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Rethinking Gender Identities and Sexual Orientation: The Multidimensional Gender and Sexuality Inventory (MGSI)

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Abstract

The traditional binary understanding of gender identities and sexual orientation, though long standard in both society and research, oversimplifies the true complexity of these concepts. Grounded in Tate's five-part understanding of gender according to the BIRDS framework: Biology, Identity, Roles, Displays and Sentiment, we develop the Multidimensional Gender and Sexuality Inventory (MGSI) which moves beyond binary categories to reflect fluid, non-normative identities and experiences. The MGSI is based on five well-established, multi-item scales: the Multi-Gender Identity Questionnaire, the Sexual Orientation Questionnaire, the Transgender Congruence Scale, the Open Sex Role Inventory, and the Multidimensional Scale of Perceived Discrimination. The MGSI was developed using exploratory factor analysis on data from 1,305 gender-diverse U.S. participants. It offers an adaptable, customizable format that lets researchers select dimensions that match their research focus—be it gender identity, sexual orientation, or experiences of discrimination—offering them a comprehensive and flexible tool for investigating gender and sexuality in diverse contexts.

1. Introduction

In recent years, an increasing number of countries—including India and several European nations—have formally recognized non-binary and third-gender identities, expanding be- yond the traditional male-female binary (Supreme Court of India, 2014; German Federal Court of Justice, 2020). This shift in legal recognition mirrors broader societal changes and reflects a growing population of individuals who do not exclusively identify as either man or woman.

Despite this growing diversity, binary gender categories remain dominant in both research and policy. Gender is frequently conflated with sex as registered at birth, and many empirical studies fail to distinguish between the two (Brady et al., 2021; Cameron and Stinson, 2019; National Academies of Sciences, Engineering, and Medicine, 2022). While binary classification often offers comparability with previous research, it oversimplifies gender and marginalizes the experiences of individuals whose identities do not fit within traditional categories (Brenøe et al., 2022). The persistence of binary gender frameworks may reinforce systemic exclusion, a problem compounded by recent policy decisions in countries such as the U.S. (White House, 2025) and the U.K. (CNN, 2025).

The urgency of addressing such exclusions is reflected in global policy agendas. For example, the United Nations' Sustainable Development Goal 10 (SDG10) calls for reducing inequality by promoting the social and economic inclusion of all people, regardless of identity (United Nations, 2015). Marginalized groups —including minorities, women, transgender individuals, and individuals with disabilities—often face barriers to accessing education, employment, healthcare, and they often earn less than men for the same work, face barriers to career advancement, and are underrepresented in leadership roles (Euro- pean Commission, 2021). These barriers perpetuate social exclusion and hinder efforts to achieve equitable development. Achieving SDG 10 thus requires targeted policies that dismantle systemic inequalities and promote inclusive participation across all sectors of society—efforts that must be informed by research practices capable of capturing the full spectrum of gender diversity.

Efforts to quantify gender in psychology started with the *Bem Sex Role Inventory* (BSRI) of Bem (1974), who reconceptualized masculinity and femininity as orthogonal dimen- sions. This inventory allowed for classification as androgynous, undifferentiated, or tra- ditionally gendered (masculine/feminine). However, it relied on culturally stereotyped traits and assumed stable, binary gender identities. It did not address self-identification, gender expression, or the influence of external pressures, thus limiting its applicability.

Egan and Perry (2001) introduced a multidimensional model of gender identity that represented a major conceptual advance by recognizing the multidimensional nature of gen- der identity, yet it was limited in scope to children. Measures were structured around girls/boys categories and did not account for non-binary or transgender experiences out-

side traditional norms. Tate et al. (2015) noted that the use of 'gender' in psychology specifically has always been confusing because that single term refers to, at minimum, five different conceptual objects. This 5-concept understanding led Tate (2025) to develop the BIRDS framework to offer a more structured and comprehensive understanding of gender identity. BIRDS provides a systematic model for understanding gender across five interrelated components:

- **Biology**: sex assigned at birth and other physical attributes (modifiable or not).
- **Identity**: how individuals self-categorize (e.g., woman, man, nonbinary).
- **Roles**: cultural norms, ideologies, and expectations about gender.
- **Display**: external expressions such as clothing, voice, and mannerisms.
- **Sentiments**: intra- and intergroup attitudes and evaluations based on gender.

As Tate (2025) notes, many trans individuals in the U.S. have relied on the Identity (I) component of BIRDS to articulate their sense of being transwomen, transmen, or non- binary. Thus, dismissing the usefulness of a "true gender" as rooted in the I-component lacks empirical support and, at worst, risks erasing the legitimacy of self-defined gender identities—especially among trans populations. Rejecting this complexity may inadvertently reinforce cisnormative assumptions as default starting points.

Although the BIRDS model by Tate (2025) offers a comprehensive framework, it currently remains a theoretical model, not a psychometric instrument. Despite the theoretical rich- ness of models such as Egan and Perry's, and Tate's, most empirical tools do not yet fully operationalize these frameworks. Existing instruments typically assess only isolated dimensions, often remain bound to binary classifications, and rarely address the intersections between gender and sexuality. To the best of our knowledge, no validated tool yet exists that captures all five components of the BIRDS framework in an integrated and empirically supported way. This gap highlights a critical need for measurement tools that reflect the full complexity of contemporary gender theory.

To address this limitation, this paper proposes a granular, self-assessed inventory for gender and sexuality that transcends traditional gender concepts by accounting for the multiple dimensions that shape a person's gender and sexuality, the Multidimensional Gender and Sexuality Inventory (MGSI). We followed a systematic approach to develop the MGSI. First, we reviewed the literature to identify items[1] from well-established multi- item inventories that align with the gender dimensions we sought to capture. The MGSI captures key aspects of the construct, such as satisfaction with one's gender (Jacobson and Joel, 2018), the congruence between gender identity and external appearance (Kozee et al., 2012), perceptions of both blatant and subtle gender-based discrimination (Molero et al., 2013), and sexual orientation (Jacobson and Joel, 2018), within a unified framework. Thus, the MGSI translates the BIRDS framework into a unified empirical tool that captures diverse aspects of identity across populations, and the MGSI draws on items from five validated scales: the Multi-Gender Identity Questionnaire (MIQ) (Jacobson and Joel, 2018), the Transgender Congruence Scale (TCS) (Kozee et al., 2012), the Open Sex Role Inventory (OSRI) (De Roover and Vermunt, 2019), the Multidimensional Scale of Perceived Discrimination (MSPD) (Molero et al., 2013), and the Sexual Orientation Questionnaire (SOQ). In summary, our review of the literature led us to select the MIQ, the TCS, the OSRI, the MSPD, and the SOQ as the inventories we source the items for our study from. We will refer to these five source inventories as the "origin inventories" for our study.

Using data from 1,305 U.S. residents—including both cisgender/heterosexual and non- cisgender/non-heterosexual individuals—
we conducted an exploratory factor analysis (EFA), revealing twelve robust dimensions. These include gender identity satisfaction, presen- tation congruence, perceived pressure to conform, sexual orientation, and experiences of discrimination. Traditional masculinity/femininity stereotypes were less predictive than expected, while dimensions tied to identity and discrimination were central.

The MGSI offers a modular, flexible structure that aligns with contemporary understand- ings of gender. It allows researchers to examine distinct dimensions independently or in combination, depending on the context. This approach supports the goals of SDG10 by offering more accurate, inclusive, and policy-relevant tools to assess how gender influences behavior, opportunity, and well-being across populations.

2. Items Considered for the MGSI

2.1. Item Selection

We started with a systematic literature review (see Supplemental Files (SF) Section 1) to identify items from well-established multi-item inventories that aligned with the specific gender dimensions we aimed to capture. After deciding on our five "origin inventories", we examined their items' factor loadings. Following Jolliffe and Cadima's (2016) recom- mendation, we retained only those items with robust factor loadings of .70 or greater. This rigorous item selection process resulted in narrowing down the initial item pool from 198 to 153 (SF Section 3 presents the original versions of the multi-item inventories and highlights which items we excluded). We then harmonized the scales of the items. The five origin inventories used varying Likert scales, such as 5-point and 7-point scales. To ensure consistency across all dimensionally reduced multi-item inventories, and to more closely approximate a continuous scale, we uniformly standardized all items to a 10-point Likert scale. We employed the BIRDS framework to systematically identify and analyze five interrelated components of gender, except for the "B" component, since we elicit individuals' sex as part of the elicitation of their socio-demographic details. The remaining components are each represented by a shorthand term, which we detail—along with its rationale—in the following subsections.

2.1.1. Internal Dimension

Internal corresponds to the "Identity" dimension of Tate's BIRDS framework. This dimension encompasses an individual's basic sense of self as a male, female, or other individual (Stoller, 1964) and their felt compatibility with 'their' gender group (e.g., self- perceptions of gender typicality as well as feelings of contentment with one's gender) (Egan and Perry, 2001). We used the 24-item MIQ of Jacobson and Joel (2018) as our origin inventory for assessing gender identity. The inventory items assess *feeling as a woman/man*, *sometimes feeling as a woman/man*, *feeling between a woman and a man*, *feeling as neither gender*, *wishing to be a woman/man*, and *feeling as a 'real' woman/man*. We retain those 14 MIQ items that score factor loadings of .70 or higher in the Jacobson and Joel (2019) Principal Component Analysis (PCA) results (details in SF Section 3.2).

2.1.2. Gender Roles Dimension

Gender Roles corresponds to the "Roles" dimension of Tate's BIRDS framework. This dimension assesses how an individual's identity matches contemporary gender roles as- signed by friends, family, co-workers and others, and those imposed by political, educa- tional, religious, media, medical, cultural and social institutions (Johnson et al., 2009). The 44-item OSRI measures 22 masculine and 22 feminine traits. The inventory's dual focus on internal self-perception and external societal expectations allows for a compre- hensive examination of how individuals navigate the complex interplay between their own sense of gender and the broader gender roles and stereotypes that shape our world. We retained the 18 OSRI items that scored factor loadings of .70 or higher in the De Roover and Vermunt (2019) EFA results (details in SF Section 3.5).[3]

2.1.3. External Dimension

External corresponds to the "Displays" dimension of Tate's BIRDS framework. This dimension evaluates how an individual expresses their identity through body presentation, clothing choices, or name selection (Kozee et al., 2012), but does not include mannerisms, contrary to Tate's suggestion. Mannerisms are excluded because they are often involun- tary or culturally mediated behaviors (Pang et al., 2024), and may not reflect intentional or self-determined expressions of identity in the same way that appearance-based choices do (Hester and Hehman, 2023).

The 12-item TCS of Kozee et al. (2012) consists of two subscales: 1) Appearance congru- ence (Q1-Q9) (e.g., “My outward appearance reflects my gender identity”), which exam- ines whether external appearance adequately represents gender identity, and 2) Gender identity acceptance (Q10-Q12) (e.g., “I have accepted my gender identity”), which reflects the individual’s acceptance of the gender that society assigns to the individual. The item “I am not proud” was the only one to score below our .70 threshold in the Iliadis et al. (2020) Confirmatory Factor Analysis (CFA) results. To streamline the assessment and save time for participants, we removed six more items that were almost identical to other items (details in SF Section 3.3).

2.1.4. Relations Dimension

Relations corresponds to the “Sentiments” dimension of Tate’s BIRDS framework. This dimension assesses whether individuals experience gender-based discrimination. The 20- item MSPD of Molero et al. (2013) measures four aspects of perceived discrimination: blatant group discrimination (Q1-Q7), subtle group discrimination (Q8-10), blatant indi- vidual discrimination (Q11-Q17), and subtle individual discrimination (Q18-Q20). The scale’s fourfold focus on perceived discrimination provides a comprehensive framework for individuals to articulate and evaluate their experiences. We retained the 19 MSPD items that scored factor loadings of .70 or higher in the Molero et al. (2013) CFA results (details in SF Section 3.4).

2.1.5. Sexuality Dimension

Sexuality is not part of the BIRDS framework. This dimension assesses a person’s sexual orientation and other aspects of their sexuality. Despite the distinction between a person’s gender and their sexual orientation (Hereth et al., 2020), it is important to explore how the two concepts relate. Since many studies that report gender/sex effects do not control for sexual orientation, these ex- planatory variables are confounded and reported gender/sex effects could conceivably be driven not by the study participant’s own gender/sex, but rather by the (perceived) gender of the individuals the study participant feels sexually or romantically attracted to. The 7-item SOQ of Jacobson and Joel (2018) comprises questions assessing internal and external facets of participants’ sexual orientation. These facets encompass areas such as sexual fantasies, sexual attraction, sexual behavior, and romantic relationships. We also added an item suggested by Jacobson and Joel (2018), which asks participants to select a sexual orientation category that resonates with their internal sense of self. The categories of this additional item are “Exclusively heterosexual,” “Mostly heterosexual,” “Bisexual,” “Mostly homosexual,” “Exclusively homosexual,” “Pansexual,” “Asexual,” and “Other.” We retain all SOQ items plus the additional item, since they all score factor loadings of .70 or higher in the Jacobson and Joel (2019) PCA results (details in SF Section 3.6).

2.2. Development of New Supplementary Summary and Expec- tation Items

In addition to the items taken from the five origin inventories, we developed two new, supplementary items for each dimensionally reduced origin inventory. We created one item that closely reflects the respective, dimensionally-reduced origin inventory, and denoted this additional item the “Summary Item”. We created a second item that aligns with conventional expectations for the corresponding dimension, i.e., we pondered the question “What would individuals expect to be asked in a questionnaire regarding their gender, gender stereotypes, or sexual orientation?” and then prepared an item that captures this expectation. We denoted this additional item the “Expectation Item”. In line
with the harmonized scales, the two additional items also follow the standardized 10-point Likert scale answer options. We clearly mark the additional items for each origin inventory in SF Section 3 and its subsections. We will refer to these additional items as the “supplementary items” for our study.

2.3. Modifications to Gender-Specific Survey Items

Certain items in the origin inventories specifically refer to either women or men. For example, the SOQ (Jacobson and Joel, 2018) includes questions that are either gender- neutral or presented twice, once in a form intended for male and once in a form intended for female participants. For instance, a female-oriented question is “In the past 12 months, have your romantic relationships been with men?”. In such cases, we ask the question in forms intended for men and women, but also for transwomen, transmen and non-binary individuals. This yields a total of five forms to allow for greater granularity and precision (e.g., when measuring the participants’ sexuality). For example, every participant has to answer all five versions of the question with whom (see the square brackets) the participant might have had a romantic relationship: “In the past 12 months, have your romantic relationships been with [women / men / transwomen / transmen / non-binary individuals]?” We apply this solution across all origin inventories whenever items exclusively referenced men and women.

After running through this multi-step protocol, the completed draft of our candidate
inventory comprised 177 items, including the 24 summary and expectation items, and eleven demographic questions. We then collected data using this candidate inventory. Following the data collection, we derived the final version of the MGSI from our candidate inventory using EFA.

3. Data Collection

All materials for our study are accessible athttps://osf.io/wr5cz/?view_only=589a8ee81e164a2ea5ab32e3b9255ed2, including in- structions, datasets and analysis files. Given that our article is exploratory in nature and we did not aim to test specific hypotheses, we did not preregister the study. We obtained ethics approval from all universities involved. We will reveal the respective reference numbers after the anonymous review process has concluded. Furthermore, you can interactively explore the data of the five dimensions at https://mgsi.shinyapps.io/mgsi/, including using 1) stacked bar charts and 2) scatter plots. Additionally, the script and related files are available in OSF in the ShinyApp folder at https://osf.io/wr5cz/?view_only=589a8ee81e164a2ea5ab32e3b9255ed2.

3.1. Participants

We recruited participants through the online research platform Prolific.com and collected data between April 30, 2024 and May 7, 2024. The sample consists of a total of 334 indi- viduals whose answers on Prolific's pre-screening questions suggested that they were het- erosexual, cisgender women, another 334 whose answers suggested that they were hetero- sexual, cisgender men, and 668 whose answers suggested that they were non-heterosexual or non-cisgender. The online survey took no more than 20 minutes and participants re- ceived £ 4.00 conditional on passing two attention checks and completing the survey. We excluded 26 responses due to missing entries and another five that lacked a valid Prolific ID. This resulted in the 1,305 valid observations used in the EFA[7]. Table 1 provides an overview of the final dataset of participants, tabulated by their sex and gender as indicated in Prolific pre-screening questions. We provide demographic details in Table SF7.

Table 1: Participant sex and gender as stated on Prolific.

Gender	*Female*	**Sex** *Male*	*Unspecified*	**Total**
Woman	404	22	0	426
Man	68	384	0	452
Transwoman	7	36	1	44
Transman	81	10	1	92
Non-binary	219	65	7	291
Total	**779**	**517**	**9**	**1,305**

Note. Individuals who did not answer Prolific.com's pre-screening question about their sex are listed as "Unspecified".

3.2. Study Protocol

After informing participants about the study and collecting their consent, we inform them about the definition of gender used in the survey: "Gender identity describes each person's deeply felt internal and individual experience of gender, which may or may not correspond to the sex assigned at birth"(EIGE, 2024). Afterward, they started with the two main survey sections. The first section elicited basic socio-demographic factors, including items concerning sex, gender, age, religiosity, ethnicity, level of education, occupation, personal income, marital status, number of dependents, religion and sexual orientation. The second section included our candidate inventory as laid out in Section 2 plus two attention check questions. The items of each origin inventory were presented on a separate page and participants could not return to preceding pages.

4. Analysis

4.1. Replication of Existing Findings

To ensure the reliability of the MGSI, we conducted a thorough replication of existing findings based on our collected data. In essence, we performed analyses to determine whether the results we obtained for the different origin inventories with our sample align with previously published findings. Detailed results are available in SF Section 4. As noted earlier, we had to adjust the origin inventories slightly, such as regarding their scaling. Nevertheless, our findings remain broadly consistent with those reported in the literature. This consistency supports the generalizability of our dataset, confirming that it is representative and suitable for developing the MGSI. By ensuring alignment with established outcomes, we can confidently proceed with constructing a valid and reliable measure. We next conducted composite-level zero-order correlation analyses among the five scales— MIQ, TCS, OSRI, SOQ, and MSPD— separately for each gender identity group. This disaggregated approach addresses a key gap in the literature, as previous studies (cf. Tate et al., 2015) have not reported these associations stratified by gender identity. To conserve space, we report our findings in Table SF57 in Section 4.7 of the Supplemental Files.

4.2. Exploratory Factor Analysis

We used EFA to develop the MGSI. EFA allows us to uncover the underlying structure of the gender and sexuality constructs by identifying latent dimensions that explain the relationships among the survey items, ensuring that the resulting inventory reflects the complexity and multidimensionality of gender and sexuality in an evidence-based manner. We follow Williams et al. (2010) and the recommendations of Goretzko et al. (2021) to set up the following five-step protocol for developing the MGSI.

Step 1: Suitability of data for factor analysis

We began by conducting several preliminary tests to ensure that the collected data was suitable for the EFA. First, we verified that the Sample (N) to Variable (p) ratio (N:p ratio) was adequate (Hogarty et al., 2005). Although recommendations vary, gathering a minimum of ten observations per survey item is

generally advised (Turker, 2009). Our survey included 153 items on the five dimensions, 24 supplementary items, and 11 demo- graphic items, with responses from 1,305 participants, thus comfortably surpassing the recommended N:p ratio.

Second, we assessed the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy and Bartlett's Test of Sphericity to confirm the suitability of our data for factor analysis, as recommended by Williams et al. (2010). While the KMO index is particularly useful when the ratio of cases to variables is less than 1:5, we still calculated it as part of our data evaluation. The KMO index ranges from 0 to 1, with values above 0.50 considered the minimum acceptable threshold for factor analysis. Additionally, Bartlett's Test of Sphericity must yield a significant result ($p < 0.05$) to justify proceeding with factor analysis. Our pre-analysis results indicate that our data is well-suited for EFA, with an overall KMO value of 0.936 and a significant Bartlett Test of Sphericity (Shrestha, 2021).

Step 2: Factor extraction

Goretzko et al.'s (2021) review of studies containing EFA shows that Principal Axis Fac- toring (PAF) and Maximum Likelihood (ML) are the methods most and second most frequently used, respectively. Fabrigar et al. (1999) argue that ML estimation should be preferred over other factor extraction methods, such as PCA or PAF, due to the numerous fit indices available for ML. We therefore chose ML for our EFA.

Step 3: Number of factors

To determine the number of factors, Fabrigar et al. (1999) and Goretzko et al. (2021) recommend using different criteria, such as Parallel Analysis (PA), which in our case results in 13 factors, and the Empirical Kaiser Criterion (EKC), which results in 18. In Figure 1, we show the three metrics relevant to determining the number of factors based on these two criteria.

The first metric are the eigenvalues of the data, represented by the blue solid line. These eigenvalues are derived from the actual dataset and reflect the amount of variance ex- plained by each factor, with the factor number on the x-axis.

The second metric is the EKC, represented by the black dotted line. The EKC suggests that factors with eigenvalues greater than or equal to 1 are significant and should be retained. The third metric is the PA, represented by the red dashed line, illustrating the eigenvalues of simulated data across the number of factors. Figure 1 shows that the blue line remains above the red line up to Factor 13. To verify the differences, we present a hierarchical reduction in the number of factors, starting with 18 (EKC) and progressing to 13 factors (PA) in SF section 5.2.

We next identified the variance proportions and cumulative variance for each factor, which we present in Table 2. The VAR column shows the proportion of total variance explained by each factor and the CUM column reflects the cumulative amount of variance explained by the factors. The first five factors together account for 48.31% of the total variance, for example. After the initial factors, the contribution to the total variance becomes increasingly marginal, reaching 100% by Factor 101.

Table 2: Variance and Cumulative Variance for each Factor.

Factor	VAR	CUM
1	0.243	0.243
2	0.080	0.323
3	0.063	0.386
4	0.058	0.444
5	0.039	0.483
6	0.030	0.513
7	0.027	0.540
8	0.024	0.564
9	0.021	0.585
10	0.018	0.603
11	0.016	0.619
12	0.014	0.633
13	0.014	0.647
14	0.013	0.660
15	0.012	0.672
16	0.011	0.683
17	0.011	0.694
18	0.010	0.704
19	0.010	0.714
20	0.009	0.723
...	...	...
101	0.000	1.000

Step 4: Rotational method

When it comes to the various rotation methods, Fabrigar et al. (1999) recommend oblique procedures, since these can lead to uncorrelated and correlated factors, whereas orthogonal methods enforce an uncorrelated factor solution. Goretzko et al. (2021) note that the majority of reported EFAs utilized oblique rotation methods. In the correlation matrix in Table SF58 in the Supplemental Files, we identified the inter-correlations of the variables in our dataset. Since factor inter-correlations are expected in this dataset, we chose oblique rotation (specifically oblimin) for factor extraction. This allows for the possibility that the underlying factors may be correlated, which better aligns with the data structure compared to an orthogonal method.

Step 5: Interpretation of factors

In the process of interpreting factor loadings, two critical methodological issues require careful consideration: 1) The number of items representing a latent factor, and 2) whether items load highly on more than one factor. Fabrigar et al. (1999) suggest that no less than four items should represent each latent construct, with acceptable reliabilities (>.70) for each. Like Howard (2016), we follow the suggested .40–.30–.20 rule. This rule recom- mends that satisfactory items (i) load onto their primary factor above .40, (ii) load onto alternative factors below .30, and (iii) exhibit a difference of .20 between their primary and alternative factor loadings.

Primary Loadings: A closer examination in Table SF78 revealed that Factor 13 was supported by only two instead of the required four items exceeding the threshold of .40. Factor 13 thus did not meet the minimum criteria. By refining the model to 12 factors, we re-checked whether the retained factors were supported by sufficient items, providing a more stable and methodologically sound solution. Based on the suggested factor loadings for the EFA reported in Table SF87, we classified the items of the 12 latent factors by verifying whether their loadings exceeded .40. For the MIQ items, MIQ1, which captures satisfaction with one's gender, loaded onto Factor 4. MIQ4 and MIQ5, which capture perceptions of one's gender as male, loaded onto Factor 3. MIQ6 and MIQ7, which capture identification with both genders, and MIQ9 and MIQ10, which captu with sex, did not meet the .40 threshold for any factor.

The TCS items followed a similar pattern. TCS1–TCS5, which capture satisfaction with appearance, loaded onto Factor 4, like MIQ1.

All OSRI items, assessing masculine and feminine traits, fell short of the .40 threshold. The SOQ items displayed a more diverse loading pattern. SOQ1c–2c, which capture ro- mantic attraction to women, loaded onto Factor 3. SOQ1b, SOQ1d–e, SOQ3a–b and SOQ3d–e, which capture romantic/sexual involvement with men and non-cisgender indi- viduals, loaded onto Factor 5. SOQ2b and SOQ2d–e, which capture sexual attraction to non-cisgender individuals, loaded onto Factor 10.

The MSPD items revealed a clear structure. MSPD10a–j, which capture personal experi- ences of discrimination, loaded onto Factor 1. MSPD1a–MSPD9a, which capture percep- tions of discrimination against men, loaded onto Factor 2. MSPD1b–5b and MSPD7b, which capture discrimination against women, aligned with Factor 8. MSPD1c–e, MSPD2c– e, MSPD3c–e, MSPD5d–e and MSPD7e, which capture discrimination against non-cisgender individuals, loaded onto Factor 6. MSPD8c–e, which capture discrimination against non- cisgender individuals, loaded onto Factor 7, and MSPD9c–e, which capture discrimination against non-cisgender individuals, loaded onto Factor 9. These findings suggest that the factors represent interconnected facets of the broader construct of discrimination, encom- passing both personal experiences and perceptions of bias against specific demographic groups.

Overall, the factor loadings reveal several patterns that informed our development of the MGSI. MIQ1, which assesses satisfaction with personal gender, aligns with TCS1 through TCS5, measuring satisfaction with appearance, all loading onto Factor 4. Conversely, MIQ4 and MIQ5, focusing on the perception of one's gender as male, load onto Factor 3. The SOQ items demonstrate a complex loading pattern, reflecting multiple constructs: romantic and sexual attraction to men and non-cisgender individuals (Factor 5), non-cisgender individuals (Factor 10) and women (Factor 3). This complexity suggests various dimensions of romantic and sexual attraction across different genders.

The MSPD items, addressing perceptions of discrimination, load onto several factors, highlighting a broad range of constructs: discrimination against men (Factor 2), against women (Factor 8), and against non-cisgender individuals (Factors 6, 9, 11 and 12), with personal experiences of discrimination loading onto Factor 1.

The 12 identified factors provide a structured framework for developing the MGSI, allow- ing it to capture a wide range of constructs, including personal satisfaction with gender, perceptions of own gender as male or female, romantic and sexual attractions, and dif- ferent forms of discrimination. By incorporating these diverse factors, the MGSI can effectively differentiate and assess distinct aspects of gender and sexuality.

Cross-loadings: Following the screening of the primary loadings, we checked the cross- loadings, as suggested by Howard (2016). We addressed the cross-loadings by examining whether items load on multiple factors with loadings greater than .30, and whether the difference between the primary and secondary loadings was less or greater than .20, fol- lowing the .40–.30–.20 rule. If the distance was below the threshold, we flagged the item and excluded it from the analysis. In Table SF87, we can see that items with distances of less than .20 were MSPD4b ("Women suffer from discrimination in the health sphere."), MSPD6b ("Women suffer from discrimination by some private institutions (e.g., banks, insurance companies, etc."), MSPD8b ("Even when people seem to accept women, I think that, deep down, they have some misgivings."), and MSPD9b ("Even though there is no express rejection, people treat women differently"). As a result, we did not include these items in the MGSI (see Table 3).

Table SF97, which reports the factor loadings of all items in our dataset including the supplementary items, shows that the loadings of MSPD6b, MSPD8b and MSPD9b exceed

.40 on two factors, but do not exhibit a difference of .20 between their loadings. This consistent pattern across both tables demonstrates that the inclusion or exclusion of supplementary items results in cross-loadings for the same items, except for MSPD4b, which exhibits cross-loadings only in Table SF97.

Effect of including the supplementary items: When we included the supplementary items, we obtained larger, more comprehensive factors, which implied an altered prioritization and a renumbering of the factors. We report on the effect of the summary items in more detail in Section 5.5. Specifically, when EFAs were conducted with and without the supplementary items, the resulting factor structures were highly comparable, yielding the same number of factors and only minimal differences in loadings across the two versions of the scale. The inclusion of supplementary items did not enhance the interpretability or clarity of the factors, and items from the original inventories that already demonstrated weaker loadings, such as those from the OSRI and MIQ, remained unaffected. This pat- tern suggests that the psychometric limitations of these items could not be mitigated by the addition of supplementary content. Overall, the findings indicate that the supplementary items did not contribute substantive value to the factor structure, either by improving its stability or by addressing weaknesses in particular constructs. Given that the supplementary items were not part of the origin inventories and offered no psychometric advantage, they were excluded from the full MGSI in favor of a more parsimonious and theoretically coherent solution.

5. The Multidimensional Gender and Sexuality Inven- tory (MGSI)

5.1. Constructing the MGSI with Factor Extraction and The- matic Grouping

The crucial question we aimed to answer was how to capture the most relevant dimensions that form an individual's gender and sexuality. After completing our five-step procedure, we ended up with 12 factors, consisting of several items each. These represent the full version of the MGSI.

Table 3 below presents all MGSI items, including a comprehensive breakdown of the individual items associated with each of the 12 factors. Each factor references a distinct origin inventory of the MGSI (except for Factor 3, which comprises items referencing the MIQ and the SOQ, and Factor 4, which comprises items referencing the MIQ and the TCS). The factors are numbered according to their order of extraction, which is determined by the amount of variance they each explain. Factor 1 accounts for the greatest portion of the total variance in the data, followed by Factor 2, Factor 3, and so on.

Table 3: Full MGSI – 12 Factors.

Code	Items of respective Factors
Factor 1 MSPD10a MSPD10b MSPD10c MSPD10d MSPD10e MSPD10f MSPD10g MSPD10h MSPD10i MSPD10j	I have felt personally rejected for being a [gender]. I have been treated unfairly for being a [gender].
	I have been discriminated at work for being a [gender].
	I have been discriminated in the health sphere for being a [gender]. I have been discriminated in the legal sphere for being a [gender].
	I have been rejected in my daily social relations for being a [gender].
	I have been the target of discriminatory actions by some private institutions (e.g., banks, insurance companies, etc.) for being a [gender].
	Even when people seem to accept me, deep down, I think they have some misgivings because I am a [gender].
	Even though there is no express rejection, people treat me differently when they see I am a [gender].
	I feel that people mistrust me for being a [gender].
Factor 2	
MSPD1a MSPD2a MSPD3a MSPD4a MSPD5a MSPD6a	In society, men are visibly rejected. Society treats men unfairly.
	Men suffer from occupational discrimination.
MSPD7a MSPD8a	Men suffer from discrimination in the health sphere. Men suffer from rejection in their daily social relations.
MSPD9a	Men suffer from discrimination by some private institutions (e.g., banks, insurance companies, etc.).
	Society mistrusts men.
	Even when people seem to accept men, I think that, deep down, they have some misgivings.
	Even though there is no express rejection, people treat men differently.
Factor 3	
MIQ4	In the past 12 months, have you worn the clothes typically associated with males, such as pants or suits?
MIQ5 SOQ1c	In the past 12 months, have you felt more like a man than like a woman?
	In the past 12 months, has/have your romantic relationship(s) been with women?
SOQ2c	In the past 12 months, when you felt sexually attracted, was this to women?
Factor 4 MIQ1 TCS1 TCS2 TCS3 TCS4	
TCS5	In the past 12 months, have you felt satisfied being a [gender]? My outward appearance represents my gender identity.
	I am happy with the way my appearance expresses my gender identity. I feel that my mind and body are consistent with one another.
	I am happy that I have the gender identity that I do.
	I have accepted my gender identity.

Table 3: Full MGSI – 12 Factors (continued).

Code	Items of respective Factors
Factor 5	
SOQ1b SOQ1d SOQ1e	In the past 12 months, has/have your romantic relationship(s) been with transmen?
SOQ3a SOQ3b SOQ3d	In the past 12 months, has/have your romantic relationship(s) been with transwomen?
SOQ3e	In the past 12 months, has/have your romantic relationship(s) been with non-binary individuals?
	In the past 12 months, when you had sex, was it with men?
	In the past 12 months, when you had sex, was it with transmen?
	In the past 12 months, when you had sex, was it with transwomen?
	In the past 12 months, when you had sex, was it with non-binary individuals?
Factor 6 MSPD1c MSPD1d MSPD1e MSPD2c MSPD2d MSPD2e MSPD3d MSPD3e MSPD5d MSPD5e	
MSPD7e	In society, transwomen are visibly rejected. In society, transmen are visibly rejected.
	In society, non-binary individuals are visibly rejected. Society treats transwomen unfairly.
	Society treats transmen unfairly.
	Society treats non-binary individuals unfairly. Transmen suffer from occupational discrimination.
	Non-binary individuals suffer from occupational discrimination. Transmen suffer from rejection in their daily social relations.
	Non-binary individuals suffer from rejection in their daily social relations.
	Society mistrusts non-binary individuals.
Factor 7	
MSPD8c MSPD8d	Even when people seem to accept transwomen, I think that, deep down, they have some misgivings.
MSPD8e	Even when people seem to accept transmen, I think that, deep down, have some misgivings.
	Even when people seem to accept non-binary individuals, I think that,
	deep down, they have some misgivings.
Factor 8 MSPD1b MSPD2b MSPD3b MSPD5b	
MSPD7b	In society, women are visibly rejected. Society treats women unfairly.
	Women suffer from occupational discrimination.
	Women suffer from rejection in their daily social relations. Society mistrusts women.
Factor 9	
MSPD9c MSPD9d	Even though there is no express rejection, people treat transwomen differently.
MSPD9e	Even though there is no express rejection, people treat transmen differently.
	Even though there is no express rejection, people treat non-binary
	individuals differently.

Table 3: Full MGSI – 12 Factors (continued).

Code	Items of respective Factors
Factor 10	
SOQ2b	In the past 12 months, when you felt sexually attracted, was this to transmen?
SOQ2d SOQ2e	In the past 12 months, when you felt sexually attracted, was this to transwomen?
	In the past 12 months, when you felt sexually attracted, was this
	to non-binary individuals?
Factor 11	
MSPD6c	Transwomen suffer from discrimination by some private institutions (e.g., banks, insurance companies, etc.).
MSPD6d MSPD6e	Transmen suffer from discrimination by some private institutions (e.g., banks, insurance companies, etc.).
	Non-binary individuals suffer from discrimination by some private
	institutions (e.g., banks, insurance companies, etc.).
Factor 12 MSPD4c MSPD4d	
MSPD4e	Transwomen suffer from discrimination in the health sphere. Transmen suffer from discrimination in the health sphere.
	Non-binary individuals suffer from discrimination in the health sphere.

Note. The answer options for all questions are: Always, Very often, Often, Quite Often, Some- times, Occasionally, Rarely, Very rarely, Almost never, Never, Does not apply.

5.2. Practical Implementation from Full Scale to Streamlined Use

If an unlimited number of participants with ample time would be available for a study interested in the broad dimensions of gender identity and sexuality, the ideal approach would be to have respondents complete all items across the 12 factors identified in the EFA. However, very often, researchers are interested only in specific aspects, such as in gender-based discrimination. Thus, we propose a streamlined approach to ensure a more practical and efficient usage.

As Table 3 makes clear, many of the identified factors are conceptually related, measuring similar aspects of gender and sexuality. The names of the factors are also a guide, based on our own screening of the items within each factor, the overall context and common themes that the factors address. Thus, we grouped the 12 factors into three overarching dimensions: 1) Own Gender, 2) Discrimination, and 3) Romantic and Sexual Attraction and Activities.

If researchers, for example, wish to focus on a single question related to “Own Gender”, then they should select the factor with the greatest explanatory power, i.e., the factor with the lowest number in the dimension “Own Gender”, which would be Factor 3. Researchers can utilize these questions based on the relevant dimension(s) their studies focus on, such as specific aspects of gender, experiences of discrimination, or patterns of romantic and sexual behaviors. Our categorization is intended to aid targeted exploration and analysis in future research.

Still, the number of questions within a factor are often high – Factor 1 alone comprises 10 items. As study respondents often have limited time to complete surveys and research budgets are tight, we propose a more compact way of using the MGSI. This proposal is to assess each factor using a single, carefully formulated question that captures its core concept, instead of including all items of a factor. This is possible because, upon closer inspection, many items within a factor are found to be similar and/or overlap. We thus condense the items into a single summary item for each factor. The only exception is Factor 3, for which we derive two condensed items, since it has items referencing both personal gender identity and sexual attraction. Table 4 presents the resulting short-form version of the MGSI.

Table 4: Short-form MGSI – 12 Factors.

Code	Items of respective Factors
1. Own Gender	
Factor 3. Perception and expression of own gender as male and sexual attraction to women	
SUMM1	In the past 12 months, how often have you felt and dressed more like a man than a woman?
SUMM2	In the past 12 months, was your sexual attraction primarily toward women?
Factor 4. Satisfaction with personal gender identity	
SUMM3	Do you feel satisfied with your personal gender identity and appearance?
2. Discrimination	
Factor 1. Personal discrimination experience	
SUMM4	Do you feel discriminated against or treated differently because of your gender?
Factor 2. Perception of discrimination against men	
SUMM5	How fairly do you think men are treated in society and in areas such as work, health, and private institutions?
Factor 6. Perception of discrimination against non-cisgender individuals in society	
SUMM6	How fairly do you think non-cisgender individuals are treated in society?
Factor 7. Perception of visible rejection of non-cisgender individuals	
SUMM7	Do you think that transwomen, transmen, and non-binary individuals face visible rejection?
Factor 8. Perception of discrimination against women	
SUMM8	How fairly do you think women are treated in society and in areas such as work, health, and private institutions?
Factor 9. Perception of discriminatory treatment of non-cisgender individuals in general	
SUMM9	Do you think that, even without explicit rejection, people still treat transwomen, transmen, and non-binary individuals differently?
Factor 11. Perception of discrimination against non-cisgender individuals by private institutions	
SUMM10	Do you think that transwomen, transmen, and non-binary individuals face discrimination from private institutions, such as banks or insurance companies?
Factor 12. Perception of discrimination against non-cisgender individuals in the health sphere	
SUMM11	How fairly do you think non-cisgender individuals are treated in the health sphere?
3. Romantic and Sexual Attraction and Activities	
Factor 5. Extent of romantic and sexual activities with men and non-cisgender individuals	
SUMM12	In the past 12 months, have you engaged in a sexual activity with a man, transman, transwoman or non-binary individual?
Factor 10. Extent of sexual attraction towards non-cisgender individuals	
SUMM13	In the past 12 months, have you felt sexually attracted to a transman, transwoman, or non-binary individual?

Note. The answer options for all questions are: Always, Very often, Often, Quite Often, Some- times, Occasionally, Rarely, Very rarely, Almost never, Never, Does not apply.

We began with 153 questions, derived from five inventories, and, through a rigorous refinement process informed by the latest statistical methodology, distilled them into 12 factors consisting of 67 items. These were further condensed into 13 key questions spanning three main dimensions, capturing the essential components of gender identity and sexuality as measured by the MGSI. Note that we report extensive robustness checks for this process in Section 6 in the Supplementary Files.

For the practical application of the MGSI, we propose the following approach:

- Comprehensive Assessment: If time and budget allow, include all 67 questions across all dimensions for a full evaluation.
- Time- and Budget-Constrained Studies: Use the short-form MGSI.
- Targeted Research: For studies focusing on specific aspects, researchers may
  a) use all questions within a relevant dimension, or b) select the highest-loading factor within a relevant dimension.

These options highlight the MGSI's flexibility, allowing researchers to adapt its use to different study designs and constraints. The MGSI's adaptability, combined with its ability to assess gender identities and sexual orientations comprehensively while remaining practical and scalable, represents one of its key strengths.

6. Discussion

This study responds to the urgent need for more inclusive, intersectional survey tools by introducing the MGSI, a tool that captures the complexity of gender identity and ex- pression in many contemporary societies. In doing so, it directly supports the SDG 10, which emphasizes reducing inequalities and promoting the inclusion of all, irrespective of gender, identity, or background. One of the core challenges in achieving SDG 10 lies in the invisibility and misrepresentation of marginalized populations within existing data infrastructures. Traditional gender measures—rooted in binary classifications and often conflated with sex—systematically exclude or misclassify non-binary, genderqueer, trans- gender, and gender-nonconforming individuals. Without accurate data, policies aimed at reducing inequality cannot adequately address the specific barriers faced by these popu- lations.

This study developed the MGSI to address the pressing need for inclusive, empirically grounded tools that capture the complexity of gender and sexuality in contemporary populations. By synthesizing and expanding validated instruments—including the MIQ, TCS, OSRI, MSPD, and SOQ—the MGSI bridges a longstanding gap between evolving gender theory and empirical measurement. Moreover, by capturing dimensions such as gender identity, external expression and discrimination, the MGSI enables intersectional analyses that are essential for identifying compounding forms of exclusion.

The EFA revealed twelve robust dimensions reflecting key components of *gender identity*, *presentation congruence*, *pressure to conform*, *sexual orientation*, and *perceived discrimi- nation*. This multifaceted structure provides empirical support for Tate's BIRDS frame- work, which conceptualizes gender through five distinct but interrelated components: Biology, Identity, Roles, Display, and Sentiments. The MGSI's factor structure aligns well with these dimensions, offering an attempt at operationalizing the BIRDS model:

- **Biology**: The MGSI does not conflate gender and sex. It follows the BIRDS model that sees *Biology* as one part of the gender experience and surveys the respondent's sex separately in the demographics section.
- **Identity** and **Display**: The MGSI factors capture internal gender satisfaction and external appearance congruence. *Identity* refers to an individual's internal sense of gender, while *Display* refers to how gender is externally expressed. The strong loading of items related to both internal identification and outward presentation on a shared factor supports theories of gender congruence (Kozee et al., 2012), which emphasize the psychological significance of alignment between self-concept and external gender presentation.
- **Roles**: The MCSI factors measure societal and internal pressure to conform to traditional gender expectations, thus mapping onto the *Roles* component. This re- flects how individuals perceive and navigate socially constructed norms associated with their gender, which can be particularly constraining for those whose identities fall outside binary classifications. Notably, however, the OSRI items intended to measure gender roles did not load significantly onto the MGSI factors. The lack of strong factor loadings for the OSRI items suggests that, as currently measured, gender roles may not be a central component of the MGSI's conceptualization. However, this does not necessarily imply that gender roles are unimportant to gen- dered experience—rather, it may reflect a divergence in how these constructs are operationalized or experienced across populations.
- **Sentiments**: The MGSI factors measuring discrimination, which capture the emo- tional and social responses individuals encounter based on their gender, are part of the *Sentiments* component. These factors comprise the affective and societal feed- back mechanisms that shape lived gendered experiences, particularly for marginal- ized groups. Perceived discrimination emerged as a distinct factor in the MGSI, re- flecting the specific challenges faced by individuals. Also, we determined additional factors reflecting the salience of discrimination especially for those who identify as non-cisgender.

While our tool builds on five existing scales, the MGSI advances the field by integrating them into a modular, practical structure. This enables both fine-grained analysis and flexible applications across domains. Such tools are essential for evaluating inequities in health, education, employment, and finance—thus supporting data-informed policies that promote social inclusion. We emphasize that the MGSI rests on foundational contribu- tions from prior inventories. We strongly encourage future users to cite Jacobson and Joel (2018), Kozee et al. (2012), Molero et al. (2013), and De Roover and Vermunt (2019), whose work enabled this integrated measure.

7. Limitations and Future Directions

Despite the robustness of the factor structure, we wish to acknowledge several limitations. First, while the sample size exceeded the recommended participant-to-item ratio, our specific sample may only partially represent the diversity of genders and experiences across different cultural or socio-economic contexts, since we sampled U.S. participants only. Future research could expand the sample to include more diverse populations to enhance the generalizability of the findings beyond the U.S., especially if political pressures obstruct gender and sexuality research there in the near-term future.

Second, the reliance on self-reported measures introduces the potential for social desir- ability bias, particularly in items assessing sensitive topics like sexual attraction and ex- periences of discrimination. However, self-reporting remains the most direct and reliable method for capturing personal and internal experiences of gender identity and sexuality, as these aspects are inherently subjective and can only be accurately understood from the individual's perspective. Nevertheless, we advise that researchers do their best to mitigate such biased responses, by for example very transparently ensuring anonymity of the collected data.

Third, we retained several factors composed of only three items—slightly below the four- item guideline recommended by Fabrigar et al. (1999). While one item falls below the.70 loading threshold suggested by Jolliffe and Cadima (2016), the remaining items show adequate loadings. In addition, the absence of cross-loadings and the strong conceptual alignment among the items provide support for their inclusion. Nevertheless, future re- search may consider expanding these factors to further examine their stability and improve measurement precision.

Fourth, our capacity to study identities is constrained by the fact that we cannot fully understand how identities transform and develop over time. The dynamic nature of identity, shaped by personal experiences, social contexts, and cultural influences, makes it challenging to capture their full complexity. Without the ability to track and comprehend the nuances of these dynamic changes, our study of gender remains limited.

Finally, while our use of EFA offers a robust foundation for identifying the underlying structure of the MGSI, future studies could employ confirmatory factor analysis (CFA) to further examine the scale's validity and reliability across different populations and contexts.

Overall, the MGSI constitutes a fundamentally novel tool for researchers, offering a de- tailed and customizable way to capture gender, sexual attraction, and experiences of discrimination. Breaking down these complex constructs into specific dimensions allows researchers to gain more precise and meaningful insights, advances gender-related studies across disciplines, and paves the way for more inclusive and comprehensive research.

Declarations

Ethical Statement

Ethical approval for this study was granted by the University of Graz Ethics Committee (decision dated 15 April 2024; confirmation letter issued 16 May 2024; approval number: 39/79/63), prior to the start of data collection. Ethics approval from the University of Exeter was obtained (approval number: 6502314, approval date: 07/06/2024) to formally acknowledge the study within the local institutional framework. All research was performed in accordance with the relevant institutional and national guidelines and regulations applicable when human participants are involved.

Informed Consent

Since data collection took place through the University of Graz, informed written consent was obtained in accordance with this approval and obtained from all participants at the very beginning of the study. In the consent form, which can be found as part of the instructions (see pages 1-3 in the MGSI_Survey.zip at https://osf.io/wr5cz/?view_only=589a8ee81e164a2ea5ab32e3b9255ed2), participants were informed about the nature and purpose of the research, the voluntary basis of their participation, their right to withdraw at any time, and the measures taken to protect confidentiality. Importantly, participants gave consent for their anonymized data to be used for the purpose of this research and, after a paper is published, to be shared as part of a replication package. Depending on when an individual participated, their consent was obtained between April 30, 2024, and May 7, 2024.

Conflicts of Interest

The author(s) declare that there were no conflicts of interest with respect to the authorship or the publication of this article. *The author(s) will be revealed after the anonymous review process.*

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Materials

All data, analysis code, and materials for our study are accessible at

https://osf.io/wr5cz/?view_only=589a8ee81e164a2ea5ab32e3b9255ed2.

Artificial Intelligence

In preparing this manuscript, we utilized Grammarly to identify and correct any typos and grammatical errors. Furthermore, we employed ChatGPT to improve the manuscript's readability. We take full responsibility for the content, which reflects our original ideas and research findings. We adhered to SAGE's policies regarding the use of generative artificial intelligence and are disclosing this usage to uphold transparency in our research process.

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Figures

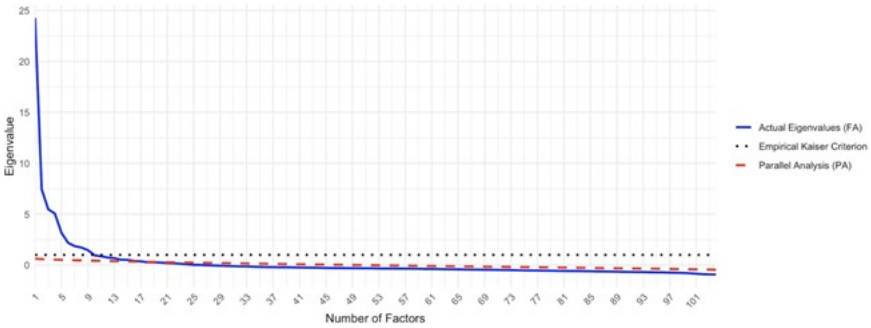


Figure 1

Factor extraction.

Supplementary Files

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- SupplementaryFile.pdf