44. <https://doi.org/10.1023/a:1018708410947>.
- Moller-Leimkuhler, A.M., Yucel, M., 2010. Male depression in females? *J. Affect. Disord.* 121, 22–29. <https://doi.org/10.1016/j.jad.2009.05.007>.
- Nagoshi, J.L., Kulis, S., Marsiglia, F.F., Pina-Watson, B., 2020. Accounting for linguistic acculturation, coping, antisociality and depressive affect in the gender role-alcohol use relationship in Mexican American adolescents: a moderated mediation model for boys and girls. *J. Ethn. Subst. Abuse.* <https://doi.org/10.1080/15332640.2020.1781732>.
- Nezu, A.M., 1987. Psychological Distress, Problem Solving, and Coping Reactions: sex Role Differences. *Sex Role.* 16, 205–214. <https://doi.org/10.1007/BF00289650>.
- O'Heron, C.A., Orlofsky, J.L., 1990. Stereotypic and nonstereotypic sex role trait and behavior orientations, gender identity, and psychological adjustment. *J. Pers. Soc. Psychol.* 58, 134–143. <https://doi.org/10.1037/0022-3514.58.1.134>.
- Oliver, S.J., Toner, B.B., 1990. The influence of gender role typing on the expression of depressive symptoms. *Sex Role.* 22, 775–790. <https://doi.org/10.1007/BF00292060>.
- Price, E.C., Gregg, J.J., Smith, M.D., Fiske, A., 2018. Masculine traits and depressive symptoms in older and younger men and women. *Am. J. Men. Health* 12, 19–29. <https://doi.org/10.1177/1557988315619676>.
- Price, I.R., Lavercombe, L.J., 2000. Depression in early adolescence: relation to externalising and internalising behaviour. *Percept. Mot. Skill.* 90, 723–730. <https://doi.org/10.2466/pms.2000.90.3.723>.
- Roos, P.E., Cohen, L.H., 1987. Sex roles and social support as moderators of life stress adjustment. *J. Pers. Soc. Psychol.* 52, 576–585. <https://doi.org/10.1037/0022-3514.52.3.576>.
- Russo, N.F., Green, B.L., Knight, G., 1993. The Relationship of Gender, Self-Esteem, and Instrumentality to Depressive Symptomatology. *J. Soc. Clin. Psychol.* 12, 218–236. <https://doi.org/10.1521/jscp.1993.12.2.218>.
- Sanfilippo, M.P., 1994. Masculinity, femininity, and subjective experiences of depression. *J. Clin. Psychol.* 20, 144–157. [https://doi.org/10.1002/1097-4679\(199403\)50:2<144::AID-JCLP2270500204>3.0.CO;2-0](https://doi.org/10.1002/1097-4679(199403)50:2<144::AID-JCLP2270500204>3.0.CO;2-0).
- Sappington, J., Nott, C., Broerman, F.S., 1998. Comparisons by sex of psychometric correlates of the MMPI-2 Depression Scale. *Percept. Mot. Skill.* 87, 539–543. <https://doi.org/10.2466/pms.1998.87.2.539>.
- Small, A., Gessner, T., Ferguson, T., 1984. Sex role and dysphoric mood. *Sex Role.* 11, 627–638. <https://doi.org/10.1007/BF00288116>.
- Sterner, T.R., Gudmundsson, P., Falk, H., Seidu, N., Ahlner, F., Wetterberg, H., Ryden, L., Sigström, R., Ostling, S., Zettergren, A., Kern, S., Waern, M., Skoog, I., 2020. Depression in relation to sex and gender expression among Swedish septuagenarians-Results from the H70 study. *PLoS ONE* 15. <https://doi.org/10.1371/journal.pone.0238701>.
- Stoppard, J., Paisley, K., 1987. Masculinity, femininity, life stress, and depression. *Sex Role.* 16, 489–496. <https://doi.org/10.1007/BF00292483>.
- Szpitalak, M., Prochwicz, K., 2013. Psychological gender in clinical depression. Preliminary study. *Psychiatr. Pol.* 47, 53–64.
- Vafaei, A., Ahmed, T., Freire Ado, N., Zunzunegui, M.V., Guerra, R.O., 2016. Depression, Sex and Gender Roles in Older Adult Populations: the International Mobility in Aging Study (IMIAS). *PLoS ONE* 11, e0146867. <https://doi.org/10.1371/journal.pone.0146867>.
- Waelde, L.C., Silvern, L., Hodges, W.F., 1994. Stressful life events: moderators of the relationships of gender and gender roles to self-reported depression and suicidality among college students. *Sex Role.* 30, 1–22. <https://doi.org/10.1007/bf01420737>.
- Welkowitz, J., Lish, J.D., Bond, R.N., 1985. The Depressive Experiences Questionnaire: revision and validation. *J. Pers. Assess.* 49, 89–94. <https://doi.org/10.1207/s15327752jpa4901.17>.
- Whitley, B.E., Girdley, B.E., 1993. Sex role orientation, self-esteem, and depression: a latent variables analysis. *Personal. Soc. Psychol. Bull.* 19, 363–369. <https://doi.org/10.1177/0146167293194001>.
- Wilhelm, K., Parker, G., Asghari, A., 1998. Sex differences in the experience of depressed mood state over fifteen years. *Soc. Psychiatry Psychiatr. Epidemiol.* 33, 16–20. <https://doi.org/10.1007/s001270050016>.
- Wilson, R., Cairns, E., 1988. Sex-role attributes, perceived competence and the development of depression in adolescence. *J. Child Psychol. Psychiatry* 29, 635–650. <https://doi.org/10.1111/j.1469-7610.1988.tb01885.x>.
- Wong, J.L., Whitaker, D.J., 1993. Depressive mood states and their cognitive and personality correlates in college students: they improve over time. *J. Clin. Psychol.* 49, 615–621. [https://doi.org/10.1002/1097-4679\(199309\)49:5<615::aid-jclp2270490503>3.0.co;2-o](https://doi.org/10.1002/1097-4679(199309)49:5<615::aid-jclp2270490503>3.0.co;2-o).
- Wong, J.L., Whitaker, D.J., 1994. The stability and prediction of depressive mood states in college students. *J. Clin. Psychol.* 50, 715–722. [https://doi.org/10.1002/1097-4679\(199409\)50:5<715::aid-jclp2270500508>3.0.co;2-k](https://doi.org/10.1002/1097-4679(199409)50:5<715::aid-jclp2270500508>3.0.co;2-k).
- Wupperman, P., Neumann, C.S., 2006. Depressive symptoms as a function of sex-role, rumination, and neuroticism. *Pers. Individ. Dif.* 40, 189–201. <https://doi.org/10.1016/j.paid.2005.05.017>.
- Zeldow, P.B., Clark, D., Daugherty, S.R., 1985. Masculinity, femininity, type A behavior, and psychosocial adjustment in medical students. *J. Pers. Soc. Psychol.* 48, 481–492. <https://doi.org/10.1037/0022-3514.48.2.481> review.
- Abramson, L.Y., Metalsky, G.I., Alloy, L.B., 1989. Hopelessness depression: a theory-based subtype of depression. *Psychol. Rev.* 96, 358. <https://doi.org/10.1037/0033-295X.96.2.358>.
- Arrindell, W.A., Hatzichristou, C., Wensink, J., Rosenberg, E., van Twillert, B., Stedema, J., Meijer, D., 1997. Dimensions of national culture as predictors of cross-national differences in subjective well-being. *Pers. Individ. Dif.* 23, 37–53. [https://doi.org/10.1016/S0191-8869\(97\)00023-8](https://doi.org/10.1016/S0191-8869(97)00023-8).
- Arrindell, W.A., Steptoe, A., Wardle, J., 2003. Higher levels of state depression in masculine than in feminine nations. *Behav. Res. Ther.* 41, 809–817. [https://doi.org/10.1016/S0005-7967\(02\)00185-7](https://doi.org/10.1016/S0005-7967(02)00185-7).
- Arrindell, W.A., Veenhoven, R., 2002. Feminine values and happy life-expectancy in nations. *Pers. Individ. Dif.* 33, 803–813. [https://doi.org/10.1016/S0191-8869\(01\)00193-3](https://doi.org/10.1016/S0191-8869(01)00193-3).
- Bassoff, E.S., Glass, G.V., 1982. The Relationship between sex roles and mental health: a meta-analysis of twenty-six studies. *Couns. Psychol.* 10, 105–112. <https://doi.org/10.1177/0011000082104019>.
- Bem, S.L., 1974. The measurement of psychological androgyny. *J. Consult. Clin. Psychol.* 42, 155. <https://doi.org/10.1037/h0036215>.
- Bem, S.L., 1979. Theory and measurement of androgyny: a reply to the Pedhazur-Tetenbaum and Locksley-Colten critiques. *J. Pers. Soc. Psychol.* 37, 1047–1054. <https://doi.org/10.1037/0022-3514.37.6.1047>.
- Calvo-Salguero, A., García-Martínez, J.M.A., Monteoliva, A., 2008. Differences between and within genders in gender role orientation according to age and level of education. *Sex Role.* 58, 535–548. <https://doi.org/10.1007/s11199-007-9354-6>.
- Catalyst, 2020. List: women CEOs of the S&P 500. <https://www.catalyst.org/research/women-ceos-of-the-sp-500/> (Accessed 22 December 2020).
- Cleary, A., 2012. Suicidal action, emotional expression, and the performance of masculinities. *Soc. Sci. Med.* 74, 498–505. <https://doi.org/10.1016/j.socscimed.2011.08.002>.
- Cohen, J., 1988. Statistical power analysis for the behavioral sciences /Jacob Cohen. *Technometrics* 31, 499–500. [https://doi.org/10.1016/s0277-9536\(99\)00390-1](https://doi.org/10.1016/s0277-9536(99)00390-1).
- Coleman, D., Feigelman, W., Rosen, Z., 2020. Association of high traditional masculinity and risk of suicide death: secondary analysis of the Add Health study. *JAMA Psychiatry* 77, 435–437. <https://doi.org/10.1001/jamapsychiatry.2019.4702> <https://dx.doi.org/>.
- Courtenay, W.H., 2000. Constructions of masculinity and their influence on men's well-being: a theory of gender and health. *Soc. Sci. Med.* 50, 1385–1401. [https://doi.org/10.1016/s0277-9536\(99\)00390-1](https://doi.org/10.1016/s0277-9536(99)00390-1).
- Cuijpers, P., 2018. The Challenges of Improving Treatments for Depression. *JAMA* 320, 2529–2530. <https://doi.org/10.1001/jama.2018.17824>.
- Donnelly, K., Twenge, J.M., 2017. Masculine and feminine traits on the Bem Sex-Role Inventory, 1993–2012: a cross-temporal meta-analysis. *Sex Role.* 76, 556–565. <https://doi.org/10.1007/s11199-016-0625-y>.
- Duval, S., Tweedie, R., 2000. Trim and fill: a simple funnel-plot-based method of testing and adjusting for publication bias in meta-analysis. *Biometrics* 56, 455–463. <https://doi.org/10.1111/j.0006-341X.2000.00455.x>.
- Egger, M., Smith, G.D., Schneider, M., Minder, C., 1997. Bias in meta-analysis detected by a simple, graphical test. *BMJ Br. Med. J.* 316, 469–471. <https://doi.org/10.1136/bmj.315.7109.629>.
- Field, A.P., 2001. Meta-analysis of correlation coefficients: a Monte Carlo comparison of fixed- and random-effects methods. *Psychol. Method.* 6, 161–180. <https://doi.org/10.1037/1082-989X.6.2.161>.

- Gibson, P.A., Baker, E.H., Milner, A.N., 2016. The role of sex, gender, and education on depressive symptoms among young adults in the United States. *J. Affect. Disord.* 189, 306–313. <https://doi.org/10.1016/j.jad.2015.08.067>.
- Gonzalez, C.A., Bockting, W.O., Beckman, L.J., Durán, R.E., 2012. Agentic and Communal Personality Traits: their Associations with Depression and Resilience among Transgender Women. *Sex Role.* 67, 528–543. <https://doi.org/10.1007/s11199-012-0202-y>.
- Hankin, B.L., Abramson, L.Y., Moffitt, T.E., Silva, P.A., McGee, R., Angell, K.E., 1998. Development of depression from preadolescence to young adulthood: emerging gender differences in a 10-year longitudinal study. *J. Abnorm. Psychol.* 107, 128.
- Higgins, J.P., Thompson, S.G., 2002. Quantifying heterogeneity in a meta-analysis. *Stat. Med.* 21, 1539–1558. <https://doi.org/10.1002/sim.1186>.
- Higgins, J.P., Thompson, S.G., Deeks, J.J., Altman, D.G., 2003. Measuring inconsistency in meta-analyses. *BMJ Br. Med. J.* 327, 557–560. <https://doi.org/10.1136/bmj.327.7414.557>.
- Hyde, J.S., Mezulis, A.H., 2020. Gender differences in depression: biological, affective, cognitive, and sociocultural factors. *Harv. Rev. Psychiatry* 28, 4–13. <https://doi.org/10.1097/HRP.0000000000000230>.
- Ibrahim, A.K., Kelly, S.J., Adams, C.E., Glazebrook, C., 2013. A systematic review of studies of depression prevalence in university students. *J. Psychiatr. Res.* 47, 391–400. <https://doi.org/10.1016/j.jpsychires.2012.11.015>.
- James, S.L., Abate, D., Abate, K.H., Abay, S.M., Abbafati, C., Abbasi, N., Abbastabar, H., Abd-Allah, F., Abdela, J., Abdelalim, A., 2018. Global, regional, and national incidence, prevalence, and years lived with disability for 354 diseases and injuries for 195 countries and territories, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. *The Lancet* 392, 1789–1858. [https://doi.org/10.1016/S0140-6736\(18\)32279-7](https://doi.org/10.1016/S0140-6736(18)32279-7).
- Juster, R.P., Bizik, G., Picard, M., Arseneault-Lapierre, G., Sindi, S., Trepanier, L., Marin, M.F., Wan, N., Sekerovic, Z., Lord, C., Fiocco, A.J., Plusquellec, P., McEwen, B.S., Lupien, S.J., 2011. A transdisciplinary perspective of chronic stress in relation to psychopathology throughout life span development. *Dev. Psychopathol.* 23, 725–776. <https://doi.org/10.1017/S0954579411000289>.
- Kabeer, N., 2012. Women's economic empowerment and inclusive growth: labour markets and enterprise development. *Int. Dev. Res. Centre* 44, 1–70. <https://doi.org/10.1017/S0033291718000648>.
- Knaak, S., 2004. On the reconceptualizing of gender: implications for research design. *Sociol. Inq.* 74, 302–317. <https://doi.org/10.1111/j.1475-682X.2004.00093.x>.
- Kuehner, C., 2017. Why is depression more common among women than among men? *Lancet Psychiatry* 4, 146–158. [https://doi.org/10.1016/S2215-0366\(16\)30263-2](https://doi.org/10.1016/S2215-0366(16)30263-2).
- Liberati, A., Altman, D.G., Tetzlaff, J., Mulrow, C., Gotzsche, P.C., Ioannidis, J.P., Clarke, M., Devereaux, P.J., Kleijnen, J., Moher, D., 2009. The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: explanation and elaboration. *PLoS Med.* 6, e1000100. <https://doi.org/10.1371/journal.pmed.0060136>.
- Lou, Y., Lei, Y., Mei, Y., Paavo, L.H., Li, H., 2019. Review of abnormal self-knowledge in major depressive disorder. *Front. Psychiatry* 10, 130. <https://doi.org/10.3389/fpsy.2019.00130>.
- Mac Giollaibhui, N., Hamilton, J.L., Nielsen, J., Connolly, S.L., Stange, J.P., Varga, S., Burdette, E., Olino, T.M., Abramson, L.Y., Alloy, L.B., 2018. Negative cognitive style interacts with negative life events to predict first onset of a major depressive episode in adolescence via hopelessness. *J. Abnorm. Psychol.* 127, 1. <https://doi.org/10.1037/abn0000301>.
- Mata, D.A., Ramos, M.A., Bansal, N., Khan, R., Guille, C., Di Angelantonio, E., Sen, S., 2015. Prevalence of depression and depressive symptoms among resident physicians: a systematic review and meta-analysis. *JAMA* 314, 2373–2383. <https://doi.org/10.1001/jama.2015.15845>.
- Pilar Matud, M., 2019. Masculine/instrumental and feminine/expressive traits and health, well-being, and psychological distress in Spanish men. *Am. J. Men. Health* 13. <https://doi.org/10.1177/1557988319832749>.
- Pleck, J.H., 1975. Masculinity - Femininity. *Sex Role.* 1, 161–178. <https://doi.org/10.1007/BF00288009>.
- Reilly, D., 2019. Gender can be a continuous variable, not just a categorical one: comment on Hyde, Bigler, Joel, Tate, and van Anders (2019). *Am. Psychol.* 74, 840–841. <https://doi.org/10.1037/amp0000505>.
- Reynolds, J.R., Ross, C.E., 1998. Social stratification and health: education's benefit beyond economic status and social origins. *Soc. Probl.* 45, 221–247. <https://doi.org/10.1073/pnas.1201730109>.
- Rotenstein, L.S., Ramos, M.A., Torre, M., Segal, J.B., Peluso, M.J., Guille, C., Sen, S., Mata, D.A., 2016. Prevalence of depression, depressive symptoms, and suicidal ideation among medical students: a systematic review and meta-analysis. *JAMA* 316, 2214–2236. <https://doi.org/10.1001/jama.2016.17324>.
- Salk, R.H., Hyde, J.S., Abramson, L.Y., 2017. Gender differences in depression in representative national samples: meta-analyses of diagnoses and symptoms. *Psychol. Bull.* 143, 783–822. <https://doi.org/10.1037/bul0000102>.
- Sanderson, S., Tatt, I.D., Higgins, J., 2007. Tools for assessing quality and susceptibility to bias in observational studies in epidemiology: a systematic review and annotated bibliography. *Int. J. Epidemiol.* 36, 666–676. <https://doi.org/10.1093/ije/dym018>.
- Seedat, S., Scott, K.M., Angermeyer, M.C., Berglund, P., Bromet, E.J., Brugh, T.S., Demyttenaere, K., De Girolamo, G., Haro, J.M., Jin, R., 2009. Cross-national associations between gender and mental disorders in the World Health Organization World Mental Health Surveys. *Arch. Gen. Psychiatry* 66, 785–795. <https://doi.org/10.1001/archgenpsychiatry.2009.36>.
- Seidler, Z.E., Dawes, A.J., Rice, S.M., Oliffe, J.L., Dhillon, H.M., 2016. The role of masculinity in men's help-seeking for depression: a systematic review. *Clin. Psychol. Rev.* 49, 106–118. <https://doi.org/10.1016/j.cpr.2016.09.002>.
- Shafer, A.B., 2006. Meta-analysis of the factor structures of four depression questionnaires: beck, CES-D, Hamilton, and Zung. *J. Clin. Psychol.* 62, 123–146. <https://doi.org/10.1002/jclp.20213>.
- Spence, J.T., 1991. Do the BSRI and PAQ measure the same or different concepts? *Psychol. Women Q.* 15, 141–165. <https://doi.org/10.1111/j.1471-6402.1991.tb00483.x>.
- Spence, J.T., Helmreich, R., Stapp, J., 1975. Ratings of self and peers on sex role attributes and their relation to self-esteem and conceptions of masculinity and femininity. *J. Pers. Soc. Psychol.* 32, 29. <https://doi.org/10.1037/h0076857>.
- Spence, J.T., Helmreich, R.L., 1981. Androgyny versus gender schema: a comment on Bem's gender schema theory. *Psychol. Rev.* 88, 365–368. <https://doi.org/10.1037/0033-295X.88.4.365>.
- Stockard, J., 2006. *Gender Socialization, Handbook of the Sociology of Gender*. Springer US, Boston, MA, pp. 215–227.
- Stroup, D.F., Berlin, J.A., Morton, S.C., Olkin, I., Williamson, G.D., Rennie, D., Moher, D., Becker, B.J., Sipe, T.A., Thacker, S.B., 2000. Meta-analysis of observational studies in epidemiology: a proposal for reporting. *JAMA* 283, 2008–2012. <https://doi.org/10.1001/jama.283.15.2008>.
- Sung, Y., 2020. Korean young adults' perceptions of fathers' gender role conflict, depressive symptoms, and paternal relationship quality: the mediating effects of fathers' violence. *Asia Pac. J. Couns. Psychother.* 11, 76–92. <https://doi.org/10.1080/21507686.2019.1704808>.
- United Nations Development Programme, 2019. Human Development Reports. <http://hdr.undp.org/en/data> (Accessed 22 December 2020).
- Viinikainen, J., Bryson, A., Böckerman, P., Elovainio, M., Pitkänen, N., Pulkki-Råback, L., Lehtimäki, T., Raitakari, O., Pekkonen, J., 2018. Does education protect against depression? Evidence from the Young Finns study using Mendelian randomization. *Prev. Med.* 115, 134–139. <https://doi.org/10.1016/j.ypmed.2018.08.026>.
- Von Elm, E., Altman, D.G., Egger, M., Pocock, S.J., Gøtzsche, P.C., Vandenbroucke, J.P., Initiative, S., 2014. The Strengthening of Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. *Int. J. Surg.* 12, 1495–1499. <https://doi.org/10.1016/j.ypmed.2007.08.012>.
- Voyer, D., Voyer, S., Bryden, M.P., 1995. Magnitude of sex differences in spatial abilities: a meta-analysis and consideration of critical variables. *Psychol. Bull.* 117, 250. <https://doi.org/10.1037/0033-2909.117.2.250>.
- Voyer, D., Voyer, S.D., 2014. Gender differences in scholastic achievement: a meta-analysis. *Psychol. Bull.* 140, 1174. <https://doi.org/10.1037/a0036620>.
- Wang, K., Lu, H., Cheung, E.F.C., Neumann, D.L., Shum, D.H.K., Chan, R.C.K., 2016. Female preponderance of Depression in non-clinical populations: a meta-analytic study. *Front. Psychol.* 7. <https://doi.org/10.3389/fpsyg.2016.01398>.
- Weisel, K.K., Zarski, A.C., Berger, T., Krieger, T., Schaub, M.P., Moser, C.T., Berking, M., Dey, M., Botella, C., Baños, R., Herrero, R., Etchemendy, E., Riper, H., Cuijpers, P., Bolinski, F., Kleiboer, A., Görlach, D., Beecham, J., Jacobi, C., Ebert, D.D., 2019. Efficacy and cost-effectiveness of guided and unguided internet- and mobile-based indicated transdiagnostic prevention of depression and anxiety (ICare Prevent): a three-armed randomized controlled trial in four European countries. *Internet Interv.* 16, 52–64. <https://doi.org/10.1016/j.invent.2018.04.002>.
- Whitley, B.E., 1985. Sex-role orientation and psychological well-being: two meta-analyses. *Sex Role.* 12, 207–225. <https://doi.org/10.1007/BF00288048>.
- Wilson, D., 2017. Practical meta-analysis effect size calculator [Online calculator]. <http://www.campbellcollaboration.org/escalc/html/EffectSizeCalculator-SMD-main.php> (Accessed 22 December 2020).
- Wood, W., Eagly, A.H., 2012. Biosocial construction of sex differences and similarities in behavior. *Adv. Exp. Soc. Psychol.* 55–123. Elsevier.
- World Economic Forum, 2020. Global Gender Gap Report 2020. http://www3.weforum.org/docs/WEF_GGGR_2020.pdf (Accessed 22 December 2020).
- World Health Organization, 2017. Depression and other common mental disorders: global health estimates. <https://apps.who.int/iris/bitstream/handle/10665/254610/WHO-MSD-MER-2017.2-eng.pdf;jsessionid=A200DB4B20A0BDB5FB48F07FFD1CD0F?sequence=1> (Accessed 22 December 2020).