Quality of life of treatment-seeking transgender adults: A systematic review and meta-analysis

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Abstract
The study aims to systematically extract and analyse data about Quality of Life (QoL) in the transgender population. A systematic literature search and meta-analysis were conducted using the MEDLINE, EMBASE, PubMed, and PsycINFO databases, up to July 2017. Only English language quantitative studies, in adults, which reported the means for validated QoL measures were included. Random-effect meta-analysis was adopted to pool data and estimate the 95% Confidence Intervals (CI). From 94 potentially relevant articles, 29 studies were included within the review and data extraction for meta-analysis was available in 14 studies. The majority of the studies were cross-sectional, lacked controls and displayed moderate risk of bias. Findings from the systematic review suggested that transgender people display poor QoL, independent of the domain investigated. Pooling across studies showed that transgender people report poorer mental health QoL compared to the general population (−0.78, 95% CI = −1.08 to −0.48, 14 studies). However, meta-analysis in a subgroup of studies looking at QoL in participants who were exclusively post-CHT found no difference in mental health QoL between groups (−0.42, 95% CI = −1.15 to 0.31; 7 studies). There was insufficient data for a pre-treatment subgroup. Evidence suggests that transgender people have lower QoL than the general population. Some evidence suggests that QoL improves post-treatment. Better quality studies that include clearly defined transgender populations, divided by stage of gender affirming treatment and with appropriate matched control groups are needed to draw firmer conclusions.

Keywords Transgender · Quality of life · Mental health quality of life · Sex-related quality of life · Voice-related quality of life · Body image-related quality of life

1 Introduction
The term transgender (or trans) describes people whose gender identity differs from the sex they were assigned at birth based on their sexual characteristics, whilst the appellation cisgender refers to any individual who is not transgender and whose gender identity matches the sex assigned at birth [1]. Due to the mismatch between gender identity and sex assigned at birth, many transgender people experience severe distress, generally known as gender dysphoria, which tends to ameliorate following transition to the experienced gender [2].

The process of physical transition consists of different stages. Guidelines for the assessment and treatment of transgender and gender non-conforming people have been developed by the World Professional Association of Transgender Health (WPATH) to facilitate this process (Standards of Care, SOC) [2]. The SOC aims to describe the different treatments that transgender people might wish to undergo, known as Gender Affirming Treatments (GAT), which may include puberty suppression, Cross-sex Hormonal Treatment (CHT), Chest Reconstructive Surgery (CRS) and Gender Affirming Genital Surgeries (GAGSs) [2]. Thus, for the present review, the term ‘treatment’ is also used to describe GAT.

GAT produces bodily changes that impact and alter gender role and its expression by developing secondary sexual characteristics of the experienced gender in order for the body to become more congruent with the gender identity of the individual [2]. These changes might be sufficient to mitigate the gender dysphoric symptoms [2] and hence improve the
individual’s QoL. However, not every transgender person requires gender affirming treatment and the dysphoria may improve through gender social role transition only. Thus, treatment might vary depending on the specific needs of the transgender person seeking treatment [2].

Many transgender people, particularly prior to their physical transition, face considerable challenges. These challenges can be physiological (development of some of the secondary sexual characteristics of the sex assigned at birth), social (lack of social support, rejection, discrimination, victimisation, transphobia) [3–12] and psychological (e.g. anxiety, depression, low self-esteem) [3, 13–16]. All these factors have been found to have a negative impact on the quality of life (QoL) of transgender people [17, 18].

QoL is a complex and broad concept. It has been described in different ways, such as the quality of one’s life conditions, one’s satisfaction with life conditions, and as a combination of life’s conditions and satisfaction [19]. De Vries and colleagues [20] defined QoL as the individuals’ perceptions of their life satisfaction and happiness that has an impact on objective and subjective wellbeing. Hence, QoL measures can be considered as a way of quantifying the level of functioning and perceived wellbeing of people’s lives [17]. The concept of QoL encompasses a range of different physical and psychosocial domains. Several factors have been shown to affect QoL in transgender populations, such as presence or absence of depression and psychopathology, transitional status (such as the use of cross sex hormone treatment), levels of social support and perceived discrimination [6, 21–29].

The literature regarding QoL in transgender people mainly focuses on four QoL dimensions: voice-related (vQoL); sex-related QoL; body image-related QoL; and general QoL. Voice-related QoL can be described as the impact that the perception of one’s own voice, in terms of femininity and masculinity, has on the QoL of the individual [30]. This dimension is very important for transgender people, as the pitch of the voice is an important aspect of gender expression and perception [31, 32]. Sex-related QoL is a state of social, physical and mental wellbeing related to sexual life [33]. This concept refers to the sexual functioning and general satisfaction with sexual life [34]. Body image-related QoL stems from the notion that experiencing a positive body image is linked with more satisfactory relationships, sexuality, improved well-being and overall general QoL [35]. Thus, transgender people’s incongruence between gender identity and bodily characteristics could potentially impact their body satisfaction and as a consequence their QoL [35–38]. Finally, general QoL describes the overall satisfaction with life not linked to specific physical health conditions and which includes subcategories linked to aspects of mental, physical, and social life [39].

There are mixed results regarding the QoL in the transgender population. While most of the literature suggests that transgender people have lower QoL compared to the general population [17], which increases once on CHT or post-GAGS [28, 40, 41], other studies have not replicated such findings [42, 43]. These mixed results may be explained by the lack of homogeneity in the population studies, as well as by the different types of QoL and measurements used. For instance, the effect of CHT and genital surgery on the QoL of transgender people when compared to the general population is unclear, as studies often use mixed samples in terms of treatment status and/or focus onto different stages of transition. The review carried out by Murad and colleagues [27] suggested that CHT improves QoL, sexual and psychological functioning as well as gender dysphoria; however these findings are based on low quality evidence and the actual impact of both medical and social transitions upon QoL needs to be better understood [44].

Therefore, the primary aim of this this study is to conduct a critical systematic review and meta-analysis of studies of QoL in transgender populations and to explore the range of QoL assessed. The present research also aims to investigate the impact of CHT by exploring QoL in transgender people at different stages of gender transition.

Additionally, as there is a lack of understanding of the QoL domains most relevant to transgender people and of how demographic, psychosocial and treatment-related factors influence those domains, this review specifically aims to assess the different dimensions of QoL in transgender populations and their associated factors.

1.1 Eligibility criteria

Studies were included if they aimed to measure QoL in transgender populations using validated QoL tools. Articles were eligible for inclusion if they reported a mean QoL score for a transgender population and were either written in the English language or had an available translation into English. Both cross-sectional and longitudinal studies were included and there was no restrictions on settings. Studies were excluded from this systematic review if they investigated QoL in transgender children (<18 years) as QoL vary with age [45]. Additionally, articles were excluded if they had fewer than 20 participants as in small studies there is a high risk of selection bias and a lack of statistical power [46, 47]. Where different articles utilised the same database and same measures, the most recent article was taken into consideration and included within the meta-analysis. Qualitative studies, case studies, conference abstracts and review articles were also excluded. See Table 1 for summary of the review’s eligibility process.

1.2 Search strategy

PRISMA guidelines were followed [48] to carry out this review. Ovid (PubMed, EMBASE, PsycINFO) and Medline
databases were searched from 1946 to July 2017. Terms for transgender people (Transgender, Transsexual, Gender Identity Disorders, and Gender Dysphoria) were searched using the OR function and combined with the terms related to (Quality of Life, QoL, Life Satisfaction) using the “AND” operator. Additionally, the reference lists of pertinent articles were searched to identify any further potential relevant papers.

1.3 Quality assessment

Risk of bias was assessed using an instrument adapted from Ibrahim et al. [49] as this instrument covered the most relevant criteria to assess risk of bias in descriptive studies. Criteria were [1] a clear definition of the target population, [2] adoption of either random, complete or consecutive recruitment or an attempt at recruiting every participant in the sampling frame, [20] sample as representative of the target population or the report presents evidence that results can be generalised to transgender people, acknowledging that most studies included treatment-seeking transgender people attending gender clinics [3] response rate equal or greater than 70%, [4] adequate sample size with a minimum of 300 participants as smaller sample sizes produce large confidence intervals and less precise results [50, 51] and [5] use of validated measures. The chosen criteria were evaluated as providing either a risk of bias (or unclear risk of bias) (1 point) or no risk of bias (0 point). Scores are then summed and an overall risk of bias rating is created where higher scores indicate greater risk of bias. Studies were rated as low risk of bias (+++) (when all or most of the criteria were satisfied), moderate risk of bias (+) (when some of the criteria were satisfied) or high risk of bias (−) (when either a few or no criteria were satisfied), as per the NICE [52] guidelines for risk of bias assessment.

1.4 Data extraction

A data extraction table was used to record authors, date of publication, country where the study was conducted, participants’ information (sample sizes, mean age of sample at assessments), information on treatment status, study design, control group and follow-up (if applicable), QoL measures used, results, factors associated with QoL and conclusions. Separate tables were constructed differentiating depending on the QoL domain investigated.

1.5 Meta-analysis

Mental health-related QoL was used as the outcome of interest for the meta-analysis, as it was the most widely reported outcome and physical QoL is more sensitive to the effects of age [53]. The most frequently used QoL measures (e.g. SF-36, SF-12) do not calculate a total score but calculate separate composite scores for mental and physical health. Generic (i.e. not condition specific) mental health-QoL scores for all samples with means and Standard Deviations (SDs) reported were eligible for inclusion in the meta-analysis. When the means and SDs for a cisgender group were provided, these were used as the comparison in the meta-analysis. Where these were not available, normative data most applicable to the study country were obtained from the articles providing validation of the specific measures adopted and were used as comparison. Utilisation of normative data as a control might cause methodological concerns, as this might increase effect sizes; however, to not lose valuable data and to be able to carry out the meta-analyses, this method was deemed as the best approach. This approach was adopted for four studies [54–57].

In longitudinal studies, data from the first time point at which the participants met the age criterion for the review were used. Where studies reported incomplete results, values were either manually calculated (e.g. SDs from means) or authors were contacted to provide the missing data.

A second meta-analysis with a sub-group of studies reporting data for samples of participants who were exclusively post-GAGS, and therefore post-CHT, as the big majority of people undergoing gender affirming surgeries are already on hormonal treatment, was conducted. Pre-treatment-QoL was not assessed due to a lack of studies using exclusively pretreatment samples. RevMan 5 [58] was utilised to conduct the meta-analyses.

It was hypothesised that the results would be heterogeneous because of differences between studies in the stages of transition investigated (e.g. mixed samples, pre-CHT, post-CHT, post-GAGS), in the diverse types of recruitment utilised (e.g. consecutive, snowballing), in the presence of clinical

| Table 1 | Criteria for inclusion of studies within the review |
|---------|--------------------------------------------------|
| Category | Criteria |
| Study population | Transgender people, Gender Dysphoria, Transsexualism as well as previous diagnoses according to DSM or ICD, or self-defined as transgender |
| Sample size | At least 20 participants |
| Study settings | All settings |
| Time period | Published from 1946 to July 2017 |
| Publication criteria | Articles in English, Articles in peer reviewed journal |
| Study design | Observational studies using standardised measure of QoL, Cross-sectional or longitudinal designs |
and/or non-clinical individuals within the samples as well as in the focus onto the different gender identities of the participants (e.g. transman, transwoman, both). Consequently, Random Effects Models (RAM) with 95% confidence interval was used for the analyses as it implies that the selected studies are carried out in diverse populations [59]. I² statistics were calculated to examine heterogeneity, which is expressed in percentages suggesting different degrees of heterogeneity with 25% indicating low, 50% moderate and above 75% high [60]. Additionally, Q statistics were calculated to determine the statistical significance of heterogeneity [61].

### 1.6 QoL measures used in the review

See Table 2 for a description of the measures used in the studies to assess QoL. Voice-related QoL was assessed using the Voice Handicap Inventory (VHI) and the Transgender Self-Evaluation Questionnaire (TSEQ), sex-related QoL using the sexual subdomain of the WHOQOL-100 and the King’s Health Questionnaire (KHQ), body image-related QoL using the body image-related subdomain of the WHOQOL-100 as well as the Body Image Quality of Life Inventory (BIQLI), and generic (non-condition specific) QoL was measured using the Short Form 36 Health Survey (SF-36), version 2 of the Short Form 36 Health Survey (SF-36-v2), version 2 of the Short Form 12 Health Survey SF-12-v2, WHOQOL-100, WHOQOL-BREF, WHOQOL-BREF-TR or the Subjective Quality of Life Analysis (SQUALA). See Table 2 for a description of the measures.

### 2 Results

A total of 403 studies were identified through database searches, 288 through Ovid and 115 through PubMed. An additional 12 articles were selected for inclusion in the review after screening reference lists of relevant papers. After removing duplicates, 94 abstracts were screened by the first researcher (AN), which resulted in 43 studies that were read in full. Of these, fifteen were excluded due to reasons such as lack of a validated QoL measure (n = 4), of direct measurement of QoL (n = 6), of results reported specifically for transgender people (n = 4) and one study was qualitative. Finally, a sample of 29 papers was discussed, agreed with the other researchers (JA and CG) and included within this review. See Fig. 1 for description of the study’s selection process.

#### 2.1 Study characteristics

The majority of the studies were conducted in European countries (n = 20). Three studies were carried out in Spain [21, 32, 34], in France [22, 23, 66] and in Belgium [43, 65, 83]. Two studies were conducted in Italy [73, 74], UK [69, 70], the Netherlands [20, 35] and Germany [31, 55], whilst one study was carried out in Switzerland [81], one in Sweden [64] and one in Turkey [76]. With regard to non-European countries one study was from Brazil [56], one from China [54] and the remaining articles were from the USA (n = 7).

Out of the 29 included articles; a) four explored vQoL [24, 30, 31, 83], b) four looked at sex-related QoL [34, 73, 74, 81], c) three assessed body image-related QoL [35, 73, 74], and e) 22 studies measured generic (non-condition specific) QoL [2, 17, 21–23, 42, 43, 54–57, 64–66, 68–71, 73, 74, 76, 81]. With regard to vQoL, the study by Mora and colleagues [32] measured vQoL with the aid of a non-validated measure as well as general QoL with a well-validated tool, thus the article was included in the subgroup of general QoL. The study conducted by Parola and colleagues [66] was excluded from the sex-related QoL domain, as it did not employ a validated measure to assess sex-related QoL. Studies reporting generic-QoL that either separated mental and psychological subscales or provided a total QoL score (e.g. Castellano et al. – 71) were included in the systematic review. Of the four papers that measured sex-related QoL, three used the sex-related facet of the WHOQOL-100 [34, 73, 74] whilst one paper measured QoL related to incontinency in transgender women post-GAGS and was included within the sex-related QoL domain [81]. Finally, with regard to body image-related QoL, one article used a specific body image-related QoL measure (BIQLI) [35] whilst the others used the body image facet of the WHOQOL-100 [73, 74].

In terms of study design, 22 studies were cross-sectional [17, 21–24, 30, 34, 42, 43, 54, 55, 57, 65, 66, 68–71, 73, 76, 81, 83] and seven were longitudinal [20, 31, 32, 35, 56, 64, 74], although three of the longitudinal studies [20, 31, 32] only reported cross-sectional data for QoL. Of the 29 included studies, eight compared scores of transgender people to normative data [17, 21, 34, 42, 43, 64, 65, 68], and eight compared transgender to cisgender individuals [21, 22, 30, 31, 69, 70, 74, 81] of which four studies used a matched comparison group [22, 69, 70, 74]. However for one matched study [70] the gender identity of the comparison group was unclear. Four articles compared QoL in transgender women to QoL in transgender men [23, 66, 76, 83]. The majority of studies (n = 23) recruited transgender people through clinical services [20–23, 30–32, 34, 35, 43, 55, 56, 64–66, 68–70, 73, 74, 76, 81, 83]. The remaining five studies recruited participants through opportunity sampling, word of mouth, flyers, advertisement and through community outreach [17, 42, 54, 57, 71].
### Table 2  Quality of life measures used in the review

| Measure | Details |
|---------|---------|
| **1. Short Form 36 Health Survey** SF-36 [62, 63] | This tool was developed to measure multiple operational health indicators of QoL [62]. It is a well-validated international measure of health-related QoL consisting of 36-items providing scores for two summary components (Physical and Mental), which encompass 4 subdomains each. The Physical component includes Physical functioning, Role limitations related to Physical problems, Body pain, whilst the Mental component comprises of Perception of General health, Vitality, Social functioning, Role limitations due to Emotional problems, and Mental health. The scores range from a minimum of 0 until a maximum of 100, where higher scores indicate greater functioning and enhanced perception of QoL. The cut-off for the population norm is around 50. The measure was validated in a wide variety of clinical and non-clinical populations, and it displayed an internal consistency value of .88 when used with Transgender populations [63]. This tool was employed by six studies reported on within this review [43, 54, 55, 64–66]. |
| **2. Short Form 36 Health Survey Version 2** SF-36v2 [67] | This measure was developed out of the SF-36. It includes more up-to-date norms and QoL domains. It is a standardised, comprehensive and validated QoL measure assessing two summary scores (Physical and Mental components), which encompass 4 subdomains each. The Physical component includes Physical functioning, Role-physical, Bodily pain, General health, whilst the Mental component comprises of Vitality, Social functioning, Role-emotional, and Mental health. It uses a 5-points Likert-scale ranging from 1 (poor/true) to 5 (excellent/false). Higher scores represent higher perceived QoL levels. This measure has also been used and corroborated in an online sample of transgender men displaying a Cronbach’s alpha for reliability ranging from .93 to .95 [17]. This tool was employed by seven studies reported on within this review [17, 22, 42, 68–71]. |
| **3. Short Form 12 Health Survey Version 2** SF-12v2 [72] | This instrument is a subset of the SF-36. It comprises of two summary component scores (Physical and Mental), which encompass 4 subdomains each. The former component includes Physical functioning, Role-physical, Bodily pain, General health, whilst the latter component refers to Vitality, Social functioning, Role-emotional, and Mental health. This measure utilises a 5-points Likert-scale ranging from 1 (poor/true) to 5 (excellent/false). Scores range from 1 to 100, with higher perceived QoL represented by higher scores. This measure was validated and showed a good internal consistency, with Cronbach’s alphas of .89 for the Physical component summary and of .86 for the Mental component summary [72]. This tool was employed by one study reported on within this review [32]. |
| **4. WHOQOL-100** [39] | It is a self-administered, self-rated measure to assess QoL developed by the World Health Organization QoL group. It has been developed cross-culturally and it maintains excellent psychometric properties and internal consistency. This tool comprises a total of 100-items; 96 measures 24 specific QoL facets, whilst the remaining 4-items estimate General QoL and Overall QoL. The facets are distributed across 6 domains, such as Physical health, Psychological health, Independence, Social relationships, Environment, and Spirituality/Religion/Personal beliefs. In order to investigate the Sexual QoL the specific Sexual activity facet was measured, whilst to examine Body image-related QoL the body image facet was assessed. Items are rated on a 5-points Likert-scale ranging from 1 (very poor/very dissatisfied/not at all) to 5 (very good/very satisfied/extremely). Higher scores indicate greater reported QoL. The scale’s internal consistency values have been found to range between 0.65 and 0.93 [39]. This tool was employed by four studies within this review [34, 56, 73, 74]. |
| **5. WHOQOL-BREF** [45] | It is a self-rated measure that has been validated in field studies involving approximately 30 languages [27]. It is an abbreviated version of the WHOQOL-100. This tool has 26-items and uses a 5-points Likert-scale measuring 4 domains (Physical, Psychological, Social relationships, and Environment). In addition, there are two questions regarding General QoL and General health. Higher scores indicate greater QoL. Internal consistency values cross-culturally have been found ranging from .51 to .89 [45]. This tool was employed by three studies within this review [20, 21, 57]. |
| **6. WHOQOL-BREF-TR** [75] | The WHOQOL-BREF-TR is a 27-items 5-point Likert-scale measuring four domains (Physical, Mental, Social and Environmental) in two categories (Perceived QoL in general and perceived health status). It displays acceptable psychometric properties when used on the Turkish population (Cronbach’s alpha ranging from .53 to .83) [75]. This is the Turkish version of the WHOQOL-BREF and it was used by one study included in this review [76]. |
2.2 Risk of bias

Risk of bias was evaluated for the 29 studies according to the criteria stated in Table 1. Only three studies recruited more than 300 participants [17, 42, 71] and the majority either reported response rates lower than 70% or did not mention this information (n = 21) thus increasing the risk of sampling bias [17, 20, 23, 24, 30–32, 34, 35, 38, 42, 43, 54, 55, 64, 65, 68, 70, 74, 81, 83]. Overall, only two studies were rated having a low risk of bias [22, 69], twenty studies had a moderate risk of bias [17, 20, 21, 23, 34, 35, 42, 54–57, 64, 65, 70, 71, 73, 74, 76, 81, 83] and seven a high risk of bias [24, 30–32, 43, 66, 68]. See Table 3 for details regarding studies’ quality assessment and risks of bias.

3 Results of the literature review

3.1 Voice-related QoL

Of the four papers describing vQoL, three used a cross-sectional design [24, 30, 83], whilst one article used a longitudinal design with cross-sectional data for vQoL [31]. There were no studies looking at pre-treatment transgender people.
Only one study offered comparisons of transgender people post-treatment with normative data and reported worse vQoL for transgender people when compared to controls [31]. The cross-sectional studies that looked at people post-treatment (GAGS, CHT, Voice Feminisation Treatment - VFT) found transgender people to experience voice-related disability, in that they feel handicapped in everyday life because of their voice [31, 83]. This could be due to the fact that hormone therapy for transgender women had not affected on their voice. Only one study compared people according to their gender identity; this study by T’Sjoen and colleagues [83] found that transgender men report better vQoL compared to transgender women post-GAT. Overall, vQoL appears to be worse in transgender people, particularly in women, even post-GAT. See Table 4 for details.

The few studies investigating predictors of vQoL found increased age of the transgender individual, increased femininity of the voice [24] and low dihydrotestosterone as well as high Luteinising Hormone (LH) in the blood [83] to be factors predictive of a positive vQoL in populations of transgender women.

### 3.2 Sex-related QoL

Four studies investigated sex-related QoL by adopting a cross-sectional design [34, 73, 74, 81]; one offered comparisons with normative data [34], one compared the transgender group with a cisgender group matched for experienced gender [73], one carried out comparisons between transgender men and transgender women as well as between pre- and post-CHT
### Table 3  Risk of bias of studies included in the review

| Source | Sample definition (Inclusion criteria) | Recruitment (Random, complete, consecutive) | Representativeness of Sample (Exclusion criteria and clinical/non-clinical populations) | Response rate (min 70%) | Sample Size (min 300) | Comparison Use of validated measures | Quality rating |
|--------|----------------------------------------|---------------------------------------------|----------------------------------------------------------------------------------|------------------------|-----------------------|-------------------------------------|----------------|
| 1. Auer et al. (2017) [55]            | 0                                      | 1                                           | 0                                                                | 1                      | 1                     | 1                                   | +             |
| 2. Ainsworth & Spiegel (2010) [68]    | 1                                      | 1                                           | 1                                                                | 1                      | 1                     | 1                                   | 0             |
| 3. Bartolucci et al. (2015) [34]      | 0                                      | 0                                           | 1                                                                | 0                      | 1                     | 1                                   | +             |
| 4. Basar et al. (2016) [76]           | 0                                      | 1                                           | 0                                                                | 0                      | 1                     | 0                                   | +             |
| 5. Bouman et al. (2016) [69]          | 0                                      | 1                                           | 0                                                                | 0                      | 0                     | 0                                   | ++            |
| UK                                            | 0                                      | 0                                           | 1                                                                | 0                      | 1                     | 1                                   | +             |
| 6. Cardoso da Silva et al. (2016) [56] | 0                                      | 1                                           | 1                                                                | 0                      | 1                     | 0                                   | +             |
| 7. Castellano et al. (2015) [73]       | 1                                      | 1                                           | 0                                                                | 1                      | 0                     | 1                                   | +             |
| 8. Colton Meier et al. (2011) [71]     | 1                                      | 1                                           | 0                                                                | 1                      | 0                     | 1                                   | +             |
| 9. Colton Meier et al. (2013) [42]     | 1                                      | 1                                           | 0                                                                | 1                      | 0                     | 1                                   | +             |
| 10. Davey et al. (2014) [70]           | 0                                      | 1                                           | 1                                                                | 1                      | 1                     | 0                                   | +             |
| 11. de Vries et al. (2014) [20]        | 0                                      | 0                                           | 1                                                                | 1                      | 1                     | 1                                   | +             |
| 12. Gomez-Gil et al. (2014) [21]       | 0                                      | 0                                           | 1                                                                | 0                      | 1                     | 1                                   | +             |
| 13. Gorin-Lazard et al. (2012) [22]    | 0                                      | 0                                           | 1                                                                | 0                      | 0                     | 0                                   | +             |
| 14. Gorin-Lazard et al. (2013) [23]    | 0                                      | 0                                           | 1                                                                | 1                      | 1                     | 0                                   | +             |
| 15. Hancock et al. (2011) [30]         | 0                                      | 1                                           | 1                                                                | 1                      | 1                     | 1                                   | –             |
| 16. Hancock et al. (2016) [24]         | 1                                      | 1                                           | 0                                                                | 1                      | 1                     | 1                                   | –             |
| 17. Hoy-Ellis et al. (2017) [57]       | 0                                      | 1                                           | 1                                                                | 0                      | 1                     | 1                                   | +             |
| USA                              | 18. Kuhn et al. (2009) [81]             | 0                                           | 0                                                                | 1                      | 1                     | 1                                   | +             |
| 19. Lindqvist et al. (2017) [64]       | 1                                      | 0                                           | 0                                                                | 1                      | 1                     | 0                                   | +             |
| 20. Manieri et al. (2014) [74]         | 0                                      | 0                                           | 1                                                                | 1                      | 1                     | 1                                   | +             |
and the fourth study compared QoL linked to incontinence in transgender people post-GAGS to twenty members of the clinical staff who underwent at least one previous abdominal or pelvic operation [81]. This last study was included within this section as it is linked to surgery outcomes and to satisfaction with sexual life. Only one study looked at a transgender sample pre-GAGS and found that transgender people report worse sex-related QoL than the general population [34]. Studies including people post-GAGS suggested that transgender people still experienced lower sex-related QoL than their matched controls [73, 81]. When looking at gender differences, Castellano et al. [73] suggested that, at post-GAGS, transgender women did not display significantly different sex-related QoL compared to cisgender women, whilst transgender men showed lower sex-related QoL than cisgender men. Instead, studies comparing transgender people according to gender identity reported a significantly lower sex-related QoL in transgender men when compared to transgender women, independently of the transitional status [34, 73]. Only one study described changes in sex-related QoL using a longitudinal methodology [74]. This study found a significant improvement in sex-related QoL for both transgender men and transgender women post-CHT [74]. Overall, it appears that sex-related QoL improves post-GAT. However, such appears to be poor, particularly in transgender men when compared to cisgender men. See Table 5 for details.

Regarding predictors of sex-related QoL, CHT [34], low LH in the blood [73], having a partner and experiencing less negative mood symptoms [34] have been found to be factors associated with more positive sex-related QoL.

### 3.3 Body image-related QoL

Three papers described body image-related QoL, however none of these studies investigated QoL pre-GAT [35, 73, 74]. The cross-sectional study conducted by Castellano et al. [73] found no difference in body image-related QoL between the transgender sample post-medical treatments and a matched cisgender sample. The two longitudinal studies reported an improvement in body image-related QoL after treatment, specifically after CHT [74] and mastectomy for transgender men [35]. This suggests that gender affirming treatments are of benefit to body image-related QoL in transgender samples. The limited research in this area shows that body image related QoL improves post-GAT. See Table 6 for details.
Table 4  Studies investigating voice-related quality of life in transgender people (n = 4)

| Authors          | Number of Trans participants, mean age at assessment | Treatment status | Study design | Comparative groups, follow-up | Outcome measures | Results | Factors associated | Conclusions |
|------------------|---------------------------------------------------|------------------|--------------|--------------------------------|------------------|---------|-------------------|-------------|
| Hancock et al. (2011) [30] USA | 20 TW 48.8 yrs | Post-VFT 100% Post-GAGS 45% | Single centre Clinical group Cross-sectional | CGI Speakers: 5 cis women (46.8 yrs) 5 cis men (40.8 yrs) CG2 Listeners: 12 cis men (18.8 yrs) 13 cis women (19.65 yrs) (No follow-up) | TSEQ | Self-ratings: Femininity = 529 Likability = 552 Listener ratings: Femininity = 493 Likability = 533 | None studied | For TW vQoL moderately correlated with how others perceive their voice. vQoL correlated more strongly with speaker’s perception of voice compared with others’ perceptions |
| Hancock (2016) [24] USA | 81 TW 43 yrs | VFT 46% | Clinical and non-clinical group Cross-sectional | Completed VHI vs. completed VHI + TSEQ (No follow-up) | VHI TSEQ | General: VHI = 37.5 TSEQ = 76.5 VHI + TSEQ: VHI = 37.6 TSEQ = 76.5 VHI_{mean} = 32.29 | None studied | TW reported a wide range of vQoL; some individuals are severely affected by their voices whilst others are not. |
| Meister et al. (2017) [31] Germany | T0 21 TW 42.1 yrs T1 18 TW 46 yrs | T0 = Pre-VFT 100% T1 = Post-VFT 100% | Single centre Clinical group Prospective longitudinal with cross-sectional data regarding VHI | T0 vs T1 German control group | VHI | | | |
| T’Sjoen et al. (2006) [83] Belgium | 28 TW 33 yrs. TW 49 yrs. TM | GAGS 100% CHT 100% | Single centre Clinical group Cross-sectional | TW vs. TM (No follow-up) | VHI | TM: Total= 4(0–10) (F = 1, E = 0, P = 3, Phone = 0) TM + vQoL: Lower DHT Higher LH | | Better vQoL for both TW and TM above the cut-off for disability, meaning that they do experience voice-related disability |

CG Control Group, CHT Cross-sex Hormonal Treatment, Cis Cisgender, DHT Dihydrotestosterone, E Emotional, F Functional, FFS Face Feminisation Surgery, GAGS Gender Confirming Genital Surgery, LH Luteinizing Hormone, P Physical, TM Transgender men, TW Transgender women, VFT Voice Feminisation Treatment
| Authors (year) | Country | Number of Trans participants, mean age at assessment | Treatment status | Study design | Comparative groups, follow-up | Outcome measures | Results | Factors associated | Conclusions |
|---------------|---------|--------------------------------------------------|-----------------|-------------|-----------------------------|----------------|---------|-------------------|-------------|
| Bartolucci et al. (2015) [34] | Spain | 67 TW 36 TM DSM-IV-TR 31.46 yrs. TW 28.69 yrs. TM | Pre-GAGS 100% CHT 40% (TW 46% TM 28%) Post-CRS 30% (TW 35% TM 19%) | Single centre Clinical group | Cross-sectional | Nomative data (No follow-up) | WHOQOL-100 | sQoL TW: Poor/very poor 48% Good 23% Very good 20% TM: Poor/very poor 54% Good 27% Very good 28% | sQoL: CHT Having a partner Less negative feelings | Pre-GAGS about half of trans sample perceived sexual QoL as either poor or very poor compared to the control group |
| Castellano et al. (2015) [73] | Italy | 46 TW 14 TM 32.7 yrs. TW 30.2 yrs. TM | + 2 years post-GAGS 100% CHT 100% | Single centre Clinical group | Cross-sectional | 60 matched cis control sample (No follow-up) | WHOQOL-100 | sQoL TW = 65.85 TM = 54.21 | +QoL: Lower LH | Trans people reported levels of QoL similar to cis controls |
| Kahn et al. (2009) [81] | Switzerland | 52 TW 3 TM 51 yrs. Trans | CHT 100% GAGS 100% | Single centre Clinical group | Cross-sectional | 20 healthy female medical staff, not matched (No follow-up) | KHQ | KHQ = 27.31 | None studied | 15-years post-GAGS QoL is lower for trans people in domains of General health, Role, Physical and Personal limitation than the cis control group |
| Manieri et al. (2014) [74] | Italy | 56 TW 27 TM 32.7 yrs. TW 30.2 yrs. TM | T0 = initiation of CHT 100% T1 = 3 months post-CHT 100% T2 = 6 months post-CHT 100% T3 = 9 months post-CHT 100% T4 = 1 year post-CHT 100% | Single centre Clinical group | Prospective longitudinal | Pre- vs. during CHT | WHOQOL-100 | T4: sQoL = 50.25 TM: sQoL = 62.05 | None studied | TW reported significant improvement in sexual and general QoL 1 year post-CHT |

BI Body Image, CHT Cross-sex Hormonal Treatment, Cis Cisgender, CRS Chest Reconstructive Surgery, GAGS Gender Confirming Genital Surgery, LH Luteinizing Hormone, sQoL Sexual QoL, SR Social Relationships, TM Transgender men, TW Transgender women
Body satisfaction and Pre- vs. post-CRS BIQLI Pre-CRS = 0.32 +QoL:

Passing feelings of in social situations are associated with higher QoL and self-esteem in TM.

Table 6: Studies investigating body image-related quality of life in transgender people (n = 3)

| Authors          | Number of Trans participants, mean age at assessment | Treatment status | Study design | Comparative groups, follow-up | Outcome measures | Results | Factors associated | Conclusions |
|------------------|------------------------------------------------------|------------------|--------------|-------------------------------|-----------------|---------|---------------------|-------------|
| Castellano et al. (2015) [73] | 46 TW 14 TM 32.7 yrs. TW 30.2 yrs. TM | + 2 years post-GAGS 100% CHT 100% | Single centre Clinical group | 60 matched cis control sample | WHOQOL-100 | TW = 64.64 TM = 67.91 | +QoL: Lower LH Trans people reported levels of QoL similar to cis controls |
| Manieri et al. (2014) [54] | 56 TW 27 TM 32.7 yrs. TW 30.2 yrs. TM | T0 = initiation of CHT 100% T1 = 3 months post-CHT 100% T2 = 6 months post-CHT 100% T3 = 9 months post-CHT 100% T4 = 1 year post-CHT 100% | Single centre Clinical group | Pre- vs. during CHT | WHOQOL-100 | T4: TW: BI = 21.85 TM: BI = 68.75 | None studied TW reported significant improvement in sexual and general QoL 1 year post-CHT |
| van de Grift et al. (2016) [34] | 26 TM 26.1 yrs. TW | T0: CHT 100% T1: CRS 100% T2: CHT 100% | Single centre Clinical group | Pre- vs. post-CRS (T0 = baseline T1 = 6 months after CRS) | BIQLI | Pre-CRS = 0.32 Post-CRS = 0.38 +QoL: Body satisfaction Feelings of "passing" in social situations | Body satisfaction and "passing" in social situations are associated with higher QoL and self-esteem in TM |

BI Body Image, BodyQoL Body image-related quality of life, CHT Cross-sex Hormonal Treatment, Cis Cisgender, CRS Chest Reconstructive Surgery, GAGS Gender Confirming Genital Surgery, LH Luteinizing Hormone, sQoL Sexual QoL, SR Social Relationships, TM Transgender men, TW Transgender women, VFT Voice Feminisation Treatment

3.4 General (non-condition specific) QoL

Out of the 22 studies that assessed generic (non-condition specific) QoL, there were no pre-baseline differences in QoL between trans and cisgender people. However, post-baseline, trans people reported lower QoL than cisgender people, with one study suggesting that trans people reported lower QoL than cisgender people at baseline but higher QoL than cisgender people at follow-up. Five studies investigated post-GAGS QoL, all of which found that trans people reported lower QoL than cisgender people. Two studies investigated post-chest reconstruction QoL, with one study finding no difference in QoL between trans and cisgender people. Five studies investigated post-CHT QoL, with three studies finding no difference in QoL between trans and cisgender people, one study finding lower QoL in trans people, and one study finding higher QoL in trans people. Two studies investigated QoL at post-FMT, with one study finding no difference in QoL between trans and cisgender people. Two studies investigated QoL at post-FT, with one study finding no difference in QoL between trans and cisgender people and one study finding lower QoL in trans people. One study investigated QoL at post-VFT, with one study finding no difference in QoL between trans and cisgender people. One study investigated QoL at post-vaginal reconstructive surgery, with one study finding lower QoL in trans people.

Only one study looked at factors associated to body image-related QoL. [73]
improvement in transgender women 1-year post-GAGS when compared to pre-CHT values [56]. The third study compared QoL pre-GAGS (on CHT) and 1, 3 and 5-years post-GAGS. This study found that although QoL pre-GAGS was lower than the general population it improves 1-year post-GAGS. However the study also found that it reduces 3 years post-GAGS and even more 5 years after genital surgery. This could be explained as the first year post-GAGS is often known as the “honeymoon period” and people tend to report overly enhanced QoL, which are not representative of a long-term picture of patients’ psychological status and QoL [43]. When investigating longitudinal results according to gender a study found that transgender women displayed greater improvements in QoL 1-year post-CHT compared to transgender men [74].

Overall, the studies investigating general QoL in transgender people found poorer QoL pre-GAT than the general population, which improve after GAT in the short term. See Table 7 for details.

Medical and surgical treatments (i.e. CHT, CRS, GAGS) [17, 21–23, 56, 66, 68, 71], post-surgical well-being [20] and sexual functioning [43], presence of social and family support [21, 42, 55, 70, 77], decreased depression, anxiety and stress levels [42, 55], lack of chronic pain symptomatology [55], hope and resilience [54], high self-esteem and low levels of interpersonal issues [69], lack of identity stigma [57], having a good body image and good sleep quality [55], low levels of LH in the blood [73] as well as being employed and in a relationship, younger age, higher education, a high household income [65] and having undergone military service [57] were found to be factors predictive of a positive QoL.

### 4 Results of the meta-analysis

#### 4.1 Meta-analysis – Mental health-related QoL of transgender people compared to the general population

Measurements of QoL provide information regarding physical and mental health-related QoL but only a minority of studies looked at physical health-related QoL; therefore the meta-analysis focused on mental health-related QoL compared to those of the general population. Of the 22 studies assessing general QoL in transgender populations, 14 were considered suitable for inclusion in the meta-analysis [17, 20–22, 43, 54–57, 64, 65, 68–70]. These studies include people pre-GAT, post-GAT and mixed groups at different stages of medical transition. Studies were excluded from meta-analysis due to the absence of the mean, SD and/or sample size [66, 74], mental health quality of life not reported separately [73], insufficient detail about scoring [32, 42, 71] and the lack of access to appropriate normative data [23, 76]. Data at pre-treatment were utilised for the two longitudinal studies included in the meta-analysis [56, 64]. Additionally, normative data as comparison was obtained for four studies [54–57].

The results of the meta-analysis (14 studies) showed that transgender people report a statistically significantly lower mental health-related QoL than the general population (standard mean difference = −0.78, 95% CI = −1.08 to −0.48, Z = 5.16, p < 0.00001). Heterogeneity was high ($I^2 = 97\%$, $p < 0.00001$) (see Fig. 2).

#### 4.2 Meta-analysis – Subgroup analysis – Mental health-related QoL post-hormonal treatment of transgender people compared to the general population

A second meta-analysis was conducted with only the 7 studies that included exclusively post-treatment QoL scores [20, 43, 56, 64, 65, 68, 70]. The longitudinal study of Lindqvist et al. [64] investigated QoL post-GAGS but as the first time measurement was pre-GAGS and thus post-CHT, this measure was included in this analysis. Whilst for the longitudinal study of de Vries et al. [20], values at the latest time-point were used, as they measured QoL post-CHT in a sample of individuals older than 17 years of age.

The meta-analysis of 7 studies found that there was no statistically significant difference in mental–health related QoL of transgender people following CHT compared to the general population (standard mean difference = −0.42 CI 95% = −1.15 to 0.31; Z = 1.13; $p = 0.26$). Heterogeneity was high ($I^2 = 98\%; p < 0.00001$) (see Fig. 3).

### 5 Discussion

The aim of this study was to systematically and critically review the literature pertaining to quality of life in transgender people, to meta-analytically investigate mental-health related QoL compared to cisgender populations and to investigate the impact of GAT on the QoL of this population. A total of 29 studies met the inclusion criteria and were used for the systematic review and, of these, 14 studies were suitable for including in the meta-analysis. Most papers in this area investigated general QoL and only a few focused on either vQoL, sex-related QoL or body image-related QoL. The majority of these articles displayed either high or moderate risk of bias. Many studies used transgender samples that are not homogeneous in terms of gender affirming medical treatment status, which makes it difficult to draw firm conclusions about the impact of GAT.

Findings from the meta-analysis of mental health-related QoL suggest that the QoL of transgender people is significantly poorer than that of the general population, with a medium to large effect size (standard mean difference = 0.78). The
| Authors (year) | Country | Number of Trans participants, mean age at assessment | Treatment status | Study design | Comparative groups, follow-up | Outcome measures | Results | Factors associated | Conclusions |
|---------------|---------|------------------------------------------------------|------------------|-------------|----------------------|-----------------|---------|-------------------|-------------|
| Table 7 | | | | | | | | | |
| Ainsworth & Spiegel (2010) [68] USA | 247 TW 28 FFS (51 yrs) 28 FFS (51 yrs) 25 GAGS (50 yrs) 47 FFS + GAGS (49 yrs) 147 No surgery (46 yrs) | 28 FFS (CHT 86%) 25 GAGS (CHT 100%) | Clinical group | Cross-sectional | CG1 = FFS only CG2 = GAGS only CG3 = FFS + GAGS CG4 = No surgery CG5 = General population | SF-36-v2 | CG1 = 50 CG2 = 49.3 CG3 = 49.2 CG4 = 39.5 | +QoL: Surgical treatments TW have lower QoL than Dutch general female population |
| Auer et al. (2017) [55] Germany | 82 TW 72 TM | TW: CHT 79.3% Pre-GAGS 79.5% TM: CHT 80.6% Pre-CRS 56.9% Pre-GAGS 72.2% | Clinical group | Multicentre (4 sites) | Cross-sectional | SF-36 | | +QoL: Sleep quality -Depressive symptoms -Chronic pain (TM) -Anxiety (TW) +Social support (TW) +Body image (TW) |
| Başar et al. (2016) [76] Turkey | 22 TW 72 TM | CHT: 54.5% TW DMS-IV-TR DSM-V 20.8% TM: GAGS: 36.4% TW 12.5% TM | Clinical group | Single centre | TW vs. TM (No follow-up) | WHOQOL-BREF-TR | TW = 15.3 TM = 12.7 | QoL levels did not statistically differ between TW and TM. Substantial portion of low QoL in trans is due to poor sleep quality, anxiety in TW and chronic pain in TM |
| Bouman et al. (2016) [69] UK | 64 TW 40 TM 36.52 yrs | Assessment 6.7% CHT 78.8% Post-GCGS 17.3% | Clinical group | Single centre | 140 matched cis control sample (No follow-up) | SF-36-v2 | MCS = 70.9 | mQoL: Self-esteem -Interpersonal issues (too dependent) |
| Cardoso da Silva et al. (2016) [56] Brazil | 47 TW 21.23 yrs. | T1 at entrance to programme 100% T2 at least 1 year post-GAGS 100% | Clinical group | Single centre | Pre- vs. post-GAGS (T1 = baseline T2 = at least 1 year post-GAGS) | WHOQOL-100 | T1 = 14.77 T2 = 15.52 | +QoL: GAGS GAGS promotes improvement of psychological aspects of QoL and social relationships, but 1-year post-GAGS TW still report problems with physical health and independence |
| Castellano et al. (2015)[73] Italy | 46 TW 14 TM 32.7 yrs. TW 30.2 yrs. TM | + 2 years post-GAGS 100% CHT 100% | Clinical group | Single centre | 60 matched cis control sample (No follow-up) | WHOQOL-100 | TW = 67.87 TM = 69.21 | +QoL: Lower LH Trans people reported levels of QoL similar to cis controls |
| Colton Meier et al. (2011) [71] USA | 369 TM 28 yrs | CHT 66% CRS 41% | Clinical group | Online | CHT vs. No CHT (No follow-up) | SF-36-v2 | hQoL: CHT = 65.2 No CHT = 53.7 Trans = 61.3 | +QoL: CHT CHT is associated with improved mental health in TM |
| Colton Meier et al. (2013) [42] USA | 581 TM 27 years | CHT 67% CRS 41% GAGS 4% | Clinical group | Online | AM vs. AW vs. AB Normative data (No follow-up) | SF-36-v2 | AM = 58.85 AW = 64.77 AB = 60.81 | + QoL: Depression - Anxiety TM displayed higher QoL levels than the norm |
### Table 7 (continued)

| Authors            | Number of Trans participants, mean age at assessment | Treatment status | Study design | Comparative groups, follow-up | Outcome measures | Results | Factors associated | Conclusions |
|--------------------|-----------------------------------------------------|------------------|--------------|--------------------------------|------------------|---------|--------------------|-------------|
| Davey et al. (2014) UK | 63 TW, 40 TM, 56.9 yrs. TW, 28.05 yrs. TM          | TW: Post-GAGS 17.5% CHT currently 79.4% TM: Post-GAGS 15% CHT currently 0% | Single centre Clinical group | Matched cis control sample No follow-up | SF-36-v2         | MCS = 69.31 | - Stress + Social Support + MCS, VT, SF QoL Social support | Trans clinical sample reported lower QoL than matched cis sample |
| de Vries et al. (2014) The Netherlands | 22 TW, 33 TM, T0 = 13.6 yrs. T1 = 16.5 yrs. T2 = 21 yrs. TM: T0 = 13.7 yrs. T1 = 16.8 yrs. T2 = 20.5 yrs | T0 = pre-puberty suppression T1 = post CHT T2 = 1 year post-GAGS | Single centre Clinical group Prospective longitudinal with cross-sectional data regarding QoL | T0 vs. T1 vs. T2 Participants vs. nonparticipants (T0 = pre-puberty suppression T1 = when CHT introduced T2 = 1 year post-GAGS) | WHOQOL-BREF T2 pQoL = 14.66 | +pQoL: Post-surgical well-being | Well-being in trans same or enhanced compared to same-age general population young adults |
| Gomez-Gil et al. (2014) Spain | 119 TW, 74 TM, ICD-10 31.2 yrs. Trans | CHT 62.2% No CHT 37.8% | Single centre Clinical group | Cross-sectional | 101 cis people (No follow-up) | WHOQOL-BREF pQoL = 56.09 | +QoL: CHT Family support Working/studying | Trans reported lower perceived QoL compared to the cis sample. Additionally, TM reported higher social QoL than TW |
| Gorin-Lazard et al. (2012) France | 31 TW, 30 TM, 39.4 yrs. TW, 29.9 yrs. TM | No CHT: TW 19.4% TM 36.7% CHT: TW 80.6% TM 63.3% | Multicentre (3 sites) Clinical group | French age- and sex-matched control Normative data (No follow-up) | SF-36-v2 MCS = 47.92 | + mQoL: CHT - mQoL: Depression | Positive effect of CHT on QoL. Trans QoL did not differ from cis matched controls except for RP |
| Gorin-Lazard et al. (2013) France | 36 TW, 31 TM, 35.1 yrs. Trans | No CHT: TW 38.9% TM 61.1% CHT: TW 59.2% TM 40.8% | Multicentre (3 sites) Clinical group | TW vs. TM CHT vs. No CHT (No follow-up) | SQUALA TW = 12.1 TM = 11.34 Total = 11.72 | + pQoL: CHT | CHT predicted positive self-esteem, less severe depression, and greater psychological dimensions of QoL |
| Hoy-Ellis et al. (2017) USA | 84 TW, 51 TM, 48 Other, 46.88 yrs. TW, 27.48 yrs. TM, 25.64 yrs. Other | None reported | Online and/or paper Non-clinical group | Military service vs No military service (No follow-up) | WHOQOL-BREF pQoL = 64.12 | -pQoL: Identity stigma +pQoL: Prior military service | Those with prior military service had lower depressive symptomatology and higher pQoL |
| Lindqvist et al. (2017) Sweden | 146 TW, T0 = 108 TW, T2 = 64 TW, T3 = 43 TW, 36 yrs | T0 = pre-GAGS + CHT 100% T1 = 1 yr. post-GAGS 100% | Single centre Clinical group Prospective longitudinal data | T0 vs T1 vs T2 vs T3 Swedish normative data | SF-36 MCS: T0 = 73.8 T1 = 74.1 T2 = 71 T3 = 67.6 | None studied | TW (both pre and post-GAGS) reported lower QoL than general population; GAGS improves QoL 1 year |
| Authors (year) | Country | Authors (year) | Country | Treatment status | Study design | Comparative groups, follow-up | Outcome measures | Results | Factors associated | Conclusions |
|---------------|---------|---------------|---------|------------------|-------------|-------------------------------|----------------|---------|---------------------|-------------|
| Manieri et al. (2014) [74] | Italy | 56 TW | 27 TM | T0 = initiation of CHT 100% T1 = 3 months post-CHT 100% T2 = 6 months post-CHT 100% T3 = 9 months post-CHT 100% T4 = 1 year post-CHT | Single centre Clinical group Prospective longitudinal | Pre- vs. during CHT | WHOQOL-100 | T4 TW: QoL = 63.52 TM: QoL = 72.2 | None studied | TW reported significant improvement in sexual and general QoL 1 year post-CHT |
| Mora et al. (2017) [32] | Spain | T0 = 30 TW T1 = 18 TW 30 yrs | Pre-FFS 100% | Single centre Clinical group Prospective longitudinal with cross-sectional data regarding SF12v2 | None | SF-12v2 | MCS = 48.63 | None studied | Trans women suffer poor QoL |
| Motmans et al. (2011) [65] | Belgium | 63 TW | 58 TM | TW: CHT 94.6% FFS 18.7% TM: GAGS 64% GAGS 67.8% | Clinical group Cross-sectional | Normative data | SF-36 | MCS = 72.04 | +QoL: Being Employed Being in a Relationship Young age, Higher Education Higher household income + Testosterone Usage CRS | TM reported reduced mQoL than Dutch male sample. Older, low-educated, unemployed, with a low household income and single trans people had significantly lower QoL |
| Newfield et al. (2006) [17] | USA | 376 TM | 32.6 yrs | CHT 64% CRS 37% GAGS 11% | Opportunity sampling Cross-sectional | Normative data | SF-36-v2 | MCS = 39.51 | +QoL: Lower mental health-related QoL than US general population |
| Parola et al. (2010) [66] | France | 38 Trans | 32–65 yrs. range | +2 years CHT and GAGS 100% | Single centre Clinical group Cross-sectional | TW vs. TM; Extraversion vs. Introversion; Neuroticism vs. Emotional stability | SF-36 | TW: Better Social QoL = 11/15 people Better Quality of family relationships = 4/15 people TM: Better Social QoL = 10/15 people Better Quality of family relationships = 6/15 people | +QoL: CHT | TM reported better social and professional QoL, and friendly lifestyles than TW |
| Authors (year) Country | Number of Trans participants, mean age at assessment | Treatment status | Study design | Comparative groups, follow-up | Outcome measures | Results | Factors associated | Conclusions |
|-----------------------|-----------------------------------------------------|-----------------|--------------|-------------------------------|-----------------|---------|-------------------|------------|
| Wierckx et al. (2011) [43] Belgium | 49 TM 37 yrs | Post-GAGS 100% CHT 100% | Single centre Clinical group Cross-sectional | Dutch normative data (No follow-up) | SF-36 | MCS = 75.8 | Extroverted = 54.28 Introverted = 52.02 High neuroticism = 53.16 Low neuroticism = 50.77 | TM have good QoL post-GAGS compared to general Dutch population but still lower than the normative data |
| Yang et al. (2016) [54] China | 209 TW 26.7 yrs | FFS 34.93% CHT 17.70% | Non-clinical group Cross-sectional | None (No follow-up) | SF-36 | MCS = 68.28 | mQoL: Hope Resilience PhQoL: Lower age | Chinese TW reported high levels of physical QoL but low levels of mental QoL |

*AB Attracted to Both, AM Attracted to Men, AW Attracted to Women, BI Body Image, CG Control Group, CHT Cross-sex Hormonal Treatment, Cis Cisgender, CRS Chest Reconstructive Surgery, FFS Face Feminisation Surgery, GAGS Gender Confirming Genital Surgery, hQoL Health-related QoL, LH Luteinizing Hormone, MCS Mental Component Score, mQoL Mental health-related QoL, pQoL Psychological QoL, p-hQoL Psychological Health-related QoL, RP Role-Physical, SF Social Functioning, sQoL Sexual QoL, SR Social Relationships, TM Transgender men, TW Transgender women, VT Vitality*
subgroup meta-analysis including only the samples of transgender people who were classifiable as post-hormonal treatment found that transgender people post-CHT still had lower mental health-related QoL than the general population. This difference was not significant and the effect size was reduced (standard mean difference = 0.42). The possibility that treatment is associated with improvements in mental wellbeing is supported by the findings from the small number of longitudinal studies in this review. These found that both CHT and GAGS improve QoL [56, 64, 74]. However these results need to be treated with caution, as the only study to employ a longer term follow-up [64] reported that after an initial improvement in QoL at 1-year post-GAGS, scores tend to steadily decrease in the following years until reaching 5-years post-GAGS, when QoL is lower than at pre-treatment [64]. During the first year post-GAGS people tend to report overly enhanced QoL, which may not be representative of a long-term picture of patients’ psychological status and QoL [43]. The improvement in QoL experienced by transgender people at short-term could be attributed to relief at being able to live as the experienced gender. Additionally, as QoL in the general population has been shown to decrease with age [53], a decline in these scores is somewhat expected as time passes.

In contrast, the small number of studies that explore general physical health-related QoL suggest that at post-GAT, transgender people’s reported QoL scores either similar to [22] or better than that found in the general population [17, 43]. However, only a minority of studies report findings related to physical health-related QoL and it is difficult to draw accurate conclusions.

### 5.1 Condition specific QoL

When looking at condition-specific QoL, studies investigating vQoL reported that CHT has been shown to have a positive impact on transgender men. This is not surprising, as testosterone is known to affect voice by thickening vocal chords and by decreasing the pitch [87]. On the other hand, studies in transgender women, including post-voice feminising surgery, found that they still feel handicapped regarding their voice in their everyday life, irrespective of the transitional status. In fact, studies have suggested that the more feminine a transgender person perceives her own voice, the higher the experienced vQoL [30, 31]. However, these studies are limited by focusing on transgender women who transitioned post-puberty. This means that by the time they initiated physical transition, testosterone has already negatively altered their voice. Thus findings from vQoL cannot be generalised to the overall transgender population. Future studies should explore differences in vQoL between those who transitioned pre-puberty and therefore before the breaking of the voice, and those who transitioned post-puberty, when the voice has already been affected.
Regarding sex-related QoL, longitudinal studies suggest that undergoing GAT improves sex-related QoL [74] but the QoL of transgender men post-GAGS is still worse than that of cisgender men. However, the articles investigating sex-related QoL in transgender men did not distinguish whether patients underwent phalloplasty or metoidioplasty. Surgical treatments help the transgender person reach the desired physical changes and lead towards a more congruous body with their gender identity. This may lead to people feeling more comfortable with their own bodies and consequently when being intimate with others.

Longitudinal studies also supported an amelioration in body image-related QoL [35, 74]. In fact, Castellano and colleagues [73] reported no difference between the transgender population and their matched controls. This could be due to the fact that people undergoing GAGS are generally already on CHT and hormonal treatment is known to have a positive effect on body image [10, 36, 88] by aiding in the development of desired secondary sexual characteristics of the experienced gender, whilst helping to alter some of the attributes relative to the sex assigned at birth. Consequently, this leads to an improvement in body image-related QoL. Nonetheless, van de Grift et al. [35] proposed body image-related QoL to be lower for transgender people post-CRS, than for the general population. This might be caused by the fact that following CRS, some people’s genital dysphoria may increase. However, caution is still needed when generalising the findings due to the studies’ moderate risk of bias as well as their methodological limitations.

5.2 General QoL

Studies regarding general QoL have found that transgender people’s QoL is poorer than that of cisgender people, but that it improves post-GAT. The poorer QoL found in the transgender population pre-CHT [56, 74] could be explained by the high degree of mental health problems reported in this population [16, 89] as well as by the difficulties that many have in socialising and living a fulfilling life [10–12, 37]. However, the studies that focus only on people pre-CHT were rare and only included those seeking medical transition, which does not allow for a generalisation of these findings to the general transgender population.

When looking at general QoL post-GAT, only a small number of studies provided control data and none of them had a low risk of bias. Findings of the subgroup meta-analysis at post-treatment showed that there is no difference in general QoL between transgender people and the general population. The improvement in QoL post-GAT could be due to the effect of treatment in the reduction of dysphoria and mental health problems, such as self-harm and depression [13, 90].

Overall, findings support the idea that QoL improves following hormonal treatment [74] as well as post-genital surgeries [43, 56]. As people undergoing surgery are generally already on hormones, the exact role of genital surgery in QoL cannot be extrapolated from these studies. Often, even after an improvement in QoL post-surgical treatment, transgender people reported lower QoL compared to cisgender individuals [7, 56, 64, 70]. This could be due to the fact that, even if being happier with their own bodies, society is still not ready to accept transgender people; thus work, education or relationships can be affected by being transgender [6, 91, 92]. This is confirmed by the findings of studies investigating factors predictive of QoL in this population, as described in the section below.

Caution is needed while interpreting the results in comparison to cisgender individuals as not all studies have matched controls and sample sizes are generally small. Additionally, as the majority of the studies investigated QoL in transgender clinical populations, generalisation of findings for the general transgender population is hindered.

Studies on differences between transgender men and transgender women advance contrasting results. Two studies seemed to suggest that transgender men display lower QoL compared to transgender women [23, 76], two studies suggested the opposite [21, 66], whilst one study proposed no statistically significant differences between groups [55]. Literature also suggested that at 2-years post-treatment transgender men display higher QoL than transgender women [66], whilst still lower than cisgender people [73]. These findings might be due to baseline differences in QoL scores [65] as well as because of the utilisation of mixed samples in terms of treatment status. Results need to be interpreted with caution as none of the articles displayed a low risk of bias. A possible explanation for transgender men to report higher QoL than transgender women might be due to the wider social acceptance towards masculinity than femininity. This presents itself with transgender men reporting less marked psychopathology, getting involved more easily in society and being employed in more stable jobs, whilst feeling less limitations in daily life related to their physical and emotional state [21, 66]. Additionally, studies that reported transgender women to display higher QoL than transgender men suggested that these findings are unexpected and surprising [76] considering the low social status of and amount of discrimination faced by transgender women in some countries (e.g. Turkey).

5.3 Factors associated with QoL

QoL can be influenced by a wide array of factors, which can predict both its increment, as well as its decline. Literature looking at variables associated with a positive QoL for transgender people suggested that undergoing medical and surgical treatments (i.e. CHT, CRS, GAGS) are the main predictive factors, irrespective of the QoL domain studied [17, 21–23, 34, 66, 68, 71]. These findings were confirmed by longitudinal studies, which indicated an improvement in QoL from pre-to post-treatment [35, 56, 74].

Additionally, social and family support, being employed, being in a relationship, being younger, having a partner, being
highly educated, having a high household income, and the presence of past military service were associated with improved scores on general and sex-related QoL [21, 34, 54, 57, 65].

Instead, anxiety, poor sleep quality, experiencing pain, reduced self-esteem and high interpersonal issues are factors that have been linked to poor QoL in both transgender populations [22, 42, 55, 69, 70, 76] as well as in the general population [93].

6 Conclusion

As all systematic literature reviews, this study is also limited by the amount and quality of the published literature available. Future studies should employ more robust methodologies, which explore QoL in a more homogeneous population and using matched control groups.

Despite the limitations of the published literature, this review concludes that overall transgender people display poorer QoL than the general population, particularly pre-GAT, and that QoL improves once people are on CHT.

When specifically looking at the different dimensions of QoL (vQoL, sex-related QoL, and body image-related QoL), findings of the systematic review suggest that transgender people display poorer QoL than the general population, independent of the QoL domain investigated. As per general QoL, all dimensions of QoL have been shown to improve post-GAT. However, as the effect of GAT is linked to gender, a more positive vQoL was found for transgender men than transgender women at post-GAT, whilst opposite findings were obtained for sex-related QoL.

As long-term follow-up studies are limited in numbers and methodology, more studies are required exploring long-term QoL. This information may aid the development of support and interventions aiming at increasing resilience for those at risk of a poor QoL post-GAT.

Compliance with ethical standards

Conflict of interest The authors have no conflicts of interest to declare.

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