



Puberty Suppression Followed by Cross-sex Hormones and Gender Reassignment Surgery: A Prospective Follow-up of Gender Dysphoric Adolescents into Adulthood

**Annelou L.C. de Vries¹, Thomas D. Steensma²,
Eva C.F. Wagenaar³, Theo A.H. Doreleijers¹, Peggy T. Cohen-Kettenis²**

In preparation

¹ Department of Child and Adolescent Psychiatry, VU university medical center, Amsterdam, the Netherlands

² Department of Medical Psychology, VU university medical center, Amsterdam, the Netherlands

³ VU University Medical Center, Medical School, Amsterdam, the Netherlands

Abstract

Objective: To assess long term outcome of adolescents with a gender identity disorder (GID).

Design: Longitudinal cohort study with two assessments: pre-treatment (PreT), shortly after their initial attendance at the gender identity clinic and post-treatment (PostT), at least one year after gender reassignment surgery (GRS).

Setting: Gender identity clinic.

Participants: Twenty-seven young adults (11 female to males and 16 male to females) with a mean age of 13.5 years (SD 1.8) PreT and 20.9 years (SD1.0) PostT.

Intervention: GRS preceded by puberty suppression and cross-sex hormone treatment.

Main outcome measures: PreT, gender-dysphoria, behavioral problems, peer relations and intelligence were measured. PostT, gender dysphoria, treatment satisfaction, current life situation and employment or study careers, sexual experiences and romantic relationships, quality of life, satisfaction with life and happiness were assessed.

Results: Gender dysphoria resolved and participants were predominantly satisfied with the treatment received. Concerning relationships with family and peers, professional and educational careers and sexual behavior and romantic relationships, the young adults were in many aspects comparable with their non-GID peers. Participants considered their quality of life good. PreT intelligence and peer relations correlated with PostT quality of life.

Conclusion: The gender reassignment procedure starting with early puberty suppression seems to have enabled these formerly gender dysphoric adolescents to make important age appropriate developmental transitions, contributing to a satisfactory quality of life. Some PreT factors (intelligence, peer-relations) influence PostT quality of life.

Introduction

Many studies show that in adults with gender identity disorder (GID), gender reassignment (encompassing cross sex hormone treatment (CSH) and gender reassignment surgery (GRS)), is the most effective treatment of choice.¹⁸⁵ Far less evidence exists on the effectiveness of GRS in adolescents with GID. For this age group, GRS remains a matter of considerable debate.^{52,53} Two follow-up studies showed that gender dysphoria had resolved in all adolescents who had started CSH before they reached legal adulthood, and that they were functioning psychologically and socially well after GRS.^{44,45}

Puberty suppression by means of gonadotropin releasing hormone analogs (GnRHa), allows gender dysphoric adolescents to explore their desire for GRS without the distress of physical puberty development.⁵⁰ Arresting the development of secondary sex characteristics results in a life-long advantage of a convincing physical appearance congruent with the desired gender role. Puberty suppression is reversible and can be discontinued should the adolescent decide not to pursue gender reassignment.⁴⁹ It is meant to prevent the emotional problems many young transsexuals experience when puberty starts.^{40,56,163} One study evaluated 70 adolescents with GID in whom puberty was suppressed. It was found that their psychological functioning improved or remained stable, but that the gender dysphoria did not change.¹⁶⁵ However, long-term outcome studies on adolescents who never experienced a complete puberty of their natal gender after GRS are lacking.

To investigate such long-term outcome, we conducted a follow-up study on the first 27 adolescents who participated in the earlier study at the time they were adults and at least one year postsurgical. We were interested in several domains of functioning. We focused on gender dysphoria and treatment satisfaction, their current life situation and employment or study careers. We further assessed their sexual experiences and romantic relationships. We also evaluated quality of life, satisfaction with life and happiness.^{187,188} Finally, we were interested whether specific relations could be detected between certain adolescent pre-treatment characteristics and post-treatment quality of life.

Method

Participants and procedure

As described elsewhere¹⁶⁵, 140 of 196 consecutively referred adolescents were considered eligible for medical intervention between 2000 and 2008 at the Amsterdam gender identity clinic of the VU university medical center (VUmc) (for a description of the protocol: see ⁵⁰). Of this cohort, 29 adolescents who were age 16 years or older were prescribed CSH only, and 111 adolescents were prescribed GnRHa to suppress puberty.

Subsequently, 70 of the 111 started CSH treatment between the years 2003 and 2009. The first 30 young adults who had become age 18 and had GRS between 2004 and 2009 were invited to participate at least one year after their last operation. GRS was vaginoplasty for male to females (MtFs) and hysterectomy for female to males (FtMs), because after these surgeries transsexuals can legally change their gender. One person (MtF) refused to participate and two (one FtM and one MtF) failed to send back their questionnaires. This resulted in 27 participants, 11 MtFs and 16 FtMs.

Participants were assessed twice; first, shortly after their initial attendance at the gender identity clinic (pre-treatment, PreT) and second, at least one year after their GRS (post-treatment, PostT). The PreT assessment was part of the diagnostic procedure during which eligibility was assessed for puberty suppression. Preferably, the PostT assessment was combined with one of the young adults' medical check-ups at the Amsterdam gender identity clinic. When this was not possible, a separate appointment was made or a home visit was offered. In some cases, some of the questionnaires were mailed before the assessment, to be filled out at home, shortening the assessment at the hospital.

Mean ages of the participants at first assessment, at the start of GnRHa treatment, at the start of CSH, and at their GRS are presented in Table 1. Table 1 further shows participants' intelligence, as measured by either the WISC-R, the WISC-III or the WAIS-III,^{152,153,169} depending on age and year of assessment (PreT). At GRS, MtFs (19.8 years; SD 0.9) were significantly older than FtMs (18.9 years; SD 0.8, $U=27.0$, $p<.01$). No other gender differences were observed regarding ages at different stages of treatment or intelligence.

The VUmc medical ethics committee approved the study, and all participants gave informed consent.

Table 1. General characteristics

Variable	All participants (N=27)		MtFs (N=11)	FtMs (N=16)
Age (in years)	<i>M (SD)</i>	Range	<i>M (SD)</i>	<i>M (SD)</i>
at assessment PreT ^a	13.5 (1.8)	11.2–17.0	13.9 (.8)	13.2 (1.8)
at start GnRHa ^b	14.6 (1.7)	11.5–17.9	15.0 (0.6)	14.4(0.3)
at start CSH ^c	16.6 (1.1)	13.9–18.6	16.7 (1.4)	16.6 (0.9)
at GRS ^d	19.3 (0.9)	18.0–21.3	19.8 (0.9)	18.9 (0.8)
at assessment PostT ^e	20.9 (1.0)	19.7–22.8	21.3 (1.1)	20.7 (0.8)
Full-Scale intelligence	98.2 (15.0)	70–131	94.4(12.3)	103.5 (15.2)

^a PreT: pre-treatment, ^b GnRH analogs, ^c CSH: cross sex hormones, ^d GRS: gender reassignment surgery, ^e PostT: post-treatment.

Measures

Behavior problems: PreT, behavioral and emotional problems were measured by the Child Behavior Checklist (CBCL) and the Youth Self-Report (YSR), administered to the parents and the adolescents, respectively.^{23,24,170,178} For the present study, the total T problem score was used. Because the CBCL and the YSR were intended to measure general behavior disturbance and not gender dysphoria (which was measured by other means), items referring to gender atypical behavior were scored as 0s for all the analyses in this study to avoid any artificial inflation (for a full description of the items that may refer to gender dysphoric behavior, see ⁴¹).

In addition, we used the Peer Relations Scale constructed by Zucker et al.,⁴² which consisted of three items: “Doesn’t get along with other kids” (Item 25), “Gets teased a lot” (Item 38), and “Not liked by other kids” (Item 48). A higher score indicates poorer peer relations.

Gender dysphoria: PreT and PostT, the Utrecht Gender Dysphoria Scale (UGS) was used to measure adolescents’ gender dysphoria. This is a 12-item questionnaire on which the subject rates his/her agreement on a 5-point scale. The higher the score, the more gender dysphoria is indicated (for psychometric data, see ⁴⁴).

Body satisfaction: The Body Image Scale (BIS) was administered to measure PreT and PostT body satisfaction.¹⁸³ The scale consists of 30 body features which the subject is asked to rate on a 5-point scale. Each of the 30 items falls into one of three basic groups based on its relative importance as a gender-defining body feature: primary sex characteristics, secondary sex characteristics, and neutral body characteristics. A higher score indicates more dissatisfaction. For this study, an adaptation for the Dutch population was used.¹⁸⁴

Treatment evaluation: PostT, participants completed a list of questions developed for this study on satisfaction with physical appearance, satisfaction with surgical results, and feelings of regret.

Current life situation: School, profession and living circumstances: Participants were asked whether they were working or studying and where they were living (with their parents, in a student dorm, single, or cohabiting). Students were asked about their current level of education, whereas working and unemployed youth were asked to indicate the highest level of education they completed. In addition, participants were asked whether they were satisfied about their relationships with family and friends and whether they had experienced their support during the GR process and after their GRS.

Sexuality: PostT, participants completed a subset of questions from a questionnaire that was used in a large study on sexual behavior and sexual health in a representative sample of 12–25 year-olds in the Netherlands (N=4,820): “Sex under the age of 25”, conducted by the Rutgers Nisso Groep and STI AIDS Netherlands.¹⁸⁹ Responses were mostly dichotomous (yes/no). If yes, they were asked for the age of their first experience with these behaviors. We also asked all participants whether they had these experiences before and/or after their GRS.

Sexual orientation: PreT, only one question was asked: what partner would you like to have? Possible responses were: a homosexual man, a heterosexual man, a homosexual woman, a heterosexual woman, no preference, don’t know yet. Responses were recoded into four possible options: attracted to natal sex, attracted to non-natal sex, attracted to both sexes, and don’t know yet.

PostT, four sexual orientation domains were covered: sexual attraction, sexual fantasies, sexual identity and sexual behavior.

Quality of life: PostT, the WHOQOL-Bref was administered.¹⁸⁷ The WHOQOL-Bref comprises 24 questions that belong to one of four domains (Physical Health, Psychological Health, Social Relationships, and Environment), and two questions on overall quality of life and general health. The questions have a 5-point Likert scale. For the Dutch version of the WHOQOL-Bref, psychometric properties are good.¹⁹⁰ Higher scores indicate a better quality of life.

Satisfaction with life and subjective happiness: PostT, the Satisfaction With Life Scale (SWLS) was used to assess global life satisfaction.¹⁹¹ The SWLS contains five items. The responses range from 1 (strongly disagree) to 7 (strongly agree). Both the original and the Dutch version¹⁹² of the SWLS have demonstrated good psychometric properties, and the scale is suitable for use with different age groups.¹⁹¹⁻¹⁹³ The total score ranges from 5 (low satisfaction) to 35 (high satisfaction). Scores on the SWLS can be interpreted in terms of absolute as well as relative life satisfaction. A score of 20 represents the neutral point on the scale, the point at which the respondent is about equally satisfied and dissatisfied. For example, scores between 21 and 25 represent slightly satisfied, and scores between 26 and 30 represent being satisfied with life.¹⁹³

The Subjective Happiness Scale (SHS) is a four-item scale of global subjective happiness in the present moment.¹⁹⁴ The SHS has been utilized across a variety of populations, ages, and cultures. The SHS has a high internal consistency across samples (Cronbach’s alphas 0.85–0.95 in eight different studies).¹⁹⁴ Both the SWLS and the SHS have been used in the Netherlands Twin Register (NTR) study.¹⁹⁵

Analyses

97

Mann-Whitney or Chi square tests were used to ascertain gender differences. Two-sided Fisher Exact tests were used to ascertain differences in sexual behavior experience before and after GRS. Repeated measures ANOVA was used to ascertain within subject differences between gender dysphoria and body satisfaction at baseline functioning (PreT, before the start of GnRHa) and after GRS (PostT) with gender entered as a between-subject variable. Pearson correlations were used to determine relationships between PreT and PostT measures. Not all 27 young adults completed the full PreT assessment, because some instruments were added to the test battery after the first eligible adolescents had started GnRHa. Therefore only data of adolescents who were administered questionnaires on both assessments could be used for PreT-PostT comparisons (CBCL: 24, IQ: 25, UGS: 21 and BIS: 22).

Results

Gender dysphoria and body satisfaction

A significant improvement was seen on the UGS and the satisfaction with primary sex characteristics ($p < .001$) between PreT and PostT (see Table 2). Satisfaction with secondary sex characteristics changed as well, although less ($p < .05$). There were no significant gender differences on the gender dysphoria and body satisfaction scores either PreT or PostT (see Table 2). However, there were significant interaction effects between gender and the changes of gender dysphoria and body satisfaction between PreT and PostT; MtFs showed more improvement in their satisfaction with primary and secondary sex characteristics compared to FtMs. With their neutral body characteristics, MtFs became more satisfied whereas FtMs became less satisfied between PreT and PostT (see Table 2).

Table 2. Gender dysphoria and Body Satisfaction

		Pre-Treatment	Post-Treatment	Time effect	Gender effect	Time x Gender effect
	No.	M (SD)	M (SD)	F (df)	F (df)	F (df)
UGS ^a						
All	21	54.5 (5.4)	15.4 (3.1)	1163.1 (1,19)*	4.2 (1,19)	3.3 (1,19)
MtFs	7	51.9 (6.9)	15.6 (4.0)			
FtMs	14	55.7 (4.1)	15.2 (2.8)			
BIS ^b						
Primary sex characteristics						
All	22	4.2 (0.5)	2.4 (0.6)	153.6 (1,20)*	0.9 (1,20)	14.0 (1,20)*
MtFs	9	4.4 (0.4)	2.0 (0.6)			
FtMs	13	4.0 (0.6)	2.7 (0.5)			
Secondary sex characteristics						
All	22	2.6 (0.6)	2.3 (0.5)	4.6 (1,20)**	0.2 (1,20)	6.0 (1,20)**
MtFs	9	2.7 (0.3)	2.1 (0.6)			
FtMs	13	2.4 (0.7)	2.5 (0.4)			
Neutral body characteristics						
All	22	2.4 (0.6)	2.3 (0.5)	2.7 (1,20)	4.2 (1,20)	13.9 (1,20)*
MtFs	9	2.9 (0.4)	2.1 (0.5)			
FtMs	13	2.0 (0.5)	2.4 (0.4)			

* $p < .001$, ** $p < .05$, ^a UGS: Utrecht Gender Dysphoria Scale, ^b BIS: Body Image Scale.

Treatment satisfaction

All participants were – often or always – satisfied with their physical appearance in their new gender role, were convinced that they succeeded in their new gender role, and were never treated by others as someone of their natal gender.

All MtFs underwent vaginoplasty and were either very (n=6; 54%) or reasonably (n=5; 45%) satisfied. They liked the appearance of their vaginas very well (n=8; 73%) or reasonably well (n=3; 27%). Possibly as a result of early puberty suppression, natural growth of the breasts had occurred on estrogen treatment in the majority of the MtFs. Therefore,

70% did not need breast enlargement surgery. All MtFs (with or without breast enlargement surgery) were very satisfied with the appearance of their breasts.

In FtMs, as a result of early puberty suppression, three persons (19%) did not need any breast removal and for ten (63%) a “donut procedure” breast removal was performed, resulting in scars only around the nipples. A “sous-mammaire” procedure, for larger breasts resulting in scars on the chest, was necessary in three FtMs (19%). All FtMs were satisfied with their chests and reported swimming or sunbathing without T-shirts. All FtMs were also satisfied with their hysterectomies. Of the FtMs, four (25%) had a metadoioplasty, six (38%) were waiting for a metadoioplasty, three (19%) were waiting for a phalloplasty, and three (19%) were uncertain about their choice of external genital surgeries at the time of the study. Of the four FtMs who had undergone a metadoioplasty, three were very satisfied and one was reasonably satisfied with the appearance.

None of the participants had ever experienced any feelings of regret, neither during puberty suppression or CSH treatment, nor after GRS.

Current life situation

Most young adults (n=17; 63%) were living with their parents, seven (26%) were living with others (mostly in student dormitories), two were living independently and one did not have a permanent home. There were no gender differences. In the Netherlands, fifty percent of the 22-year old males and 75% of the 22-year old females have left their family homes.¹⁹⁶

Of the participants, twelve (44%) were students, three were both working and studying (11%), eight (30%) were working, and four (15%) were unemployed, of whom one MtF received disability benefits. Of the twelve young adults who had left school, their highest educational level was low (elementary school or junior high school) or secondary (vocational or academic high school). Of the fifteen students, eight (53%) were in vocational schools (pre-vocational or senior secondary vocational), and seven (47%) followed higher level education (bachelor or masters degree). Of the Dutch 18–25 year olds, more than 50% are students and 31% are following higher level education (a bachelor or masters degree¹⁹⁶). Eleven percent of the Dutch young adult population are unemployed.¹⁹⁶

Social functioning

All young adults received support concerning the GRS from their mothers, 22 (74%) from their fathers (who were unavailable for three), and 25 (93%) from their siblings. Twenty-one (78%) reported having three or more friends and the other six participants

(22%) reported having one or two good friends. Most young adults were satisfied about their social contacts with male peers (N=23, 85%) and female peers (N=25, 92%) and 26 (96%) reported that they received support from friends around their GRS. After their GRS, twelve participants (44%) reported having never been called names or harassed, the other 15 (56%) reported that they were occasionally called names or harassed. One MtF experienced aggressive harassment. Twenty-one (78%) young adults reported their social transitioning as having been easy; the other six (22%) said some things were easy while other things were difficult.

Sexual experience

All but one participant (MtF) reported that sexuality, relationships and falling in love were very or fairly important to them. Percentages of specific sexual experiences before and after GRS are presented in Table 3.

Young adults said they engaged in significantly more petting while undressed after compared with before GRS (89% versus 52%, $p < .05$). Also, the percentage of participants who said they had experienced sexual intercourse increased from 7% to 33% ($p < .05$), which was mainly accounted for by the MtFs (64% versus 9%, $p < .05$). In addition, individuals experienced more mutual receptive masturbation after compared with before GRS (63% versus 18%, $p < .05$), which was again mainly accounted for by the MtFs (73% versus 9%, $p < .05$) (see Table 3).

Significantly more FtMs compared with MtFs reported having experienced sexual arousal (100% versus 73%, $\chi^2(1) = 4.9$, $p < .05$) and masturbation (69% versus 27%, $\chi^2(1) = 4.5$, $p < .05$) before GRS, but no other gender differences in sexual experiences were observed. After GRS, significantly more MtFs than FtMs had experienced sexual intercourse (64% versus 13%, $\chi^2(1) = 7.6$, $p < .05$). No other gender differences were observed either before or after GRS (see Table 3).

When participants did not have any sexual intercourse, they were asked to give reasons. Reported reasons were: 'it just has not happened yet' (n=4), 'I am not in need of it' (n=2), 'it's scaring me (a little)' (n=2), 'there was nobody with whom I wanted to do it' (n=3), 'nobody has wanted me yet' (n=1) and 'I want to be in love with someone first' (n=3). Concerning GRS related reasons, one MtF reported 'I am dissatisfied with my vagina'. One FtM stated 'I feel ashamed about my body, being a transsexual' and nine FtMs stated 'I fall in love with girls and cannot have intercourse, being an unoperated transsexual'.

When young adults did have experience with a sexual partner, they were asked how they felt about it. One MtF felt ashamed about her breasts and four MtFs felt ashamed about their vaginas. None of the FtMs felt ashamed about their chests, but seven felt sometimes or often 'uncomfortable because of my still existing vagina' and 'not at

ease without a penis'. Nine (57%) of the 16 participants who were sexually active last year, reported being satisfied with their sex life, three (11%) were neither satisfied nor dissatisfied, and four (24%) were dissatisfied. Of all 27 young adults, 12 (46%) were (rather) satisfied with their sex life, ten (38%) were neither satisfied nor unsatisfied and four (15%) were (rather) unsatisfied.

Table 3. Sexual experience and ages of first sexual experience

N=27, all data retrospectively collected, PostT	Before GRS* N (%)	After GRS N (%)	PreGRS/ PostGRS <i>P</i>	Age first time M (SD)	Nisso Study age 21–24, %	Nisso Study age 1 st time
Falling in love						
All	n.a.#	25 (93)	n.a.	n.a.		
MtFs	n.a.	9 (92)	n.a.	n.a.		
FtMs	n.a.	16 (100)	n.a.	n.a.		
Romantic relationship						
All	n.a.	21 (78)	n.a.	15.4 (2.5)		
MtFs	n.a.	6 (55) ^a	n.a.	15.3 (1.9)		
FtMs	n.a.	15 (94) ^a	n.a.	15.3 (2.8)		
Sexual arousal						
All	24 (89)	24 (92)	1.00	14.3 (2.9)	98	14.4
MtFs	8 (73) ^a	8 (80)	1.00	13.9 (3.6)		
FtMs	16 (100) ^a	16 (100)	1.00	14.9 (2.5)		
Masturbation						
All	14 (52)	19 (73)	.249	15.9 (3.5)	85	13.9
MtFs	3 (27) ^a	7 (70)	.179	16.7 (4.5)	97 ^a	
FtMs	11 (69) ^a	12 (75)	1.00	15.2 (2.5)	74 ^a	
Kissing						
All	24 (89)	25 (93)	1.00	14.4 (2.3)	96	14.0
MtFs	10 (91)	10 (91)	1.00	13.9 (2.3)		
FtMs	14 (88)	15 (94)	1.00	14.5 (2.3)		

N=27, all data retrospectively collected, PostT	Before GRS* N (%)	After GRS N (%)	PreGRS/ PostGRS <i>P</i>	Age first time M (SD)	Nisso Study age 21–24, %	Nisso Study age 1 st time
Petting while undressed						
All	14 (52)	24 (89)	.006	16.6 (2.6)	95	15.4
MtFs	6 (55)	10 (91)	.149	16.6 (3.0)		
FtMs	8 (50)	14 (88)	.054	16.6 (2.5)		
Sexual intercourse						
All	2 (7)	9 (33)	.039	19.1 (1.4)	88	16.7
MtFs	1 (9)	7 (64) ^a	.024	19.7 (1.0) ^a		
FtMs	1 (6)	2 (13) ^a	1.00	17.5 (.71) ^a		
Mutual masturbation, receptive						
All	5 (19)	17 (63)	.002	18.4 (2.0)	89	16.3
MtFs	1 (9)	8 (73)	.008	19.2 (0.6)		
FtMs	4 (25)	9 (56)	.149	17.8 (.70)		
Mutual masturbation, active						
All	14 (52)	21 (78)	.086	16.4 (2.5)	89	16.2
MtFs	6 (55)	9 (82)	.361	16.1 (0.7)		
FtMs	8 (50)	12 (75)	.273	16.6 (0.9)		
Receptive oral sex						
All	4 (15)	13 (48)	.018	18.7 (2.0)	85	16.9
MtFs	1 (9)	6 (55)	.064	19.0 (0.7)		
FtMs	3 (19)	7 (44)	.252	18.4 (0.8)		
Active oral sex						
All	10 (37)	15 (56)	.275	17.2 (2.0)	84	17
MtFs	6 (55)	7 (64)	1.00	16.4 (0.7)		
FtMs	4 (25)	8 (50)	.274	17.8 (0.6)		
Anal intercourse						
All	2 (7)	2 (7)	1.00		28	18.4
MtFs	2 (18)	2 (18)	1.00	16.7 (2.3)		
FtMs	0	0	1.00			

* GRS: Gender reassignment surgery, #n.a.: not available.

^a significant gender difference between MtFs and FtMs ($p < .05$).

Sexual orientation

PreT, sexual orientation was available for 20 of the 27 participants of whom 15 (75%) reported being sexually attracted to their natal gender, one (5%) to both genders, and four (20%) did not know which gender they were sexually attracted to.

PostT, all but one of the 27 young adults were attracted to their natal gender, had sexual fantasies about their natal gender and identified themselves as heterosexual (in their PostT gender roles). Only one MtF (4%) was attracted to both genders, had sexual fantasies about both genders and identified as bisexual. Of the 20 young adults who had had a relationship, their partners were all of their natal gender.

Quality of Life

Mean scores on quality of life, satisfaction with life and subjective happiness are presented in Table 4, together with scores from large validation and reliability studies of the WHOQOL-Bref, the SWLS and the SHS.

Significant gender differences were observed. In the Psychological domain of the WHOQOL-Bref, MtFs reported their quality of life as better ($M=15.9$, $SD=2.1$) compared to FtMs ($M=13.9$, $SD=2.2$; $U=35.0$, $p<.01$). Likewise on the SWLS, MtFs were observed to be more satisfied than FtMs ($M=28.8$, $SD=4.2$ versus $M=22.9$, $SD=6.7$; $U=34.0$, $p<.01$).

Table 4. Quality of Life, Satisfaction with Life and Happiness mean scores with scores from validation studies

N=27	Nr.	M (SD)	Range	Validation studies Scores
WHOQOL Physical	27	15.2 (2.5)	8.6–20.0	15.0 (2.9) ^a
WHOQOL Psychological	27	14.7 (2.3)	9.3–18.6	14.3 (2.8) ^a
WHOQOL Social Relations	27	15.2 (2.4)	9.3–20.0	14.5 (3.4) ^a
WHOQOL Environment	27	15.3 (2.1)	11.0–20.0	13.7 (2.6) ^a
Satisfaction With Life Scale	27	25.3 (6.5)	9.0–33.0	26.18 (5.7) ^b
Subjective Happiness Scale	27	4.73 (0.8)	2.75–6.0	4.89 (1.1) ^c

^a International field trial, ages 21–30, Skevington et al.¹⁸⁷, ^b Dutch young adults, Arindell et al.¹⁹⁷, ^c U.S. Public College Students, Lyubomirsky¹⁹⁴.

PreT – PostT correlations

There was a positive correlation between the adolescents' PreT intelligence and the PostT WHOQOL-bref Environment domain ($r=0.414$, $n=25$, $p<.05$). Furthermore, adolescents who had a higher peer relation score (indicating lower quality of peer relations) on the self-reported YSR, had a lower score on the WHOQOL-bref Physical domain ($r=-.428$, $n=22$, $p<.05$). No other correlations were observed between PreT CBCL total *T* problem scores, YSR total *T* problem scores, Gender Dysphoria, Body Image Satisfaction, or PostT quality of life measures.

Discussion

In an earlier study of in part the same cohort of gender dysphoric adolescents we found that behavioral and emotional problems and depressive symptoms decreased while general functioning improved significantly during puberty suppression only.¹⁶⁵ However, gender dysphoria and body satisfaction had not ameliorated. The disappearance of gender dysphoria and increased body satisfaction found in the postoperative participants in the current study is in accordance with many follow-up studies in adult transsexuals, showing that gender reassignment (consisting of CSH treatment and GRS) is an effective treatment for transsexuals^{43,185} and adds to the evidence that young applicants also benefit from CSH and GRS.^{44,45}

All young adults were satisfied with their surgeries and no one had experienced feelings of regret. This is important, as poor surgical results may be a determinant of postoperative psychopathology and of dissatisfaction and regret following gender reassignment.^{136,198} Both MtFs and the FtMs were satisfied with their physical appearance. In contrast to what has been observed in studies on adults with GID,¹¹⁵ adolescents, even before treatment, were not very dissatisfied with their secondary sex characteristics. This can be attributed to the fact that, in a number of participants, puberty suppression had ceased the development of secondary sex characteristics.

In this study some adolescents had started with GnRH α to suppress puberty before the age of 12 years and with CSH before the age of 16 years. Reasons for this early start were that these MtFs were already very tall and further growth was slowed down by an early start with puberty suppression and a subsequent early start with CSH, to reach a – for females – acceptable height. One FtM received puberty suppression before the age of 12, to inhibit menarche and further breast development. As this policy did not seem to have negative long-term effects, strict age criteria (12 years for puberty suppression and 16 years for cross-sex hormones) need to be reconsidered.

The current life situation of the participants in this study with regard to living, studying and work situations seemed comparable with their Dutch peers.¹⁹⁶ Part of this result may stem from the support participants received from their families, which is perhaps also reflected by the relatively high number of participants that had not yet left their family homes in young adulthood. Gender-related abuse may result in depression and suicidality, especially during adolescence.¹³⁵ However, in the Netherlands, many gender dysphoric youth receive support from their school environments as well. Peer acceptance at school was also found in a study on Dutch prepubertal gender dysphoric children.¹⁹⁹ This is in line with cross-national studies on tolerance for homosexuality. Although tolerance for homosexuality is not the same as for gender dysphoria, the most accepting attitude with respect to homosexuality was observed in the Netherlands.^{200,201}

Many young adults who had received puberty suppression during adolescence reached all sexual milestones, some before and some after GRS, although at a slower pace than their peers.¹⁸⁹ After GRS, the percentage of young adults who had experienced various sexual activities increased significantly, indicating the importance of surgery for the development of sexuality and the formation of romantic relationships. Compared to adult transsexuals, it seemed that the participants of the current study reported more sexual desire and masturbation (for a review, see Klein et al.²⁰²). Involvement in romantic relationships and sexual experiences in adolescence are considered to be important in helping to form the foundations for future healthy adult relationships.^{62,203} For example, the presence of a romantic relationship, among other things, protected adolescents from feelings of social anxiety.²⁰⁴

All, except one MtF, identified themselves as heterosexual in their new gender role, indicating being sexually attracted to partners of their natal gender. This is in line with studies suggesting that sexual attraction to natal gender is related to early onset gender dysphoria.³⁹

Studies on adult transsexuals observed that the quality of life in postoperative adults was rather good, but less favorable than in the general population.²⁰⁵⁻²⁰⁷ In our study, however, quality of life, satisfaction with life and subjective happiness of the participants were all comparable with those of same-aged peers. Nevertheless, FtMs were less satisfied compared with MtFs and reported a poorer psychological quality of life. One of the reasons might be the unresolved desire of FtMs to have a penis. Most of the FtMs did not have genital surgery yet, because of long waiting lists, but also because surgery techniques are still improving and some are waiting for that reason. In addition, as the mean age of start of puberty is age 11 in Dutch girls and the mean age of menarche is 13 years, in most FtMs secondary sex characteristics had already developed. As said earlier, this calls for a reconsideration of the current age criteria.

Some pre-treatment characteristics correlated with post-treatment quality of life. Poorer peer relations at the time of first attendance at the gender identity clinic corre-

lated with lower quality of life after GRS and a higher intelligence at first assessment correlated with a higher quality of life after GRS. It seems therefore that risk and resilience factors play a role in GRS outcome. An ongoing person-environment interplay occurs during development, which may make some adolescents vulnerable and help others in doing well.²⁰⁸ A better understanding of these risk and protective factors may help to provide gender dysphoric adolescents with proper care.

Although the results of this study are promising concerning the effectiveness of puberty suppression, CSH and GRS in adolescents with GID, various limitations warrant comment. First, the study sample was small and came from only one clinic. However, to our knowledge, no studies on larger samples of comparable groups exist and we therefore believe that our results are of relevance. Larger studies and studies from other clinics should replicate these findings. Second, questions on sexual experience were asked retrospectively, which may have made the answers less reliable especially regarding behavior that had occurred before GRS. Third, this study did not focus on psychological functioning or physical effects of treatment. Although it is unlikely that young adults would report a satisfying quality of life while suffering from severe mental problems or poor health, these subjects deserve more attention. Fourth, the ideal study design of a double-blind placebo-controlled case-control study was, for obvious reasons, not possible.

Conclusions

From the results of this study it can be carefully concluded that a treatment protocol providing puberty suppression at an early age, followed by hormone treatment and gender reassignment surgery, enables gender dysphoric adolescents to make important age appropriate developmental transitions, contributing to a satisfactory quality of life in young adulthood. Nevertheless, adolescents experiencing poor peer relations considered their quality of life less favorable, indicating the importance of social support.