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Research for Patient Benefit
Final Report Form

Project Title	Investigating Factors prEdictive of and associatEd with psychologicaL WELLbeing in Transgender People following Gender Affirming Treatment (GAT). (FEEL-WELL)
Reference Number	PB-PG-0817-20003
Contracting Organisation	Nottinghamshire Healthcare NHS Foundation Trust
Approved Duration	20
Current Duration	20
Contracted Start Date	01/06/2019
Contracted End Date	30/01/2021
Original Award	149,982.00
Current Award	149,982.00

Project Details

Grant Title: Investigating Factors prEdictive of and associatEd with psychologicaL WELLbeing in Transgender People following Gender Affirming Treatment (GAT). (FEEL-WELL)

Reference Number:	PB-PG-0817-20003	**Contracting Organisation:**	Nottinghamshire Healthcare NHS Foundation Trust
Approved Duration:	**20**	**Current Duration:**	**20**
Contracted Start Date:	01 June 2019	**Contracted End Date:**	30 January 2021
First Contracted Start Date:	**01 April 2019**	**Current Award:**	**149,982.00**
Original Award:	**149,982.00**		

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Research Team

Chief Investigator	Professor Jon Arcelus (Nottinghamshire Healthcare NHS Foundation Trust)

Joint Lead Applicant:	

Co-Investigators:	Dr Boliang Guo (University of Nottingham) Dr Elena Nixon (University of Nottingham) Mrs Maxine Clift (Nottinghamshire Healthcare NHS Foundation Trust) Professor Andrew Yip (University of Nottingham) Dr Walter Pierre Bouman (Nottinghamshire Healthcare NHS Foundation Trust) Mr Jamie Pallas (Gendered Intelligence Community Interest Company) Mr Jonathan Lee (Nottinghamshire Healthcare NHS Foundation Trust)

Selection List	Professor Jon Arcelus

Role in research	Co-ordinating the project

Selection List	Dr Boliang Guo

Role in research	Statistics

Selection List	Dr Elena Nixon

Role in research	Quantitative methodology

Selection List	Dr Walter Pierre Bouman

Role in research	Clinical input

Selection List	Mr Jamie Pallas

Role in research	PPI and links with Community

Selection List	Professor Andrew Yip

Role in research	Qualitative methodology

Selection List	Mr Jonathan Lee

Role in research	Finance

Involvement of NIHR Infrastructure

Please indicate which NIHR Infrastructure organisations were involved in your research.

Please describe the role of each organisation in your research
None of the above infrastructures have been involved in this project, a part from advise directly from RfPB NIHR

Changes to Research Team

Please outline any changes that have been made to the research team over the course of the research, including an explanation of why they were required.

Jamie Pallas left the team and he was substituted by Carla English, PPI representative and working in the same organisation as Jamie Pallas

Scientific Summary

Please provide a structured summary of your work.

Background: Transgender people are those whose gender identity does not match the sex assigned at birth based on their sexual characteristics. There is strong evidence of high levels of mental health problems and poor quality of life among transgender people before they start Gender affirming treatment (GAT), (cross-sex hormones therapy (CHT) and/or surgery). The role of GAT in mental health symptoms and whether those symptoms are predictors of treatment outcome is unknown. Factors that affect wellbeing post treatment have not been explored.

Aims and objective: To explore factors associated with and predictive of transgender people's psychological wellbeing following GAT.

Methods: The project have consisted in 3 studies. The first two studies focus on transgender people who initiated GAT 18 months previously using a quantitative longitudinal design to analyse already collected data longitudinally. The 3rd study focusses on people who initiated GAT more than 5 years ago using a qualitative methodology.

Key findings:

In the first study data from 178 trans Participants was analysed. The results showed that GAT reduced mental health symptomatology significantly for depression ($P < .001$) and non-significantly for anxiety ($P = .37$). Social support predicted reduction in depression.

For the second study data from 137 people was analysed. Results showed that mental health symptoms pre-treatment did not predict life satisfaction post treatment.

The qualitative studies identified six themes. These themes included; work and finance, the positive impact of transition, social support, experiences of media and social media, healthcare, and societal acceptance. Each of the themes identifies a factor which participants highlighted as impacting either positively or negatively on their wellbeing.

Output

The results have been presented in 2 International conferences (WPATH Virtual conference 2020, and EPATH 2021 conference), and National conferences (BAGIS virtual conference 2020). An article has been published in an open access journal (IF of 3.35) and the paper has been used for the development of the next edition of the Global guidelines for trans health (Standards of Care 8th Edition by the World Professional Association for Transgender Health). Two publications to be submitted. The team worked with Gendered Intelligence to develop documents from the results of the study.

Conclusions

1- Gender Affirming Hormone treatment reduces mental health symptoms, particularly Depression. This is the largest longitudinal study showing the evidence of hormone treatment in mental health.

2- levels of anxiety and depression pre-treatment do not predict life satisfaction post hormone treatment, however gender congruence in associated with life satisfaction- suggesting the importance of treatment and that mental health symptoms (anxiety or depression) should not be a barrier for treatment

3- The importance of education to health professionals on trans issues as this is important for wellbeing

4- The damage that social medial and negative media representation can do to the wellbeing of trans people.

Future Plans
- To explore the routes of anxiety post treatment more in depth and develop interventions of this.
- To explore the barrier for treatment and work towards reduction of waiting times in gender services (currently 3 years)

Keyword 1:	mental health

Keyword 2:	Trans health

Keyword 3:	Wellbeing

Keyword 4:	Depression

Keyword 5:	Anxiety

Keyword 6:	Gender affirming hormone treatment

Keyword 7:	

Keyword 8:	

Plain English Summary

Please provide a plain English summary of your research.

Aims and objective: To explore which factors are associated with transgender people's psychological wellbeing

Background: Transgender people are those whose gender identity does not match their sex assigned at birth based on their sexual characteristics. There is little information as to how hormones affect people's mental health symptoms and which factors are associated with wellbeing after hormone treatment.

Methods: The project consisted of 3 studies. The first two studies follow trans people on hormones for 18 months and the last study interviews trans people to find out factors associated to their wellbeing.

Key findings:

1- Hormones reduce mental health symptoms, particularly Depression. This is the largest study showing the evidence of hormone treatment in mental health.

2- Anxiety and depression do not predict life satisfaction post hormone treatment, suggesting that mental health symptoms (anxiety or depression) should not be a barrier for treatment

3- The importance of education to health professionals on trans issues as this is important for wellbeing

4- The damage that social medial and negative media representation can do to the wellbeing of trans people.

Dissemination and Output

Presented in 2 International conferences and 1 National conference. Article published which has been used for the development of the next edition of the Global guidelines for trans health. Two other publications are about to submitted. The team worked with Gendered Intelligence to develop easy to read documents from the results of the study.

PPI

The team has been working closely with the community through Gendered Intelligence particularly as part of the interview study and the dissemination.

Future Plans
- To explore why anxiety does not reduce as much as depression with hormones and what can be done about this
- To explore barriers for treatment and work towards reduction of waiting times in gender services (currently 3 years)

Please tick the box if this section of the report has been written with members of the public who have been involved in the research.

☒Confirmed

Aims and Objectives

Please describe the original aims and objectives of the research.

The main objective of the project is to explore factors influencing psychological wellbeing (focussing on mental health and life satisfaction) of transgender people following GAT. The study will focus on two groups of transgender people: 1) those who initiated GAT 18 months previously (to analyse predictors) and 2) those who initiated GAT 5 years previously (to investigate associated factors). The aims of each study are:

1. Study 1: To investigate changes in mental health symptoms (depression and anxiety) following 18 months of GAHT

2. Study 2: To investigate the predictive role of specific factors such as socio-demographics, interpersonal (e.g. social support) and mental health symptoms collected before GAT, on mental health problems and life satisfaction 18 months from the initiation of GAT.

3. Study 3: To explore, using a qualitative design, factors influencing psychological wellbeing of transgender people who initiated GAT 5 years previously; such factors may be: attributed to the presence of specific life events/experiences in participants' lives which may have led to low levels of well-being; associated with intra-/inter-personal difficulties; and/or lack of social support, to name but a few.

Changes to Aims and Objectives

If the aims and objectives changed, please explain in what way and why.
no changes

Description of Research

Please provide a structured summary of your work.

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. Additionally, in comparison to the general cisgender population trans people have been identified by previous research as having a poorer quality of life (QoL). While prior research has focused on the wellbeing of transgender people prior to initiating Gender Affirming Medial Treatment (GAMT) or 12-18 months after initiation of GAMT, little qualitative research has been carried out to examine the factors that impact transgender peoples life satisfaction and wellbeing after this stage. The aim of these studies are;

1) To use a longitudinal methodology to investigate the effect of 18-month GAHT on depression and anxiety symptomatology and the predictors on mental health outcomes in a large population of transgender people

2) To investigate factors that impacted upon the wellbeing of transgender people who had initiated GAMT 5 or more years ago using semi-structured interviews.

Methods

For the *quantitative studies,* data already collected was used. 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). In addition, the Gender congruence and life satisfaction scale (GCLS) was used as outcome measure at T1.

For the *qualitative study* data was collected using semi-structured interviews and analysed through grounded theory and thematic analysis. The analysis focused on identifying factors discussed in the interviews that impacted upon the wellbeing of the participants . A group (n=23) of eligible participants were recruited through social media and transgender support
organizations. Participation eligibility criteria was being 18 years old or over and having initiated GAMT five or more years ago.

Findings

The quantitative studies found that from T0 to T1, symptomatology was significantly decreased for depression ($P <$ .001) and non-significantly reduced for anxiety (P = .37). Scores on the MSPSS predicted reduction in depression, while scores on the AQ-Short predicted reduction in anxiety. A multiple regression with five predictor variables was conducted to explore the predictors of Gender Congruence and life satisfaction at T1 separately. The predictors for these regressions were age, assigned sex at birth, MSPSS score, HADS-A score, and HADS-D score at T0. It was found that MSPPS scores were found to be predictors to Gender Congruence. In addition, the multiple regression analysis for life satisfaction was not significant (F(5,114)=1.380,p=0.237) with an explained variance of life satisfaction scores of 5.7% (R^2 = .057). None of the predictors included in the regression were identified as a significant predictor of cluster 2 and for life satisfaction scores.

The qualitative study identified six themes and 18 sub-themes that participants highlighted as impacting on their wellbeing. Some of these themes were the same as factors prior research has found in cisgender populations (while being viewed through the lens of trans experience), while other themes were more specific to the trans experience.

Each of the themes identifies a factor which participants highlighted as impacting either positively or negatively on their wellbeing. The themes identified are split into several sub themes in which more detailed analysis of the factors can be carried out. The themes identified include;

Theme 1 – experiences of healthcare (Sub themes: 1a- Positive and negative experiences of trans health services, 1b- The right non-specialist support): Participants discussed positive experiences from support received from medical systems and professionals. The data also highlighted the negative impact that a lack of support,

understanding, and communication could have both in regards to trans healthcare services and non-specialist healthcare services (such as GPs).

This theme is of course shaped by the trans experience of the participants as they have gone through the process of accessing and acquiring GAMT, a process that can be taxing and difficult. When these experiences were positive, participants tended to frame them in terms where a good relationship of respect and understanding had been built up between them and their clinician, while negative experiences tended to be due to a lack of communication and understanding. While this does initially seem to be an obvious point, this process for many treatment seeking trans people is an extremely personal and stressful one and a lack of understanding from clinicians as well as a lack of clear and regular communication from the clinics themselves can only make the experience more difficult. The early discharge from trans health services was a factor of dissatisfaction among some and something that services should be reviewing. As a consequence of this early discharge, many trans people need to be looked after by non-specialist services, who have a lack of understanding of their specific health needs. Specific health needs for trans people later on in transition include monitoring of hormone levels, surgical interventions (and post-surgical care) for those who want them. Some participants discussed that non-gender specialist medical professionals lacked sufficient knowledge of trans issues and the process in which trans people could access gender treatment. They described how this impacted on their GAMT even at this stage of their transition, perhaps even more so due to the increased separation from contact with GICs. This emphasises the importance of both clear and regular communication between GICs, patients, and non-specialist medical professionals, as well as the importance of training for non-gender specialist medical professionals on the issues that trans people may experience when interacting with the healthcare systems and professionals. This lack of specific health-related support was an important factor for many, which requires further research.

Theme 2 – Positive impact of transition (Sub themes: 2a- Increasing resilience and confidence, 2b- Reducing Misgendering): Participants discussed various positive impacts of transitioning on their current well-being. These impacts were both in regard to improvements in personal resilience and also in terms of reducing misgendering by others.

Theme 3 – Societal Acceptance (Sub themes: 3a- Fitting in with the trans community, 3b- Socialising and passing 3b.1- Challenges with passing 3b.2- Socialising and socialisation as a trans person, 3c- negotiating coming out, 3d- promoting societal acceptance): Participants discussed how their well-being was impacted by others' reactions to their identity and how they presented. Participants further discussed how these reactions shaped their experiences and approaches both in terms of other trans people and with cisgender people.

Theme 4 – Social support (Sub themes: 4a- Having the right social support, 4b- Losing support through transition, 4c- Feeling lonely or isolated, 4d- Support from the LGBT+ community): As expected, relationships were found to have variable impact upon the participants' well-being. With some relationships aiding in improving well-being while a lack of relationships or support from these relationships often negatively impacted participants causing feelings of isolation or loneliness. Of note in the participants responses were the relationships with LGBTQ+ people and more specifically other trans peers.

Participants discussed the importance of understanding experiences when receiving social support. This was most prevalent when participants were discussing receiving social support from the LGBTQ+ community and from their trans peers. The shared experiences of these groups allowed for participants to feel more at ease and able to discuss issues that they were experiencing without the additional emotional labour of explaining the nuances of the experience to those who had not experienced something similar. This however was not a universal experience. Interestingly, some participants experienced issues even in trans spaces, this was particularly the case for participants who were gender diverse. One participant had described the usefulness of trans and LGBTQ+ spaces however also highlighted the negative impact that some trans people's expectations of other trans bodies had on their well-being.

Theme 5- Impact of media and social media (Sub themes: 5a- Negative representation of trans issues by media, 5b- Experience of social media): Representation of trans people in the media and trans people's experience of social media can often be negative. This negative representation and experiences were highlighted by participants as factors impacting their life-satisfaction. Social media and the media in general were identified as having a significant detrimental impact for many. This was due to the negative coverage of trans issues by the media which may be more prevalent in the UK, and not universal. This impact was not only detrimental to participants well-being but also changed their media consumption habits, leading them to be more cautious about the media sources they consumed to avoid those sources which are transphobic. The additional stress of avoiding what can be prevalent transphobic media sources may also have an impact on trans people's wellbeing, this can also involve the experience of distress associated with learning that previously though safe media sources are no longer safe. In addition to this, there was a discussion around social media in which it was highlighted that online harassment is still a significant issue for many trans people when they are open about their experiences.

Theme 6 - Influence of work and financial situations (Sub themes: 6a- Job satisfaction, 6b- Workplace support, 6c- Financial security, 6d- Living environment): As seen in research in cis people, work and financial situation was linked to wellbeing. Participants highlighted several aspects which impacted their well-being ranging from positive factors such as getting satisfaction from their work and being supported in the workplace to negative factors which focused around housing pressures and a lack of financial or employment security. While many of these factors are similar to those found in a cisgender population there are some aspects which were specific to those who have trans experience such as the presence or lack of protective legislations in the workplace and hostile living environments due to transitioning.

Conclusions

The quantitative studies show that 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. 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. In addition, the lack of associations found between pre-treatment mental health symptoms and life satisfaction post treatment indicate that these factors should not constitute as barriers to access to GAMT for treatment-seeking transgender people.

A common narrative through many of the themes developed in the qualitative study is that of the experience of support. This narrative presents itself differently across the various themes. This is illustrated by participants discussing the importance of more institutional supports such as knowledgeable non-specialist medical professionals and workplace protections, as well as discussing the value of social support from family and friends and the impact of its loss.

The conclusions from the results of the qualitative study highlight the importance of the positive impact of third-party support organizations, protective legislations, awareness in the general public, and the provision of recommendations and guidance for specialist and non-specialist healthcare providers. These factors could be used for guidance in how best to provide additional services and care for transgender people who are undergoing GAMT. It is important to consider that these positive influences are already afforded to many cisgender people.

Intellectual Property, Commercialisation and Clinical Adoption

Please provide brief details of IP outputs arising from this research.
There are no issues related in this section.

Actual and Anticipated Impact

Please provide a brief impact statement.
The results have been presented in 2 International conferences (WPATH Virtual conference 2020, and EPATH 2021 conference), and a National conference (BAGIS virtual conference 2020). An article has been published in an open access journal (IF of 3.35). The paper has been used in the next edition of the Global guidelines for trans health (Standards of Care 8th Edition by the World Professional Association for Transgender Health). Two publications to be submitted. The team worked with Gendered Intelligence, to develop easy to read documents from the results of the study which has been distributed among their members.

Describe the impact the research has already achieved or might achieve in the short, medium and long term.
The results of the quantitative studies have been used as part of the development of the 8th edition of the Standards of Care for professionals working with trans people. The Standards of care are the Global guidelines for trans professionals which include, surgeons, endocrinologist, psychologist etc. They are developed by the World Professional Association for Transgender Health (WPATH). The guidelines are developed using the best evidence-based information possible, hence the results of our studies (1 and 2) will be used for this guideline. This is important as our study is the largest longitudinal study available showing the benefits of gender affirming hormone treatment in mental health and showing that mental health symptoms pre-treatment do not predict life satisfaction post treatment. This evidence is vital in highlighting the benefit of treatment and the importance of trans health services. It is expected that the 3 studies will have an impact in the way professionals work with trans people around the world. And the recommendations made in education (part of the 3rd study) of health professionals.

Dissemination

Please describe how you have disseminated your research findings and what your plans for further dissemination are.

The 3 studies have been written for publications in peer reviewed journals. The first study was published in the "andrology" journal as an open access publication and it was highlighted in "nature" reviews urology. The second and 3rd study are been developed to be submitted for publication in May or June 2021.

The 3 studies have been presented separately in several local, national and international conferences, which include;
- Research conference SURAGth- Nottingham 2019
- Research conference Division of Psychiatry- University of Nottingham 2020
- Annual conference of British Association of Gender Identity Specialist (BAGIS)- Virtual 2020
- World Professional Association for Transgender Health- Virtual Conference- International- November 2020
- European Professional Association for Transgender Health- accepted- August 2021

A summary of the results in lay language and using graphics (see attached example) was developed with the charity Gendered Intelligence, which was posted in their website, twitted and send to NHS England.

Publications

Number published	2

Number in press	0

Number submitted	1

Number in preparation	1

Publications and Other Outputs

Please add any research outputs that incorporate findings from the research and have been published since the last progress report.

Where outputs have not been published online (or the full text is not available through Europe PubMed Central (Europe PMC) or open access from the publisher) please append a copy of the final version as an annex to this report in the **'supporting documentation'** section.

Output Title	Long term effect of gender affirming hormone treatment on depression and anxiety symptoms in transgender people: A prospective cohort study

Was this output submitted to CCF?	No

Type of Output	Article

Is the output available in PubMed?	Yes

PubMed ID (PMID) for output	https://pubmed.ncbi.nlm.nih.gov/32777129/

Is the full text of this output available on Europe PubMed Central?	Yes

If the output makes any recommendations for policy and/or clinical practice, please provide details
The article is being used for the development for the global guidelines for trans health specialist developed by the World Professional Association for Transgender Health (WPATH) https://www.wpath.org/ The global guidelines are called the Standards of Care and they are currently developing the 8th edition where thanks to this article recommendations will be made of the medical necessity of hormone treatment for trans people. https://www.wpath.org/publications/soc

Is this output published open access?	Yes

How could this output be utilised? (Please tick the one option that is most applicable):	Informing health and social care policy and/or practice

Date output	10/08/2020

appeared/published:	

Output Title	Feel-Well Project

Was this output submitted to CCF?	No

Type of Output	Presentation

Is the output available in PubMed?	No

Place where the output appeared e.g. journal or conference
Conference

If the output makes any recommendations for policy and/or clinical practice, please provide details
Conference presentation at the PPI meeting in Nottingham

If available online please provide a hyperlink:	

Please give the venue:	University of Nottingham

How could this output be utilised? (Please tick the one option that is most applicable):	Informing further research

Date output appeared/published:	11/07/2019

Output Title	What factors influence the life satisfaction and wellbeing of transgender people who have initiated Gender Affirming Medical Treatment 5 or more years ago?

Was this output submitted to CCF?	No

Type of Output	Presentation

Is the output available in PubMed?	No

Place where the output appeared e.g. journal or conference
Conference

If the output makes any recommendations for policy and/or clinical practice, please provide details
Conference presentation at the International conference of the World Professional Association of Transgender Health- virtual conference due to Covid

If available online please provide a hyperlink:	

Reference: PB-PG-0817-20003   **Date submitted:**

Please give the venue:	Virtual conference

How could this output be utilised? (Please tick the one option that is most applicable):	Informing health and social care policy and/or practice

Date output appeared/published:	06/11/2020

Output Title	Long term effect of gender affirming hormone treatment on depression and anxiety symptoms in transgender people: a prospective cohort study

Was this output submitted to CCF?	No

Type of Output	Presentation

Is the output available in PubMed?	No

Place where the output appeared e.g. journal or conference
Conference

If the output makes any recommendations for policy and/or clinical practice, please provide details
Conference presentation at the World Professional Association for Transgender Health discussing the implications of the study for the development of the Standards of Care- Global guideline 8th edition.

If available online please provide a hyperlink:	

Please give the venue:	Virtual

How could this output be utilised? (Please tick the one option that is most applicable):	Informing health and social care policy and/or practice

Date output appeared/published:	06/11/2020

Output Title	Predictors of gender affirming hormone treatment in transgender people: Data Mental health and life satisfaction outcomes from based on a longitudinal study.

Was this output submitted to CCF?	No

Type of Output	Presentation

Is the output available in PubMed?	No

Place where the output appeared e.g. journal or conference
Conference

If the output makes any recommendations for policy and/or clinical practice, please provide details
Discussing the role of mental health workers in trans health, this abstract has been accepted as a presentation at the European Professional Association for Transgender Health- Gothenburg- Sweden 2021

If available online please provide a hyperlink:	

Please give the venue:	Gothenburg- Sweden

How could this output be utilised? (Please tick the one option that is most applicable):	Informing further research

Date output appeared/published:	05/08/2021

Output Title	Gender-affirming therapy linked to mental health

Was this output submitted to CCF?	No

Type of Output	Article

Is the output available in PubMed?	Yes

PubMed ID (PMID) for output	https://www.nature.com/articles/s41585-020-00377-6

Is the full text of this output available on Europe PubMed Central?	Yes

If the output makes any recommendations for policy and/or clinical practice, please provide details
A research highlight was written based on our previous publication in Nature

Is this output published open access?	No

How could this output be utilised? (Please tick the one option that is most applicable):	Informing further research

Date output appeared/published:	10/09/2020

Please detail any awards and/or prizes received by the team as a result of undertaking the research.
The study that has been published has been submitted for an award to the Institute of Mental Health at the University of Nottingham, we are awaiting the outcome of it.

Patient and Public Involvement

Please provide a summary of the patient and public involvement in this research.

Aim: to provide guidance in development, participant recruitment, and dissemination of the research

Methods: A representative of Gendered Intelligence has been working as co-applicant from the beginning of this project. They have been involved in the development of the project, and analysis of the results and writing up of some of the publications. The PPI have been involved in recruitment for the 3rd project and as a focus group for developing the questions to be used in this study (as the 1st and 2nd project used already collected data). The PPI have been instrumental in development of dissemination.

Results: Recruitment during the 3rd study was quick and easy using Gendered Intelligence's access to a wide network of potential participants. The PPI guidance in the development of the interview guide highlighted aspects that may have not been considered without them. The PPI focused dissemination of this project has aided in the consideration of alternative methods of dissemination and PPI. These methods included clear lay language summaries using graphics to get across the key points and outcomes of the research, along with a more in depth document made up of abstract-like summaries of the three studies that make up this project.

Discussion and conclusions: The project was improved through the use of PPI as it facilitated various aspects of the research. These aspects included the design process of the separate studies where trans voices and experiences could guide the development of research materials such as the interview guide, recruitment where engaging with Gendered intelligence and the community both on social media and through community groups facilitated participant recruitment, and dissemination of the research in which Gendered intelligence have been instrumental in aiding in developing lay language summaries of the research for public dissemination.

Reflective / critical perspective: This project highlighted the importance of gathering clinical data with funded research to reduce logistical issues within data collection and collation.

An important step in this area of research is to aim for a more inclusive sample, including more non-binary participants particularly in the longitudinal quantitative studies. The quantitative studies were unable to include these participants due to a lack of non-binary participants. While the qualitative study did include some non-binary participants it would have benefited from a larger number of these participants to provide a more representative sample.

This research project benefited greatly from the inclusion of PPI at all stages of the process with Gendered Intelligence and the community in general being able to provide guidance in the

design process of individual studies, materials for these studies and dissemination options for the results. This study also benefited from the use of a trans researcher as part of the research team who as a member of the community themselves were able to provide knowledge and advice based on lived trans experience. The researchers trans status also provided benefits in the interview section of the project where participants may have been put at ease talking to a researcher who had similar lived experiences.

The use of quantitative and qualitative methods in this project was also of significant benefit as it provided a deeper insight into the lived experiences of trans people through the qualitative data which was complimented by the more generalizable large-scale qualitative data.

Please tick the box if this section of the report has been written with members of the public who have been involved in the research.

☒Confirmed

Future Research Plans

Please outline your next steps to maximise patient benefit or to further inform policy development/evaluation.

The study aimed to provide preliminary data regarding wellbeing in trans people who have been on gender affirming hormone treatment for long time. The qualitative study provides important information regarding the vital part that education for professionals makes in their wellbeing. Future studies will be developed to explore the educational needs for health professionals regarding trans people and how, improving training and education, can improve trans people's wellbeing.

The study also found the damaging effect of social media in people. The charity that we work with uses social media to inform trans people and we will be working with them to explore how trans people can be safe when using social media, this is primarily important for young trans people.

The 1st study indicated that although depressive symptoms reduce following treatment, anxiety does not reduce much. This is an important finding and suggest the need to offer targeted interventions. We have already started a pilot study looking at adapting existing interventions for trans people with the aim to evaluate this new intervention.

The studies also found that mental health symptoms pre-treatment do not predict life satisfaction following treatment. Having life satisfaction as primary outcome is important in trans health as that is the primary aim of the intervention. In addition, the studies also found that hormone treatment were vital in reducing mental health symptoms, particularly depression. In view of the high levels of suicidality in this population, particularly in young people, interventions aiming at cutting waiting times for treatment are vital. In view of this, the team has already started developing a project aiming at exploring ways to reduce waiting times in gender services, which currently are over 3 years.

Publication of Research Findings

Please indicate if there is any information that you do not wish us to place in the public domain and explain why.
There is no information that we don't want to be published. Our aim is to publish the 3 studies in peer reviewed journals.

Data Sharing

Where applicable, please provide a statement about your data sharing and accessibility. It should provide a clear and positive indication:

- Where and when the data will be shared
- Who can access the data
- How the data can be obtained

For the 1st and 2nd study, data already obtained from patients from the Nottingham Centre for Transgender Health was used. This data belongs to Nottinghamshire Healthcare NHS Foundation Trust. Data could be shared with others in the future following an application to the Nottingham centre for Transgender Health and an approval by Nottinghamshire Health Care NHS Foundation Trust. This will also require an amendment to the Ethics application.

Data for the 3rd study will be kept safe at Nottingham University. Ethics approval by the University was provided with the understanding that only the research team was able to access the data, if others outside the research team wish to use this data, with the agreement with the research team, they will need to apply for an amendment to the ethics application.

Post-Award Monitoring

Please provide the details of the individual whom we can contact for post-award monitoring of this project. Usually this will be the Chief Investigator, however, another individual, for example a project manager, may be named instead.

Contact name	Prof. Jon Arcelus

Contact address	Institute of Mental Health, Jubilee campus, University of Nottingham, Nottingham NG7 2TU

Contact telephone number	01158230417

Contact email address	jon.arcelus@nottingham.ac.uk

Supporting Documentation

PROFESSOR JON ARCELUS (Orcid ID : 0000-0002-3805-0180)

Article type   : Original Article

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].

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

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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.

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.

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 ($\beta=0.81$, p=0.006). The second regression

showed that overall the model was significant ($F_{(7,152)}=2.09$, $p=0.048$) and explained 8.8% ($R^2=0.088$) 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 ($\beta=-0.069$, $p=0.034$). 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.

Authors contributions

JA conceptualised the study, participated in the study design. ZA SP JA WPB and BG handled data collection management. BG carried out the statistical analysis. ZA drafted the initial manuscript. SP drafted the initial methods and results section of the manuscript. All authors contributed to the critical review of the manuscript and approved the final version of the manuscript.

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		Assigned male at birth (2) n = 95		Assigned female at birth (1) n = 83	
	n	%	n	%	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)	

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

HORMONE TREATMENT REDUCES SYMPTOMS OF POOR MENTAL HEALTH IN TRANS PEOPLE

Trans people seeking gender affirming hormone treatment (GAHT) who have not yet received it often experience higher levels of depression and anxiety.

DEPRESSION

47.8%

DOWN 46%
21.6% OF ALL PARTICIPANTS

25.8%

BEFORE GAHT
Before starting hormone treatment, 47.75% people scored above 8* on a scale measuring symptoms of depression.

REDUCTION
Hormone treatment has a large positive impact on the levels of depression for transgender people seeking such treatment.

AFTER GAHT
After 18 months of hormone treatment, the number of participants scoring 8 or above on the scale had dropped to 25.84% (a 46% reduction)!

ANXIETY

Before hormone treatment, 51.13% people scored 8 or over on a scale measuring symptoms of anxiety; this dropped to 47.19% following 18 months of hormone treatment.

Rates of anxiety went down ~4% following hormone treatment, which is not statistically significant.

WHY A SMALLER REDUCTION?

Trans people often continue to experience discrimination and social rejection. This study highlights that anxiety around these issues is not majorly lessened by hormone treatment.

On the contrary, hormone treatment will usually mean obvious and physical changes to the person – they will often not be able to hide their trans status in places or situations it is not perceived to be safe to be 'out'.

We might have expected anxiety to in fact increase following the start of GAHT for this reason; the slight reduction may be caused by a sense of relief at starting medical transition, regardless of the external implications.

In the scales used to assess the symptoms of depression (HADS-D) and anxiety (HADS-A) experienced by participants, a score of 8 or over indicated a possible or probable depression or anxiety disorder.

WHAT HAVE WE LEARNED?

SOCIAL SUPPORT IS KEY

Gender affirming hormone treatment (GAHT) has a significant positive impact on the mental health of treatment seeking transgender people

STUDY BY:

Nottingham National Centre for Transgender Health, National Institute for Health Research, The University of Nottingham.

Those with strong social support before GAHT are more likely to experience reductions in levels of depression