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Complete List of Authors:	Aldridge, Zoe; Institute of Mental Health, Faculty of Medicine & Health Sciences; Loughborough University, School of Sport, Exercise and Health Sciences Patel, Shireen; Institute of Mental Health, Faculty of Medicine & Health Sciences Guo, Boliang; Institute of Mental Health, Faculty of Medicine & Health Sciences Nixon, Elena; Institute of Mental Health, Faculty of Medicine & Health Sciences Bouman, Walter Pierre; Institute of Mental Health, Faculty of Medicine & Health Sciences; Nottingham National Centre for Transgender Health, Witcomb, Gemma; Loughborough University, School of Sport, Exercise and Health Sciences Arcelus, Jon; Institute of Mental Health, Faculty of Medicine & Health Sciences; Nottingham National Centre for Transgender Health,
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Long term effect of gender affirming hormone treatment on depression and anxiety symptoms in transgender people: A prospective cohort study.

Zoë Aldridge[1], Shireen Patel[1], Boliang Guo[1], Elena Nixon[1], Walter Pierre Bouman[1,2], Gemma L. Witcomb[3], and Jon Arcelus[1,2].

[1]Institute of Mental Health, Faculty of Medicine and Health Sciences, University of Nottingham, Nottingham, United Kingdom.

[2]Nottingham Centre for Transgender Health, Nottingham, United Kingdom.

[3]School of Sport, Exercise and Health Sciences, Loughborough University, Loughborough, United Kingdom.

Short title: Effect of hormones in trans people's mental health

Correspondence: Professor Jon Arcelus. Institute of Mental Health, Jubilee Campus, Triumph Road, University of Nottingham, Nottingham, NG7 2TU, UK.

Email: Jon.Arcelus@nottingham.ac.uk. Tel: 44 (0) 115 82 30417

Jon Arcelus. ORCID iD. https://orcid.org/0000-0002-3805-0180.

Abstract

Background

Cross-sectional studies show that transgender people are more likely than cisgender people to experience depression and anxiety before Gender Affirming Hormone Treatment (GAHT). However, the effect of GAHT on mental health in transgender people, and the role of other factors that may have a predictive effect, is poorly explored.

Objectives

Using a longitudinal methodology, this study investigated the effect of 18 months GAHT on depression and anxiety symptomatology and the predictors on mental health outcomes in a large population of transgender people.

Materials and Methods

Participants (n=178) completed a socio-demographic questionnaire, the Hospital Anxiety and Depression Scale (HADS), the Multidimensional Scale of Perceived Social Support (MSPSS) and the Autism Spectrum Quotient Short Version (AQ-short) at pre-assessment (T0) and at 18 months after initiation of GAHT (T1).

Results

From T0 to T1, symptomatology was significantly decreased for depression (P <0.001) and non-significantly reduced for anxiety (P=0.37). Scores on the MSPSS predicted reduction in depression, while scores on the AQ-short predicted reduction in anxiety.

Discussion

GAHT reduces symptoms of depression which are predicted by having higher levels of social support. Although anxiety symptoms also reduce the changes are not significant and high levels of anxiety still remain post GAHT.

Conclusions

These results highlight the important mental health benefits of GAHT. Support services (professional, third sector or peer-support) aiming at increasing social support for transgender individuals should be made available.

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Introduction

Treatment-seeking transgender people who are not on hormone treatment, have reported high levels of mental health problems, particularly anxiety, depression and self-harm, which are likely caused by a number of internal and external stressors [1-12]. Studies examining mental health in transgender people have primarily focused on individuals attending transgender health services and hence those who are likely to experience a higher level of distress about their assigned sex at birth. These studies have primarily looked cross-sectionally at levels of anxiety [7, 13, 14], depression [7, 15-17] and self-harm [18-20].

With regards to anxiety, several studies have demonstrated high levels in transgender people before Gender Affirming Hormone Treatment (GAHT) [21.22]. For example, Bouman et al. [13] found that levels of anxiety in transgender people were three times higher than those in a matched sample from the general population. This study also found that transgender males were more anxious than transgender females. Interestingly, the high scores on autistic traits found among this population have been suggested to be a product of the high levels of anxiety and low self-esteem often experienced by this group [15] and not autism per se [23]. However, a recent study has demonstrated stability in autistic traits following GAHT [24].

Similar to anxiety, high levels of depression have also been reported in transgender individuals, prior to GAHT [16, 18, 22]. Witcomb et al. [16] reported that transgender people prior to receiving GAHT had a four-fold increased risk of a probable depressive disorder compared to a matched control sample from the general population. Why this is the case is unclear, but social factors such as lack of general social support [9, 25-27], parental support [28], and peer support have been found to be associated with depressive symptoms among transgender people [29,30]. Experiences of transphobic discrimination are associated with increased odds of suffering with depression [31] independent of other types of discrimination, e.g., racism. This suggests that transgender people who are ethnic minorities are at even greater risk, due to the intersectional experience of discriminatory events. In addition, while unemployment increases the risk of depression in the general population [32] and transgender people have been found to have a higher unemployment rate than

cisgender people [33] – being in employment is associated with higher levels of experienced transphobia and fear of disclosing mental health problems in the transgender population [34, 35].

Another factor that has been associated with mental health problems in treatment-seeking transgender people is age. Younger transgender people report high levels of bullying [36] and very high levels of self-harm [19, 37], which have been associated with increased anxiety as well as effects on self-esteem, family relationships and social life, which all negatively influence mental wellbeing.

While these studies have provided valuable insight, the use of cross-sectional methodologies to examine the impact of the above factors, particularly the role of GAHT in mental health is limited. Therefore, it is critical to explore this on a within-subject basis using a longitudinal design. This is the most effective approach to show the effects of GAHT on mental health as it provides the opportunity to examine individuals prior to and during GAHT.

A small number of longitudinal studies that focus on the effect of GAHT on mental health do exist. Colizzi et al. [38] reported significant reductions in mental health symptoms after the initiation of GAHT with anxiety reducing from 50% to 17% and depression from 24% to 11%. Heylens et al. [39] also showed significant reductions in symptoms of anxiety and depression after the initiation of GAHT to the point where they resemble those of the general population. These studies are however not without limitations. Heylens et al.'s[39] study has a small sample size (n=57), while Colizzi et al.'s [38] study is limited by the lack of evaluation of factors that may have impacted on the mental health of their participants, such as social support. Both studies describe the need to replicate their findings. In contrast, Bränström and Pachankis [40] using the Swedish population register showed no significant association between the likelihood of accessing mental health treatment and time since initiation of GAHT. The limitation of their study includes primarily that accessing mental health services does not necessarily reflect actual mental health and there is little additional information about the type of mental health treatment received by their participants. These limitations mean that this study cannot provide reliable evidence regarding the role of GAHT

on the mental health symptoms of transgender people, and this information is vital in order to provide an evidence base of GAHT improving overall quality of life of transgender people.

While the available longitudinal studies have provided valuable evidence of the effect of GAHT on transgender people's mental health there is a requirement to replicate these studies addressing their limitations. With this in mind, the primary aim of this study is to examine the effect of GAHT on anxiety and depression symptoms. The study will focus on those who have been on treatment for over 18 months as this allows for enough time for GAHT to produce physical, bodily changes but before surgical procedures have taken place, which could bias the results. As some physical changes can be quicker in assigned females at birth than in assigned males at birth (e.g., voice change with testosterone) [2], which can affect mental health outcome following GAHT, the results of GAHT in anxiety and depression for both groups will be presented separately. It is hypothesized that an improvement in mental health will take place in those assigned male and female at birth following GAHT treatment. Unfortunately, due to the long waiting list for gender affirming surgical treatment in the United Kingdom (UK), it is unlikely that people will have undergone these interventions before this time. The secondary aim of this study is to examine pre-GAHT factors which may be predicting changes in anxiety and depression following GAHT. The predictors selected for this study are based on the literature and include ethnicity, age, assigned sex at birth, civil status, employment, social support, and autistic traits. This study hypothesised that symptoms of depression and anxiety would be significantly decreased after 18 months of GAHT.

Materials and Methods

Participants

Participants were invited to take part through a national transgender health service in Nottingham, UK. This service is part of the National Health Service (NHS) and offers assessment for suitability of GAHT as well as chest and genital reconstructive surgery. The service also offers GAHT and speech and language therapy. The service accepts referrals from people aged 17 and over who are seeking, or considering, medical transition.

Procedures

The sample consisted of individuals who attended an assessment at the transgender health service from November 2014 to March 2018, who agreed participation, and who were not on GAHT prior to the assessment. Prior to the clinical assessment every patient was invited to participate in the study. If agreed, they were invited to complete a baseline questionnaire pack (T0). The pack included a socio-demographics questionnaire (age, sex assigned at birth, gender identity, ethnicity, employment status, relationship status, and whether participants were taking cross-sex hormones and/or blockers pre-assessment - as a significant proportion young people are referred from the only existing child and adolescent transgender health services in the United Kingdom). Validated questionnaires regarding anxiety and depression (HADS), social support (MSPSS), and autistic traits (AQ-Short) were also included in the information pack. Data was only included if participants returned a signed consent form with the study questionnaires.

Participants who consented and returned T0 questionnaires were invited to complete a T1 questionnaire 18 months after commencing GAHT. The T1 questionnaire pack consisted of a HADS questionnaire. This allowed a comparison of changes in depression and anxiety symptoms before and after GAHT. Data was collected in October 2019. Except for the data analysis the study was primarily unfunded and set up in a busy clinic.

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Tools

The Hospital Anxiety and Depression Scale (HADS)[41]

The HADS is a 14-item self-report screening scale originally developed to indicate the possible presence of anxiety and depression states in medical nonpsychiatric outpatient clinics. The HADS consists of two subscales, HADS-Depression (HADS-D) and HADS- Anxiety (HADS-A). Each sub-scale has seven items that are rated on a 4-point Likert scale that ranges from 0-4 with some items reverse scored. A maximum total of 21 can be obtained on each sub-scale. A score of 0-7 on both scales implies a non-clinical range, whilst a score of 8-10 suggests the possible presence of a depressive or anxiety disorder. A score of 11 or higher suggests the probable presence of a depressive or anxiety disorder. Caseness of depression and anxiety has been suggested for scores above 8 [42]. The HADS has previously been used with transgender individuals [13, 43]. For depression (HADS-D) this gave a specificity of 0.7 and a sensitivity of 0.9. For anxiety (HADS-A) this gave a specificity of 0.78 and a sensitivity of 0.9. In this study, the Cronbach's alpha for depression was 0.76 and for anxiety 0.68.

The Multidimensional Scale of Perceived Social Support (MSPSS) [44]

The MSPSS is a 12-item self-report scale to record levels of social support from family, friends and significant others. The measure consists of three subscales to measure the three different types of support. Items are rated on a Likert scale that ranges from 1 ("very strongly agree") to 7 ("very strongly disagree"). To calculate subscale scores, items from each subscale are added together and divided by 4. A total score is calculated by adding together all 12 items and dividing by 12. The mean and total scores range from 1 to 7 with a higher score indicating a higher level of perceived social support. A mean total scale score ranging from 1 to 2.9 can be considered low support; a score of 3 to 5 can be considered moderate support and a score from 5.1 to 7 can be considered high support. The MSPSS has previously been used with transgender individuals [26, 45]. In this study, the Cronbach's alpha was 0.89.

Autism Spectrum Quotient Short Version (AQ-Short) [46]

The AQ-Short is a 28-item self-report questionnaire designed to measure autistic traits to give an indication of where the person lies on the continuum of the spectrum, ranging from

healthy to autistic [47]. It is a shortened version of the validated AQ-50 [48]. It consists of two higher order factors related to autistic traits, including numbers and patterns (which assesses the extent to which people are fascinated by numbers, dates, patterns and categories) and social behaviours. The AQ-short is a 4-point Likert scale ranging from "definitely agree" to "definitely disagree", with some items reverse scored. Total scores range between 28 and 112. The AQ-Short has previously been used with transgender populations [23, 24, 49]. Higher scores represent higher levels of autistic traits. Although not intended to be a diagnostic tool, a cut-off of ≥ 70 was found to have a sensitivity of 0.94 and specificity of 0.91 to discriminate between an autism sample and a community sample. Cronbach's alpha was 0.86.

Data analysis

Data analyses were performed using the Statistical Software Package Stata 16 [50]. Stata 16 was used to conduct power analysis. Only those participants not on GAHT at assessment (T0) were included in the regression analysis. All missingness were imputed using analytical model with 20 imputed datasets generated for each model. Paired sample t-tests were used to determine if there had been a significant change in the HADS-D and HADS-A subscales from T0 to T1. Multiple regression was conducted to explore ethnicity, employment status, relationship status, age, assigned sex, MSPSS, and AQ. The hypothesis regarding whether the specific factors were predictive of changes in anxiety and depression was tested via a moderator analysis, entering only the subscales found to be significant in the linear regressions, and a product of their combined centred scores. This was tested via a multiple regression. Bonferroni corrections were used to correct multiplicity issue if needed. Although data are not normally distributed Allison [51]) states that normality is the least important assumption of regression and since data met the assumptions for linearity, homoscedasticiy, and absence of multi-colinearity or extreme outliers, a multiple regression analyses was conducted. The socio-demographic categories were split into two distinct groups for each category as seen in Table 1. Assigned sex at birth instead of gender identity was used in the socio-demographics in view of the many different gendered identities described, as an analysis based on gender identities would have made the analyses too complex to interpret; this followed previous studies approaches [23, 24]. The MSPSS and AQ-28 Short at T0 were significant factors predicting change in HADS-D and HADS-A at T1.

To check the robustness of regression estimates sensitive to missingness, all regression models were re-run on observed only data and the results were examined against the results from imputed dataset.

Ethical approval for the study was received from the NHS Ethics Committee (14/EM/0092) and the Research and Development Department at Nottinghamshire Healthcare NHS Foundation Trust in line with Health Research Authority guidance [52], which included approval for individuals aged 17 and over to sign giving their consent without the need for additional parental consent.

Results

Socio-demographic characteristics of the participants

A total of 1,271 participants were assessed between November 2014 and March 2018, completed T0 questionnaires and agreed participation in the study. Seventy-one percent (N=906) could be included in the analysis as they had not received hormones prior to assessment. Of these, 178 (20%) went on to complete a T1 questionnaire after 18 months of GAHT, indicating a response rate of 20%.   Responders did not differ from non-responders in terms of either demographic characteristics or baseline AQ-Short scores, but they were significantly less anxious at baseline than non-responders (median 9 vs 8, p=0.001; z=3.225) (see Table 1).

The age range from the 178 participants that completed T0 and T1 questionnaires ranged from 17-79 years with a median age of 23 years. More than half of the participants (n=95; 53.3%) were assigned male sex at birth and 83 (46.7%) were assigned female sex at birth. The large majority of participants classified themselves as white (n=167; 94%), were single (n=120; 69%) and were in employment (n= 75; 41%) or students (n = 58; 32%). Participants who were assigned male sex at birth were more likely to be in employment compared to participants assigned female sex at birth (47% vs 33%) while more participants assigned female sex at birth were single at the time of assessment (78% vs 57%) and a higher percentage of participants assigned male sex at birth were divorced/separated (18% vs 2%) (see Table 1).

Please insert Table 1 around here

Anxiety and depression scores

The mean score for the total group for anxiety was 8.07 (sd 4.34). It was higher in those assigned female (8.69 (sd 4.32)) versus those assigned male at birth (7.54 (sd 4.31). The mean score for depression was 7.24 (sd 4.03), also higher in assigned females (7.48 (sd. 3.94)) than assigned males at birth (7.03 (sd. 4.11).

At T0 (before hormone treatment) 51.13% of participants scored 8 or over on the HADS-A subscale and in the case of the HADS-D subscale 47.75% of participants scored above 8 placing these participants within the categories of possible to probable presence of an anxiety or depression disorder. At T1 47.19% of participants scored 8 or above in the HADS-A subscale showing a reduction of 3.94% and in the HADS-D subscale 25.84% of people scored 8 or above showing a reduction of 21.91%.

Change in anxiety and depression scores between T0 and T1

There was a statistically significant reduction in mean scores of HADS- D from T0 to T1 (mean change difference -2.05, 95% CI, -2.72 - -1.38, p=0.00). This indicated a reduction in depression following 18 months of GAHT. There was also a reduction in the HADS-A score from T0 to T1, but this was not statistically significant (mean change difference -0.31, 95% CI, -0.97-0.36, p=0.37). The same findings (a significant reduction in HADS-D and a non-significant reduction in HADS-A) were found when comparing T0 and T1 according to sex assigned at birth (see Table 2).

Please insert Table 2 around here

Predictors of anxiety and depression change after hormone treatment

Two multiple regressions with seven predictor variables were conducted to explore the predictors of change, from T0 to T1, in scores on HADS-D and HADS-A. The predictors for each were; ethnicity, employment status, relationship status, assigned sex at birth, age. MSPSS and AQ short at T0 were used as independent variables for both regressions.

The results for the first regression showed that overall the model was significant (F(7,152)=2.09, p=0.04) and explained 8.8% (R^2=0.088) of the total variance in depression scores. The model also showed that mean MSPSS scores at T0 was the only significant predictor of HADS-D change between T0 and T1 (β=0.81, p=0.006). The second regression

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showed that overall the model was significant (F(7,152)=2.09, p=0.048) and explained 8.8% (R²=0.088) of the total variance in anxiety scores. The model also showed mean AQ short scores at T0 was a significant predictor of HADS-A change between T0 and T1 (β=-0.069, p=0.034). The findings suggest that only levels of social support (MSPSS scores) and autistic spectrum traits (AQ scores) were able to predict changes in anxiety and depression following 18 months of GAHT. Having higher levels of social support (higher scores of MSPSS) predicted a reduction in depression scores following 18 months of GAHT (p=0.006) and having lower levels of autistic spectrums traits (lower AQ scores) predicted a reduction of anxiety symptoms following 18 months of GAHT (p=0.03), although this reduction was statistically non significant (See Table 3).

Please insert Table 3 around here

Discussion

This prospective longitudinal study aimed to explore whether 18 months of GAHT reduces symptoms of anxiety and depression in transgender people, whilst addressing the limitations of previous studies, by recruiting a large sample of participants within the same setting. The study found a significant reduction in symptoms of depression in transgender individuals after 18 months of starting GAHT, with a more than one fifth decrease in the number of participants who scores reflected a possible or probable depressive disorder. A statistical reduction of anxiety was not found. While reductions in depression, and to a lesser extent anxiety, were seen, a significant proportion of participants still present, post-treatment, with a possible or probable depressive disorder (25.84%) or anxiety disorder (47.19%). Data from previous studies in the field was used to compare these findings with the general population [13, 16]. Acknowledging that direct comparison can not be made, our study showed that the levels of possible and probable anxiety and depressive disorder after GAHT was still significantly higher than those reported in the general population (4.5% for possible or probable depressive disorder [16] and 34.5% for possible or probable anxiety disorder [13]. Whether these elevated levels will reduce further (when a longer use of GAHT +/- surgical interventions) needs to be explored. Thus, future longitudinal studies would benefit from following people for longer in order to track the longer-term impact of interventions.

These findings do confirm, once again, the high levels of possible anxiety and depressive disorders before GAHT and the benefit that this treatment brings. It highlights the need to facilitate the expedited use of GAHT to aid the reduction of poor mental health symptoms in the transgender population, when possible and appropriate. This conclusion supports the literature which has called for longitudinal studies such as this to replicate the findings from cross-sectional studies [15, 16, 22, 25, 38, 45]. The large reduction in depression, comparing to anxiety, may indicate that GAHT targets the dysphoria that many people attending transgender health services present with, which is manifested as depression (rather than anxiety). The fact that many transgender people still feel anxious after GAHT may be due to the victimisation, discrimination, and social rejection experienced by the transgender population [3, 5, 10, 53]. Unfortunately for some, these experiences do not necessarily stop

after initiation of GAHT and in some cases they may increase. Clinical and community services should take these findings into consideration and increase the support offered even after gender affirming medical treatment is over.

Importantly, this study also highlights how levels of pre-treatment social support is predictive of reduced risk post-treatment, since higher levels of social support prior to receiving GAHT significantly predicts a greater reduction in depression symptoms after 18 months of receiving GAHT. This indicates the importance of increasing social support in transgender people.

The study also found that those with higher levels of Autistic Spectrum Condition (ASC) traits prior to the receipt of GAHT had lower reductions in anxiety symptoms. This could indicate that those with greater ASC traits have higher anxiety symptoms even after post-treatment, or that higher ASC traits are simply reflective of difficulties in social interactions, as a result of being anxious, grounded in an individual's gender identity status. These findings corroborate cross-sectional studies which have shown that interpersonal interactions can have an impact upon transgender people's psychological wellbeing [9, 15, 23, 25, 27]. However, these results need to be interpreted with caution due to the lack of validity of the AQ short in this population.

With social support (from families, friends or significant others) being highlighted as a factor in depression it is important to consider approaches to aiding in the building of social support networks for transgender people accessing transgender services. Such support does not necessarily need to be based in clinical settings, since online and offline peer support and the work of tertiary services are available, less stigmatising, and have demonstrated a positive impact [29, 30, 54]. Resources such as Peer Support Workers (PSWs) and online peer-to-peer support may be a valuable tool to provide social support for transgender individuals awaiting and receiving GAHT. Additional support is recommended in particular to those with higher levels of ASC traits due to the lower reductions in anxiety symptoms found in this population. However, PSWs need to be appropriately trained in order to reduce any potential risks related to managing their own stress as well as power imbalances within peer and professional relationship [30].

Regarding expedited access to GAHT, there are practical issues that must be considered. [55, 56, 57]. Many countries either lack clinical services specializing in transgender health care or have significant waiting lists to access these services (13, 58-60). These practical issues surrounding accessing treatment can lead to self-prescribing of GAHT, with 23% of individuals referred to transgender health clinics using GAHT prior to their first appointment, 70% of which was sourced online [61]. Self-prescribing without medical oversight presents its own risks, most notably a lack of specialized knowledge required to minimize health risks [61].

The issues surrounding access to GAHT may be compounded by how services are configured. The role of many mental health workers in transgender health services in the UK is seen as gatekeepers; focused on the assessment of transgender people with limited attention given to psychological support. A shift in roles from gatekeeping to tangible mental health support would allow for a partial addressing of the power imbalance between transgender people and mental health professionals. This would potentially allow for transgender people to feel more able to discuss issues without fear of rejection for treatment. This in turn would provide mental health professionals with the ability to focus more on supporting the mental health of those transgender people who need it. From the evidence provided by this study it appears that this would be most important for those with low levels of social support and those with autistic traits.

The strengths of this paper are the large sample and the naturalistic prospective longitudinal design within one transgender health service, which allows for within subject comparisons and so provides a highly valid insight into the impact of GAHT on depression and anxiety of treatment-seeking transgender people. It is important to add that this is a national NHS service, which offers gender affirming medical interventions and assessment free at the point of access to people from different geographical regions within the UK. This study is one of the few in the literature currently addressing the role of GAHT on mental health with such a methodology.

There are, however, limitations to the study. We must acknowledge that participants may downplay their symptoms of depression and anxiety pre- assessment, for fear of not being

treated. Consequently, participants may have attenuated their mental health symptoms due to concern of not being accepted for GAMT. This could indicate that the changes between T0 and T1 may be more significant than recorded. As the method of recruitment was through a transgender health clinic as part of the NHS the findings are only generalizable to treatment-seeking transgender individuals. A limitation may also be the response rate. Although this is low, it is in line with other clinical studies and it may be a reflection of the unfunded nature of the study. Another limitation is that the sample consisted of predominantly white participants, which may explain why ethnicity was not a predictive factor and the lack of control group where the intervention (GAHT) is not being offered (e.g., waiting list), but this will have its limitations too. A full randomised control study within this area will not be ethically possible. Studies using data from a clinical setting must also be aware of the context in which their data is being gathered.

In conclusion, this study shows that the mental health of transgender individuals improves following GAHT, particularly for those who reported high levels of social support prior to receiving GAHT. These results highlight the important mental health benefits of GAHT and emphasises and the need for interventions focused on developing social support for transgender individuals.

Declaration of Interest

The authors have no other conflicts of interest relevant to this article to disclose. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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Table 1.

Socio-demographic characteristics (n,%) and mean (SD) scores on HADS, MSPSS and AQ-short

Score of all responders assigned male and female at birth

	Responders n = 178 n %		Assigned male at birth (2) n = 95 n %		Assigned female at birth (1) n = 83 n %	
Age, median (range) years	23 (17-74)		28 (17-79)		21 (17-64)	
Ethnic origin n (%)						
White	167	(94)	92	(97)	75	(91)
Other	11	(6)	3	(3)	8	(9)
Not known	-	-	-	-	-	-
Employment status n (%)						
Employed (1)	75	(41)	45	(47)	28	(33)
Student (2)	58	(32)	20	(21)	37	(44)
Housewife/househusband(4)	-	-	-	-	-	-
Voluntary work (3)	7	(4)	5	(5)	2	(2)
Retired (6)	5	(3)	6	(6)	-	-
Disabled (5)	7	(5)	5	(5)	3	(3)
Unemployed (0)	26	(14)	14	(14)	12	(14)
Not known (9)	1	(1)	-	-	1	(1)
Civil status n (%)						
Single (1)	120	(69)	55	(57)	65	(78)
Married (2)	15	(7)	12	(12)	1	(1)
Civil partner (3)	5	(3)	-	-	5	(6)
In a relationship (7)	4	(3)	1	(1)	4	(4)
Divorced/separated (4)	20	(11)	18	(18)	2	(2)
Widowed (5)	2	(2)	2	(2)	1	(1)
Other (6)	-	-	-	-	-	-
Not known (9+Blanks)	12	(7)	7	(7)	5	(6)
HADS- D	7.24 (4.03)		7.03 (4.11)		7.48 (3.94)	
HADS-A	8.07 (4.34)		7.54 (4.31)		8.69 (4.32)	
MSPSS	4.85(1.29)		4.64(1.35)		5.1(1.16)	
AQ	64.77(11.86)		62.83(11.94)		66.97(11.44)	

Table 2. Means (SD) of HADS-D and HADS-A scores of responders at T0 and T1

	All responders			Assigned male at birth			Assigned female at birth		
	N	Mean (sd)	Mean change from T0 to T1 (95% CI),p-value	n	Mean (sd)	Mean change from T0 to T1 (95% CI),p-value	n	Mean (sd)	Mean change from T0 to T1 (95% CI),p-value
HADS-D									
T0	178	7.24 (4.03)	-2.05 (-2.72 – -1.38), P= 0.00	95	7.03 (4.11)	-1.91 (-2.80 – -1.01) p =0.00	83	7.48 (3.94)	-2.21 (-3.23 – -1.20) p = 0.00
T1	178	5.19 (3.73)		95	5.13 (3.92)		83	5.26 (3.52)	
HADS-A									
T0	178	8.07 (4.34)	-0.31 (-0.97 – 0.36), p =0.37	95	7.54 (4.31)	-1.16 (-1.50-0.39) p =0.25	83	8.69 (4.32)	-0.55 (-0.97 – 0.92) p=0.97
T1	178	7.77 (3.90)		95	6.98 (3.96)		83	8.66 (3.65)	

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Table 3. Predictive role of ethnicity, employment status, relationship status, assigned gender at birth, age, MSPSS and AQ short for change in HADS-D and HADS-A from T0 to T1.

HADS-D				HADS-A		
	Coef.	95% CI	p	Coef.	95% CI	P
Ethnicity (grouped as White and all other at T0)	-0.37	-3.19 – 2.45	0.794	-0.67	-3.62 – 2.28	0.652
Employment (grouped as unemployed and disabled and all other at T0)	-0.97	-2.75– 0.81	0.284	-0.51	-2.37–1.35	0.591
Relationship (grouped as single, widowed, divorced/separated and other at T0 and all other)	0.31	-1.82 – 2.43	0.776	-0.61	-2.83 – 1.62	0.590
Assigned sex at T0	0.36	-1.21– 1.93	0.651	-0.17	-1.81 – 1.47	0.841
Age at T0	0.06	-.0.50 – 0.61	0.843	-0.03	-0.08 – 0.03	0.409
Mean MSPSS at T0	0.81	0.24– 1.39	0.006	0.56	-0.04 – 1.16	0.065
Mean AQ short at T0	-0.04	-0.096 – 0.025	0.250	-0.07	-0.13 – -0.05	0.034
Constant	-1.93	-4.76 – 0.90	0.179	0.41	-2.34 – 3.16	0.787