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**Quality of Life, Psychosocial Resources and Psychological
Strain in Trans* Women after Gender-Affirming Surgery.
A Cross-Sectional Study.**

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Index

1 Theoretical Background.....	7
1.1 Introduction	7
1.2 Terminology	8
1.3 A Brief Review of the Development of Terminology	10
1.4 Prevalence of Trans* Identities.....	12
1.5 Quality of Life	13
1.5.1 Quality of Life in Trans* People	14
1.6 Psychosocial Resources	15
1.6.1 Personal Resources	16
1.6.2 Social Resources	16
1.6.3 Structural Resources	17
1.6.4 Psychosocial Resources in Trans* People	17
1.7 Psychological Strain in Trans* People	18
1.8 Study Objectives, Research Questions and Hypotheses	19
2 Materials and Methods	23
2.1 Design.....	23
2.2 Experimental Procedure	23
2.3 Participants	24
2.4 Test Materials.....	25
2.4.1 Essen Resource-Inventory (ERI)	26
2.4.2 Social Support Scale (SSS).....	26
2.4.3 Sense of Coherence Scale (SOC-13).....	27
2.4.4 Relationship Questionnaire (RQ)	27
2.4.5 Health-related Quality of Life Questionnaire, Short-form 12 (SF-12).....	27
2.4.6 Essen Transidentity Quality of Life-Inventory (ETLI)	28
2.4.7 Symptom Checklist (SCL-27)	28
2.4.8 Item assessing General Quality of Life	28
2.4.9 Demographic Parameters.....	29
2.5 Statistical Analyses	29
3 Results	31

3.1 Sample Characteristics.....	31
3.1.1 Group Differences in Demographic Data	31
3.2 Quality of Life	33
3.2.1 Generic Physical and Mental Quality of Life	33
3.2.2 The Essen Transidentity Quality of Life-Inventory.....	35
3.2.3 Changes in Quality of Life Throughout the Transitioning Process.....	40
3.3 Psychosocial Resources	41
3.3.1 The Essen Resource-Inventory	41
3.3.2 Social Support Scale	46
3.3.3 The Sense of Coherence Scale.....	47
3.3.4 Relationship Questionnaire.....	48
3.4 Psychological Strain	49
3.4.1 The Symptom Checklist.....	49
3.5 Correlations.....	50
3.6 Predicting QOL – Regression Analyses.....	52
3.6.1 Predicting Generic Physical QOL	52
3.6.2 Predicting Generic Mental QOL.....	53
3.6.3 Predicting Trans* specific QOL.....	54
4 Discussion.....	55
4.1 Summary of the Results	55
4.2 Evaluation of the Hypotheses	55
4.3 Evaluation of the Methods	67
4.4 Conclusions and Future Directions.....	69
5 Summary.....	71
References.....	72
Appendix	80
A. Abbreviations	81
B. Index of Tables.....	83
C. Index of Figures	83
Acknowledgements	87
Curriculum Vitae.....	88

1 Theoretical Background

1.1 Introduction

In trans* people the subjectively perceived gender identity does not match the biological sex assigned at birth. Many of them wish to adapt their physical sex characteristics to their gender identity with the help of medical treatment as hormone therapy (HT) or gender-affirming surgery (GAS). The process of changing the physical appearance and social gender presentation may be accompanied by different strains and stressors that may influence someone's well-being and quality of life (QOL). Further, the often described feeling of "being trapped in the wrong body" and the perception of belonging to a minority group of our society may be source of severe psychological strain and may even contribute to the development of mental diseases as anxiety illnesses or depression. In the face of such a challenging condition psychosocial resources such as social support, perceived self-efficacy or access to health-care may play a crucial role in supporting a person's wellbeing and mental health and withstanding possible harmful effects of the manifold stressors.

At the beginning of their transition many trans* people are supported by counseling or psychotherapy. In the past, psychotherapeutic support was even obligatory prior to any medical gender-affirming interventions. However, many clinical psychotherapists who accompany trans* people throughout their transition report that in most cases psychotherapeutic support ends at the latest around the time of GAS. For this reason, many of them have no knowledge about the long-term development and the well-being of their clients after the transition. Is there a happy end? How does someone who has finally "arrived in the right body" feel after completing the transition? Is there a total reduction of psychological strain and a remission of possible mental co-morbidities after transitioning? Does their level of psychosocial well-being, QOL, mental health and life satisfaction resemble that of the general population? Or does being trans* mean that one will eventually and inevitably be confronted with specific strains throughout the entire life span? What are the most important resources and coping skills trans* people use to master their specific challenges in life?

The present study aimed to address just these questions.

1.2 Terminology

When taking a closer look at gender identity it becomes obvious that gender is more multifaceted than the binary male-female distinction represents. This is also increasingly acknowledged in the present literature (e.g. Nieder et al., 2013; Van de Grift et al., 2017). Some people perceive incongruence between their biological sex and their gender identity. They are referred to as *trans**, *transsexual*, *transident*, *transgender*, *gender fluid*, *bigender*, *agender*, *gender incongruent* or *gender dysphoric*. The plethora of different terms describing similar, yet specific forms of gender identities can be rather confusing. Therefore, in the following a brief definition of the most important terms relevant to this work shall be given.

The *biological* or *natal sex* refers to a person's physical sex characteristics that comprise the chromosome set, gonads, endocrine systems (especially sex hormones), internal and external genitalia, secondary sex characteristics such as voice or body hair, physique, brain structures and –functions. These different dimensions of physical sex characteristics are usually congruent in trans* people, therefore allowing an explicit classification to the male or female sex (Shively & De Cecco, 1977; Nieder et al., 2013). In the case of ambiguity or incongruence of physical sex characteristics one would speak of an *intersex condition* (Bockting, 1999). Usually, a child is characterized as male or female at birth based on the external genitalia (Shively & De Cecco, 1977; Bockting, 1999).

Gender identity describes the “individuals basic conviction of being male or female” (Green, 1974 as cited in Shively & De Cecco, 1977) or another gender such as transgender (Bockting, 1999). Gender identification is subjective and part of the individual's self-identification. People differ in the intensity with which they identify with one gender. Furthermore, in some people different gender identities may co-exist or the gender identity may fluctuate. In most people gender identity matches the natal sex, though some people experience a strong discrepancy between the biological sex and their gender identity (Shively & De Cecco, 1977; Bockting, 1999).

The term *transgender* is an umbrella term describing a diversity of people whose gender identity does not or not completely match their biological sex assigned at birth (Nieder et al., 2013). All transgender identities have in common that they perceive some extent of incongruence between their biological sex and their gender identity while only some of

them wish to adapt their physical sex characteristics (Nieder et al., 2013). Among others the term transgender includes transsexual identities. The term *transsexualism* refers to persons who consistently perceive themselves as belonging to the gender opposite to their biological sex and who wish to change their physical sex characteristics to align their body with their gender identity (Dilling et al., 2011). Currently, the term *trans** was introduced which aims to acknowledge the plurality of gender. The * is borrowed from informatics and can be replaced by any word that seems appropriate to describe a specific form of gender identity (Nieder et al., 2013).

In people with *gender incongruence* the subjectively perceived gender identity does not, or at least not completely, match the biological sex. They may be *gender nonconforming* which means that they deviate from the cultural norms prescribed for a particular sex with regard to the gender identity, gender role or gender expression (Institute of Medicine, 2011). *Gender role* comprises a set of interests, attitudes, capabilities and behaviors that are prototypically ascribed to one gender. The stereotypical gender roles depend on culture and are constantly changing. *Gender role behavior* describes the public expression of one's gender identity by executing a specific role behavior to express to what extent one perceives oneself as belonging to one gender. Importantly, there may be a discrepancy between gender role behavior and gender identity (Nieder et al., 2013). Persons who like to wear clothes which are typically associated with the other gender (*transvestites* or *cross dresser*) or persons who identify with the male and female gender (*bigender persons*) usually experience some extend of gender incongruence (Institute of Medicine, 2011).

In people with *gender dysphoria* the gender incongruent condition causes severe discomfort or psychological strain. Many people diagnosed with gender dysphoria wish to adapt their physical sex characteristics with the preferred gender and seek medical treatment such as HT or GAS (American Psychiatric Association, 2013). Within the group of people diagnosed with gender dysphoria, biological males with female gender identity are considered as trans* women (or male-to-female trans* persons; MtF) while biological females with male gender identity are considered as trans* men (or female-to-male trans* persons, FtM; Van de Grift et al., 2017).

Transitioning describes the process of “[...] medically transitioning through the use of hormones and/or surgeries to allow biological sex to more closely align with one's core gender” (Bauer et al., 2012; p. 2) and socially transitioning by changing the gender

presentation in everyday life to better align with one's gender identity. This may involve changing the first name, using new pronoun and/or changing the gender-specific social presentation (Bauer et al., 2012).

In this work the term trans* will be used to acknowledge the plurality of gender and gender identities and the unique biographies that comprise a very individual process of transitioning. However, all participants in the present study perceived themselves as belonging to the gender opposite to their biological sex and had therefore been diagnosed with transsexualism according to the International Classification of Disease (ICD-10; Dilling et al., 2011) which enabled them to receive medical treatment.

1.3 A Brief Review of the Development of Terminology

In 1966 Benjamin introduced the term *transsexualism* initially to describe men with a persistent inner conviction of being female thereby persistently showing behaviors typically ascribed to the female gender and having a strong desire to medically and surgically align their anatomical sex with the preferred gender (Benjamin, 1966). Based on his observations of clinical samples, Fisk (1974) coined the term gender dysphoria after he had identified a large diversity of gender identities with many persons strongly deviating from the classical transsexual. Hereby, Fisk acknowledged the multiplicity of gender and trans* identities. Based on Fisk (1974) Benjamin in 1979 founded the Harry Benjamin International Gender Dysphoria Association that today is known as the World Professional Association of Transgender Health (WPATH; Coleman et al., 2012). In its Standards of Care the WPATH aims to provide clinical guidance for health professionals to help trans* people to achieve long-lasting health, wellbeing and comfort. Further, it advocates for the de-pathologization of gender incongruent identities (Coleman et al., 2012).

In the past, gender incongruent conditions have been considered pathological conditions as becomes obvious by the inclusion of the diagnosis of transsexualism into the section of mental disorders of the 9th and 10th version of the International Classification of Disease (ICD-9 and ICD-10). According to the current version of the ICD-10 (World Health Organization, 1992), the diagnosis *Transsexualism* (F64.0) is included in the Disorders of Adult Personality and Behaviors (F6). The diagnostic criteria are presented in **Table 1**.

Table 1. Diagnostic criteria for Transsexualism (F64.0) according to the International Classification of Disease (ICD-10; World Health Organization, 1992; p. 215).

“A desire to live and be accepted as a member of the opposite sex, usually accompanied by a sense of discomfort with, or inappropriateness of, one's anatomic sex, and a wish to have surgery and hormonal treatment to make one's body as congruent as possible with one's preferred sex”.

Diagnostic guidelines:

“For this diagnosis to be made the transsexual identity should have been present persistently for at least 2 years, and must not be symptom of another mental disorder, such as schizophrenia, or associated with any intersex, genetic, or sex chromosome abnormality”.

The World Health Organization intends to publish the 11th version of the ICD in 2018. There is a high probability that the diagnosis *Transsexualism* will be replaced by *Gender Incongruity* and will be included in the section provisionally entitled Conditions Related to Sexual Health (Drescher et al., 2013; Zucker et al., 2016). This may help to reduce stigma and still enable access to health care to allow persons experiencing discomfort or distress caused by the gender incongruity to access the necessary medical treatment (Nieder et al., 2013; Zucker et al., 2016; Nieder et al., 2017).

Similarly, a change in perspective becomes obvious when looking at the current revisions of the Diagnostic and Statistical Manual (DSM). The psychiatric diagnosis transsexualism first appeared in the 3rd version of the DSM in 1980 (American Psychiatric Association, 1980) and was changed into *Gender Identity Disorder* (302.85) in DSM-IV in 1994 (American Psychiatric Association, 1994). In the current version of the DSM-V (American Psychiatric Association, 2013) it has been replaced with the diagnosis *Gender Dysphoria* (302.85) though the diagnosis is still included in the chapter of mental disorders. The diagnostic criteria for the diagnosis gender dysphoria are presented in **Table 2.**

Table 2. Diagnostic criteria for Gender Dysphoria in Adolescents and Adults (302.85) according to the Diagnostic and Statistical Manual of Mental Disorders (DSM-V; American Psychiatric Association, 2013; p.453).

A	<p>“A marked incongruence between one’s experienced/expressed gender and assigned gender, of at least six months’ duration, as manifested by at least two of the following:</p> <ol style="list-style-type: none"> 1. A marked incongruence between one’s experienced/expressed gender and primary and/or secondary sex characteristics (or in young adolescents, the anticipated secondary sex characteristics) 2. A strong desire to be rid of one’s primary and/or secondary sex characteristics because of a marked incongruence with one’s experienced/expressed gender (or in young adolescents, a desire to prevent the development of the anticipated secondary sex characteristics) 3. A strong desire for the primary and/or secondary sex characteristics of the other gender 4. A strong desire to be of the other gender (or some alternative gender different from one’s assigned gender) 5. A strong desire to be treated as the other gender (or some alternative gender different from one’s assigned gender) 6. A strong conviction that one has the typical feelings and reactions of the other gender (or some alternative gender different from one’s assigned gender)”.
B	<p>“The condition is associated with clinically significant distress or impairment in social, occupational, or other important areas of functioning”.</p>

1.4 Prevalence of Trans* Identities

Many different estimates regarding the prevalence of trans* identities exist. This is presumably caused by the differences in methodology, considered diagnoses, date and country of study implementation (Arcelus et al., 2015). In their meta-analysis, Arcelus et al. (2015) included 12 studies assessing the prevalence of transsexualism and gender dysphoria worldwide. In total, 95.141.541 people were included in the analysis. Of those, 4355 persons had a diagnosis of transsexualism, gender identity disorder or gender

dysphoria. The authors concluded a prevalence of 4.6 trans* persons per 100.000 individuals. The prevalence of trans* women was 6.8 per 100.000 individuals while the prevalence of trans* men was 2.6 in 100.000 individuals. The ratio of trans* women to trans* men was found to be 2.6 trans* women for 1 trans* men. Prevalence rates were found to increase when comparing older studies with more recent work. Importantly, it should be noted that the prevalence rates of trans* people may be higher than estimated in this meta-analysis as most of the included studies based their estimates on trans* persons who were treated for their gender dysphoria in specialized clinics. In fact, studies assessing prevalence of people who self identify as transgender or gender incongruent have revealed prevalence rates of 0.5% (Conron et al., 2012), or 0.6% in natal females and 0.7% in natal males (Van Caenegem et al., 2015).

1.5 Quality of Life

QOL constitutes an important indicator for a person's subjective wellbeing. It is a multidimensional construct comprising at least a physical, mental and social component and includes positive (e.g. mobility, satisfaction) and negative (e.g. pain, negative emotions) dimensions (WHOQOLGroup, 1995). QOL has become an important outcome parameter in the context of illness and treatment evaluation (Schumacher et al., 2003). Instruments assessing health-related QOL are often divided into test instruments assessing generic and (disease) specific QOL.

With the help of instruments assessing generic QOL different groups of persons or patient populations can be compared regarding their QOL. These instruments assess global aspects of health-related wellbeing that apply to all different kinds of diseases or conditions (Schumacher et al., 2003).

Questionnaires assessing (disease) specific QOL allow a more focused assessment of aspects of QOL that are especially important for a specific disease or condition. Therefore, they are only applicable to a specified group of persons. These instruments allow the evaluation of changes of QOL within the target group for example before and after a medical intervention (Schumacher et al., 2003; Wahl et al., 2010).

1.5.1 Quality of Life in Trans* People

Studies investigating QOL in trans* people have revealed mixed results. In several studies a high QOL was found in trans* persons which was comparable to the general population (Weyers et al., 2009; Wierckx et al., 2011; Gorin-Lazard et al., 2012; Motmans et al., 2012) while other studies have detected lower QOL in trans* people (Newfield et al. 2006; Gómez-Gil et al. 2014; Lindqvist et al., 2017). A study by Motmans et al. (2012) detected a reduced QOL in trans* men while trans* women did not differ from the general population. Probably, this ambiguous pattern of evidence results from the diverging designs of the different studies. Besides using different methods for QOL assessment, the studies differed regarding their sample characteristics such as the different gender-affirming treatments or the subjects' different stages in the transitioning process at the time of assessment.

Many persons diagnosed with gender dysphoria seek medical and surgical treatment to align their body with their gender identity. Therefore, investigating the effects of HT and GAS on QOL in trans* persons is of special interest. In their meta-analysis Murad et al. (2010) reviewed the existing literature investigating the impact of HT on QOL in trans* people. The authors identified 28 studies that have been conducted between 1971 and 2007. Pooling across studies showed that after sex-reassignment including HT, 80% of the 1833 trans* participants reported an improvement of their general QOL, further 80% reported an improvement of their gender dysphoria, and 72% reported an improvement of sexual functioning. Importantly, the authors conclude that these results are based on very low quality studies that often lack standardized test instruments and a control group. However, more recent studies applying standardized questionnaires (SF-36 and WHOQOL) have revealed similar positive effects of HT on QOL (Newfield et al. 2006; Gómez-Gil et al. 2012; Gorin-Lazard et al., 2012, 2013; Bartolucci et al., 2014).

Research dealing with the effects of GAS in trans* people has revealed positive effects of GAS on sexual functioning and an overall satisfaction of clients' expectations regarding social and emotional dimensions and, to a lesser extent, regarding sexual and physical domains (Klein & Gorzalka, 2009; De Cuypere et al., 2005). In a study by Lawrence (2003) 86% of the 232 participating trans* women reported a high satisfaction with their GAS and 59% reported a strong improvement of their overall QOL since GAS. Only 6% had occasional regrets which were associated with unfavorable physical or functional outcomes of surgery. Ainsworth and Spiegel (2010) could find that in trans*

women who had received GAS, QOL was comparable to control women, while trans* women without GAS showed a significantly lower QOL. A current multicenter-study of Van de Grift et al. (2017) revealed that trans* people who were satisfied with the results of their GAS showed levels of QOL comparable to the general population while trans* individuals who were dissatisfied or regretful showed a diminished QOL. This study hints towards the importance of treatment satisfaction for QOL in trans* people.

Further important factors influencing QOL in trans* people have been identified in a current multicenter-study by Auer et al. (2017). The authors identified quality of sleep, anxiousness, unemployment and insecurity with their appearance as important predictors for QOL in trans* women. For trans* men quality of sleep and chronic pain proved to be important predictors for QOL.

So far, only a few studies exist that have evaluated the long-term development of QOL in trans* people. A longitudinal study investigating trans* adolescents between the start of puberty suppression and the completion of gender-affirming procedures has revealed that GAS and HT were associated with a steady improvement of gender dysphoria and subjective well-being (De Vries et al., 2014). Lindqvist et al. (2017) have assessed QOL in trans* people before as well as one, three and five years after GAS. They could show that QOL was significantly higher one year after GAS when compared to baseline assessment and remained stable in the following years.

1.6 Psychosocial Resources

In the context of trans* specific strains and stressors that may accompany trans* people throughout their transition it is especially important to look at protective factors that can help trans* individuals to cope with adverse life events. Psychosocial resources constitute such protective factors and play an important role in coping with stressors. They are essentially important for the maintenance of mental health and wellbeing by having a salutogenic or protective effect that may buffer negative influences of adverse life-events (Willutzki & Teismann, 2013; Tagay et al., 2014). Importantly, a person's subjective perception of the availability of resources is crucial (Jerusalem, 1990 as cited in Willutzki & Teismann, 2013).

The existing literature accords that different dimensions of resources exist. On the one hand there are resources that lie within the individual (i.e. personal resources). On the other hand environmental resources exist (i.e. social and material resources; Willutzki & Teismann, 2013). A similar, but even more detailed classification of resource dimensions is provided by Tagay et al. (2014). The authors differentiate between personal, social and structural resources. These three dimensions will be described in detail in the following sections.

1.6.1 Personal Resources

Personal resources are described by Tagay et al. (2014) as character traits or abilities of a person that originate in the individual's personality (e.g. perceived self-efficacy, openness to new experiences, flexibility and emotion regulation strategies). A very similar conceptualization was suggested by Willutzki and Teismann (2013) who describe intrapersonal resources as internalized behavior patterns, character traits or abilities of a person that are used to preserve or restore health.

One specific concept of personal resources that is worth mentioning in detail is the sense of coherence (SOC) that was described by Antonovsky in 1993. SOC describes a person's ability to flexibly react to life changes and to integrate (adverse) experiences into the own biography. This is based on the confidence that a specific life event is predictable, manageable and meaningful (Antonovsky, 1993). A plethora of research indicates that a high SOC is associated with good mental and physical health underlining its high protective potential (for review see Erikson & Lindström, 2006).

1.6.2 Social Resources

Social resources constitute another important resource dimension. It includes the subjectively perceived social support or the availability of positive social relationships (Tagay et al., 2014). Importantly, these social relationships are characterized by positive interaction patterns such as respect, reciprocity and dependability (Teismann & Willutzki, 2013). The importance of social resources for coping with stressors has often been verified empirically. For example, social support has been found to be an important coping resource having a stress buffering effect for women as well as for men (e.g.

Christenfeld et al., 1997; Mallinckrodt, 2001; Heinrichs, et al., 2003; Ditzen et al., 2008). Mallinckrodt (2001) points towards the interacting effects of personal and social resources: As the author describes, the ability to regulate emotions or the competence to begin and maintain satisfying social relationships influences the quality and thus the protective potential of these relationships.

1.6.3 Structural Resources

The dimension of structural resources describes a person's supporting environment, residential situation or financial security (Tagay et al., 2014). Further, the availability of cultural offers, socio economic status and income has been accounted to the structural resource dimension (Teismann & Willutzki, 2013).

1.6.4 Psychosocial Resources in Trans* People

So far, research systematically investigating the availability of psychosocial resources in trans* people is missing. Especially, the investigation of personal resources has not yet been in the focus of research. In a qualitative study Singh et al. (2014) identified "(a) the ability to self-define and theorize one's gender, (b) proactive agency and access to supportive educational systems, (c) connection to a trans-affirming community, (d) reframing of mental health challenges and (e) navigation of relationships with family and friends" (Singh et al., 2014; p. 208) as personal resources trans* people use to deal with life stressors. Importantly, this study comprised a small sample size (N=19) and focused on trans* adolescents only.

Several studies have revealed positive effects of social and familiar support on QOL in trans* adolescents and adults (Gómez-Gil et al., 2014; Simons et al., 2013; Davey et al., 2014). Furthermore, Ott et al. (2017) could find stress buffering effects of social support in the context of strains caused by internalized transphobia and minority stress (Ott et al., 2017). Additionally, a positive social identification with the trans* community has been related to lower levels of psychological strain (Sánchez & Vilain, 2009). Being in a relationship was found to be positively associated with a high health-related QOL (Motmans et al. 2012) and a high sexual QOL (Bartolucci et al. 2014).

In their review on mental health in trans* people, Dhejne et al. (2016) identified disclosure of the gender dysphoria, social and parental support and the completion of the medical transition as protective factors. Studies that point towards the important influence of socioeconomic and employment status on QOL in trans* people (Motmans et al., 2012; Gómez-Gil et al., 2014) underline the importance of structural resources for QOL.

1.7 Psychological Strain in Trans* People

In many cultures trans* people are stigmatized and experience minority stress (Coleman et al., 2012; Hendricks & Testa, 2012) which may lead to a higher vulnerability in trans* people to develop mental health problems such as anxiety or depression (Institute of Medicine, 2011). Furthermore, in many trans* people transitioning is a gradual process. A stepwise alteration of physical appearance through hormone intake and surgical procedures occurs. The new gender role and gender-specific social presentation is often adopted in a long and gradual process which may be accompanied by severe strains (Senf, 2008). According to Senf (2008) there is no comparably radical change in a person's identity as occurs in the course of transitioning.

Several studies investigating mental health and psychiatric co-morbidities in trans* people have revealed a similar result pattern. Reisner et al. (2015) compared mental health in trans* adolescents with age- and sex-matched controls. They could find twofold to threefold higher risks for trans* adolescents to suffer from depression, anxiety disorders, suicide attempts, self-harm or receiving mental health treatment. Similarly, Davey et al. (2014) could find significantly higher levels of psychopathology as measured with the SCL-90 in trans* people when compared to controls. In their review, Dhejne et al. (2016) conclude that compared to controls there is an increased risk of psychiatric morbidity in trans* people which decreases in the course of the transition. Duisin et al. (2014) compared trans* people with control persons from the general population using SCID-II interviews to assess personality disorders. They could find higher prevalence of personality disorders in trans* individuals with trans* women showing the more severe forms of psychopathology. In a prospective longitudinal study Heylens et al. (2014b) assessed levels of psychopathology in trans* people before the beginning of medical treatment, at the beginning of HT and after GAS. Compared to the general population

trans* people showed significantly higher levels of psychopathology at baseline assessment. However, psychopathology scores decreased significantly at the beginning of HT and resembled those of the control group. This study hints towards the importance of gender-affirming medical treatment for mental health improvements in trans* individuals.

Social support was identified as one important factor to reduce anxiety symptoms in Chinese trans* women while having casual sexual relationships and experiencing friend discrimination were found to be associated with higher anxiety (Yang et al., 2016). Additionally, in their review Dhejne et al. (2016) identified victimization (discrimination, sexual abuse), difficulties to access health-care services, and interpersonal problems as risk factors for the development of psychiatric disorders.

1.8 Study Objectives, Research Questions and Hypotheses

The **first objective** of this study was to investigate generic health-related QOL in trans* women at the end of their transition. Additionally, the trans* specific QOL and its development in the course of the transitioning process was evaluated. The following research questions regarding QOL were addressed:

1. Does health-related mental and physical QOL of trans women at the end of their transition differ from QOL in the general population?*

Existing research investigating QOL in trans* people has revealed mixed results. While some studies could show comparable levels of QOL in trans* persons and controls (Weyers et al., 2009; Wierckx et al., 2011; Gorin-Lazard et al., 2012, 2013; Motmans et al., 2012) others have revealed lower levels of QOL in trans* persons (Newfield et al., 2006; Gómez-Gil et al., 2014; Lindqvist et al., 2017). This mixed result pattern is probably influenced by the different study designs and the subjects' different stages in their transition. Importantly, longitudinal prospective research by De Vries et al. (2014) and Lindqvist et al. (2017) revealed an improvement of QOL in the course of the transition. As participants in the present study had all completed their transition, a good QOL of the study sample was expected.

Hypothesis 1: *At the end of their transition trans* women do not differ from the general population regarding their health-related mental and physical QOL.*

2. Does trans* specific QOL change in the course of transitioning?

So far, no studies exist that have evaluated trans* specific QOL. Based on studies that could show an improvement of generic QOL throughout the transition (De Vries et al., 2014; Lindqvist et al., 2017) it is probable that there will be an improvement of trans* specific QOL as well.

Hypothesis 2: *Trans* specific QOL will be significantly higher at the end of transitioning than at the beginning (i.e. at the time of a person's coming-out as being trans*).*

3. What are the most important predictors of QOL in trans* women?

Current studies have revealed an especially important role of social and familiar support (Gómez-Gil et al., 2014; Motmans et al., 2012; Simons et al., 2013; Davey et al., 2014; Dhejne et al., 2016; Ott et al., 2017) for QOL in trans* persons. Therefore it was expected that social support will play an important role for the QOL of this sample group as well. As the literature investigating the influences of other psychosocial resources on QOL in trans* persons is scarce, further potential predictors of QOL were investigated exploratively.

Hypothesis 3: *High levels of social support is an important predictor for a high QOL in trans* women.*

The study's **second objective** was the systematic evaluation of the availability of different psychosocial resources in trans* women at the end of their transition. Furthermore, the development of psychosocial resources over the last three years was investigated. Specifically, the following research questions were addressed:

4. Do trans* women differ from the general population regarding their available psychosocial resources?

So far, only a few studies have investigated the availability of psychosocial resources in trans* persons. Davey et al. (2014) reported lower levels of social support in trans* women while trans* men did not differ from the general population. In their review Dhejne et al. (2016) found that trans* people receive or perceive themselves to receive less social support than controls. Based on these findings it was assumed that there would be a reduction of some of the resource dimensions in the current sample.

Hypothesis 4: *Compared to the general population trans* women show a lower diversity of available psychosocial resources.*

5. Does the availability of psychosocial resources change in the course of transitioning?

As several studies could show positive effects of gender-affirming treatments and an improvement of QOL throughout transitioning it was expected that:

Hypothesis 5: *The availability of psychosocial resources increases in the course of transitioning.*

The **third objective** of this study was to investigate psychological strain. Specifically, the following research question was addressed:

6. Do trans* women differ from the general population regarding their psychological strain?

Research addressing psychological strain, mental health and psychiatric co-morbidities in trans* people has consistently revealed that trans* people are at a higher risk of suffering from psychological strain and psychiatric co-morbidities (Davey et al., 2014; Duisin et al., 2014; Heylens et al., 2014b; Reisner et al., 2015, Dhejne et al., 2016). Encouragingly, research of Heylens et al. (2014b) revealed a reduction of psychological symptoms in the course of the transition. Similarly, in their review Dhejne et al., (2016) conclude that psychopathology improved in the course of the transition. On the other hand, research by Udeze et al. (2008) found no improvement of psychopathology in trans* people after transitioning. As psychological strain seems to be high in trans* people it was expected that:

Hypothesis 6: *Trans* women show higher amounts of psychological strain than the general population.*

The research questions were addressed using a cross-sectional study design. Trans* women who had received GAS at the Department of Urology at the University Clinic in Essen between January 1, 1995 and October 31, 2015 were invited to study participation via mail and received a set of questionnaires. A special characteristic of the present study sample was the large variance in the time interval since the participants' last gender-affirming procedure: While some participants had received GAS only 4 months before study participation, for others surgery dated back more than 21 years. This allowed the division of the total study sample into three subgroups depending on the relapse of time since the last GAS. By comparing the subgroups regarding measures of QOL, psychosocial resources and psychological strain it was possible to evaluate the post-operative long-term development of these parameters.

2 Materials and Methods

2.1 Design

A cross-sectional design was used to address the research questions. The factor *Group* was used as a between-subjects factor: The total study sample was divided into three subgroups according to the relapse of time since GAS at the moment of study participation. This allowed the comparison of available psychosocial resources, QOL and psychological strain between recently operated persons and persons who had received surgery many years ago. Furthermore, trans* women were compared to a control sample regarding these variables. Additionally, participants were asked to retrospectively indicate their QOL and the availability of psychosocial resources at different points of time in the transitioning process. Using the within-subjects factor *Time* differences in QOL and the existence of psychosocial resources in the course of the transitioning process were analyzed.

2.2 Experimental Procedure

Data sampling took place between February 1, 2016 and August 31, 2016. All trans* women who had received GAS at the Department of Urology within the defined period of time were contacted via mail and invited to participate in the study. Participants received a test package including written information about the aim and procedure of the study and a set of questionnaires. Participants had the opportunity to contact the authors at any time to clarify remaining questions about the study. If the contacted persons did not respond, a reminder was sent after 6 weeks and participants were again invited to participate. Participants were remitted 10€ for participation if they agreed to indicate information about their bank account. All participants provided written informed consent. The study protocol was approved by the ethics committee of the University Duisburg-Essen (Number of ethics committee approval: 15-6544-BO).

2.3 Participants

The internal data base of the clinic was searched to identify all trans* women who had received GAS at the Department of Urology at the University Clinic in Essen between January 1, 1995 and October 31, 2015. The flow-chart in **Figure 1** depicts the process of including participants into the study. Of the 610 identified persons, 53 were not contacted as available data was insufficient to identify the exact person ($n = 23$) or because they did not meet the inclusion criteria (e.g. they had not yet completed all sessions of GAS; $n = 30$). In total, 557 persons were contacted via mail and invited to participate in the study. Of those, 14 persons were deceased and 168 persons had moved and the new addresses could not be identified by contacting registration offices. Of the 375 persons who presumably received the study invitation, 7 persons stated that they were not interested in study participation and 210 persons did not respond. Importantly, it has to be noted that it cannot be clarified if the non-responders did after all receive the study invitation. In total, 158 trans* women participated in the study which represents a response rate of 42.13% ($\frac{158}{375} \times 100 = 42.13$).

Subjects were eligible to participate if they had a diagnosis of transsexualism (F64.0) according to the International Classification of Disease Tenth Version (ICD-10; Dilling et al., 2011) and had completed all sessions of GAS. All subjects had received medical appraisal by at least two external mental health professionals prior to surgery. Therefore, the diagnosis of transsexualism was considered as assured. Furthermore, they were aged 18 years and above, had sufficient knowledge of the German language and had agreed to the usage of their data for scientific purposes.

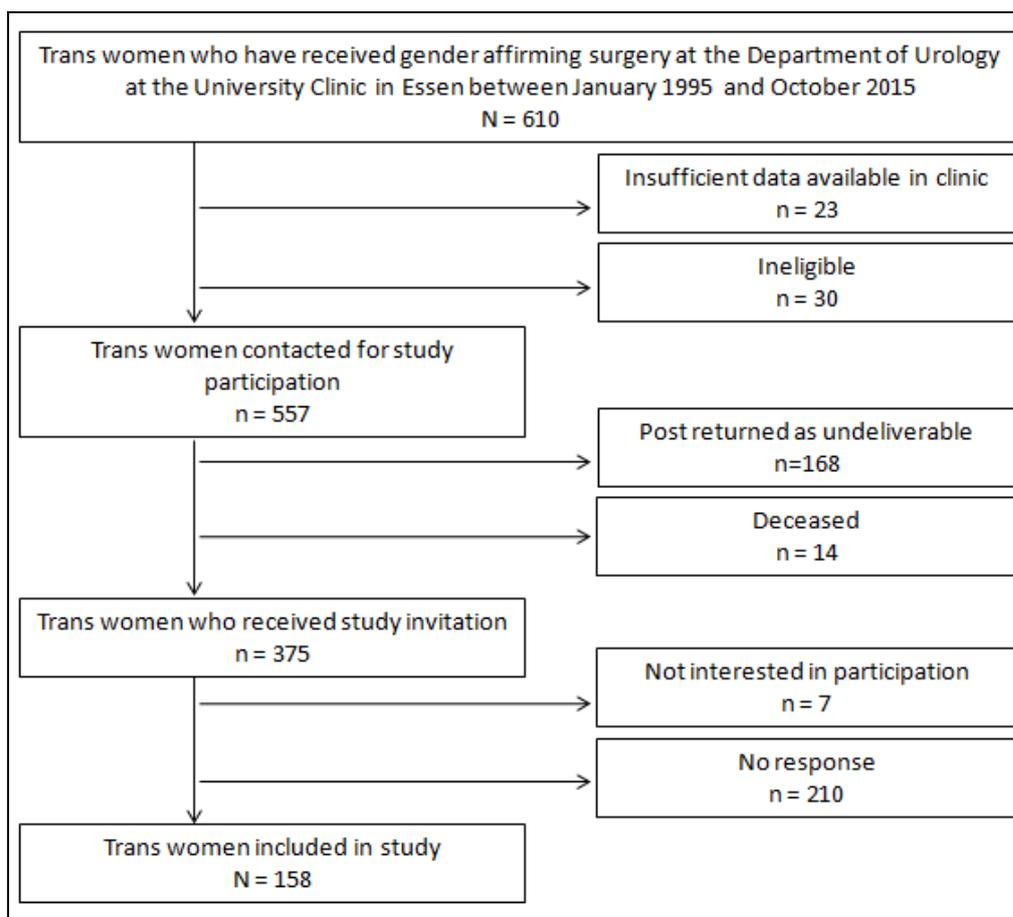


Figure 1. Flow-chart presenting the process of including participants into the study sample. In total, 158 of the contacted persons participated in the present study which results in a response rate of 42.13%.

2.4 Test Materials

An elaborate set of standardized questionnaires was used to address the research questions. Quality of life was measured using the Health-related Quality of Life Questionnaire, Short-form 12 (SF-12) and the Essen Transidentity Quality of Life-Inventory (ETLI). To evaluate the availability of psychosocial resources the Essen Resource Inventory (ERI), the Social Support Scale (SSS), the Sense of Coherence Scale (SOC-13) and the Relationship Questionnaire (RQ) were used. Finally, psychological strain was measured using the symptom checklist (SCL-27). The used test package was tested on comprehensibility and feasibility in a pilot study with N = 10 trans* women before the start of data acquisition. Participants of the pilot sample reported that it had taken them 40-60 minutes to fill in the questionnaires.

2.4.1 Essen Resource-Inventory (ERI)

The Essen Resource-Inventory (ERI) was developed by Tagay et al. (2014) to assess the individual set of a person's psychosocial resources. Such resources can help an individual to withstand adverse life events and strains. The ERI comprises three dimensions that assess (1) personal resources (PER), i.e. resources that originate in a person's character traits (e.g. self-efficacy, openness, meaningfulness, flexibility, the capability to regulate one's emotions or relatedness to nature), (2) social resources (SOR; e.g. social support, positive social relationships) and (3) structural resources (STR; e.g. financial security, access to education or healthcare). For a detailed description of the different psychosocial resource dimensions please see above. It is assumed that the three resource dimensions are closely interacting and influencing each other. The ERI allows the generation of a global score to estimate the general availability of psychosocial resources. Furthermore, the generation of three subscores enables the evaluation of the three different resource dimensions. Participants are instructed to indicate how strongly they could rely on the different psychosocial resources in the last four weeks (4-weeks-version) and three years ago (three-years-version). Subjects can indicate on a 4-points Likert-Scale (0: not at all; 3: very much) how strongly they agree with each item. A high ERI score represents a high availability of the different resources. Furthermore, the ERI comprises two open questions, asking for the most pleasant and the most upsetting event in the last three years.

2.4.2 Social Support Scale (SSS)

The Social Support Scale (SSS) was developed by Sommer and Fydrich (1991) to measure the individual's subjectively perceived or anticipated support from the social environment. In the present study the short version, consisting of 22 items, was used to enable an economic assessment of the domains of emotional and practical support, social integration, presence of confidants and satisfaction with social support. A general score can be calculated to indicate the extent of perceived social support. Participants are asked to indicate on a 5-points Likert-Scale (1: not at all; 5: very much) how strongly they agree with each statement. High values indicate high levels of social support.

2.4.3 Sense of Coherence Scale (SOC-13)

The Sense of Coherence Scale (SOC-13) has been developed by Schuhmacher, Gunzelmann and Brähler (2000). It is based on Antonovsky's concept of SOC which constitutes an important personal resource that helps an individual to resist against stressors and strains (Antonovsky, 1993). For a detailed description of the SOC please see paragraph 1.6.1. The SOC-13 comprises 13 items that merge into the subscales predictability, manageability and meaningfulness. Furthermore, a global score can be calculated. The items can be answered using a 7-points Likert-Scale ranging from 1 to 7 with high values indicating a high sense of coherence. In the present study the global score of the SOC-13 was analyzed.

2.4.4 Relationship Questionnaire (RQ)

The short version of the Relationship Questionnaire (RQ; Hahlweg et al., 1996) was developed by Kliem et al. (2012) to economically assess a person's satisfaction with her relationship or marriage. The RQ comprises 9 items that are summarized to one global score. For each item subjects can indicate on a 4-points Likert-Scale (0: never; 3: very often) how often a specific behavior is shown by them or their partner. A high score indicates a high relationship quality. Furthermore, one item measuring general happiness is included that can be answered using a 6-points Likert-Scale (0: very unhappy; 5 very happy).

2.4.5 Health-related Quality of Life Questionnaire, Short-form 12 (SF-12)

The health-related quality of life questionnaire, short-form 12 (SF-12; Bullinger & Kirchberger, 1998) was designed to measure the generic health-related quality of life. The short version comprises the mental (MCS) and physical (PCS) component scale with 6 items each. Participants are supposed to indicate on different Likert-Scales how strongly they agree with each item. High SF-12 scores represent a high QOL.

2.4.6 Essen Transidentity Quality of Life-Inventory (ETLI)

The Essen Transidentity Quality of Life-Inventory (ETLI) was developed by Tagay et al. (2018) to assess the specific aspects of QOL in trans* persons. The ETLI comprises 30 items that assess the dimensions physical (pQOL), mental (mQOL) and social QOL (sQOL) and QOL through disclosure of the gender dysphoria (QOLd). It is assumed that the different aspects of QOL are closely interacting and influencing each other. Separate scores can be calculated for the four subscales. Additionally, one global score can be calculated representing the overall trans* specific QOL. Participants are instructed to rate their QOL in the last four weeks (4-weeks-version) and to retrospectively indicate their QOL at the time of their coming-out as trans* (coming-out-version). Hereby, coming-out is defined as the moment of the first revelation of the gender dysphoria to a person of the social environment. Participants can indicate on a 4-points Likert-Scale (0: not at all; 3: very much) how strongly they agree with each item. A high ETLI score indicates a high QOL.

2.4.7 Symptom Checklist (SCL-27)

The Symptom Checklist (SCL-27; Hardt et al., 2004) is a short version of the symptom checklist SCL-90 and can be used as a screening instrument for psychiatric symptoms. The questionnaire comprises 27 items measuring depressive, dysthymic, vegetative, sociophobic and agoraphobic symptoms as well as symptoms of mistrust (Hardt et al., 2004) that are summarized in a general severity index. Subjects can indicate on a 5-points Likert-Scale (0: not at all; 4: very much) how strongly they agree with each item. A high SCL score represents high psychological strain.

2.4.8 Item assessing General Quality of Life

Using the self-constructed item "Please indicate your general quality of life at the different points of time." participants were asked to indicate on a 7-points Likert-Scale (1: very bad; 7: very good) how they estimate their general QOL (1) at coming-out, (2) at the start of hormone-intake, (3) at gender-affirming surgery and (4) in the last four weeks.

2.4.9 Demographic Parameters

Using a self-constructed questionnaire, age, employment status, civil status, relationship status and the date of the GAS was assessed as demographic information.

2.5 Statistical Analyses

Data were analyzed using the statistic program SPSS 22. Test-by-test deletion was used to deal with missing data. Participants who could not be classified into one of the subgroups due to missing information about the date of GAS procedures were excluded from subgroup analyses ($n = 7$). The numbers of subjects included in each of the respective analyses are indicated accordingly.

The total trans* group was divided into three subgroups based on the time interval since their last GAS. Participants in group 1 ($n = 48$) had received surgery 4 months to 3.0 years before study participation. Participants in group 2 ($n = 62$) had received GAS between 3.1 years and 10 years before participating in the present study and participants in group 3 ($n = 41$) had received surgery 10.1 years to 21.4 years ago. The division of the total group was based on two criteria: Firstly, it was considered to align the sample sizes of the three subgroups as much as possible. Secondly, the sample was divided at the three-years-mark. By choosing this cut-off value it was ensured that all participants of group 1 had received GAS 3 years ago or less. Therefore, when filling in the 3-years-version of the ERI they referred to a time before their GAS. Thus, it was possible to compare the availability of resources of persons before (group 1) and after (group 2 and group 3) gender-affirming procedures.

Group differences in age were analyzed using a univariate ANOVA and post-hoc pairwise comparisons. Group differences in educational level, employment status, civil status and relationship status were analyzed using Chi-Square tests.

To analyze differences in trans* specific QOL a 3 (*Group*: Group 1 vs. Group 2 vs. Group 3) x 2 (*Time*: coming-out vs. 4 weeks) ANOVA for repeated measures (rmANOVA) was conducted for the four ETLI subscales and the global score respectively. Furthermore, a difference score was calculated for the ETLI which is defined as $\Delta_{ETLI} = \text{Mean}_{(4 \text{ weeks})} - \text{Mean}_{(\text{coming-out})}$ to evaluate the magnitude of change in ETLI scores.

The item assessing changes in general QOL throughout the transitioning process was analyzed using a 3 (*Group*: Group 1 vs. Group 2 vs. Group 3) x 4 (*Time*: coming-out vs. start hormone intake vs. surgery vs. 4 weeks) rmANOVA and post-hoc pairwise comparisons.

Similarly, the ERI was analyzed using a 3 (*Group*: Group 1 vs. Group 2 vs. Group 3) x 2 (*Time*: 3 years vs. 4 weeks) rmANOVA for the ERI subscales PER, SOR and STR and the global score respectively. *Time x Group* interactions were subsequently analyzed using rmANOVAs for each group separately. Afterwards, differences between the trans* group and controls regarding the different ERI subscales were analyzed using one sample t-tests. Data of control subjects were received from the normative sample of the ERI as reported by Tagay et al. (2014).

The SF-12, SCL-27, SSS, SOC-13 and RQ were analyzed using MANOVAs to test for differences between the trans* groups (*Group*: Group 1 vs. Group 2 vs. Group 3). Subsequently, trans* subjects were compared to the mean values of control samples provided in the respective test manuals using one sample t-tests.

Three separate multiple linear regression analyses (stepwise selection) were conducted to identify predictors for generic mental and physical QOL and trans* specific QOL. PCS, MCS and ETLI global score were considered as separate dependent variables. Premises for the implementation of a multiple linear regression analysis were tested beforehand. Variables relevant to the model were selected based on their clinical interest. Only variables that were significantly correlated with the respective dependent variable were entered into the regression model. Correlations were analyzed using bivariate correlations for metric variables and point-biserial correlations for dichotomous variables. Correlation coefficients are indicated as Pearsons *r*.

Before analyzing the different questionnaires, reliability analyses were conducted using Cronbachs α . Greenhouse-Geisser corrections were applied if homogeneity of covariances was violated. The significance threshold was set to $\alpha = .05$. Bonferroni corrections were applied to control for multiple testing. Effect sizes are reported as *Cohens d* if applicable and were considered as small ($d \leq 0.2$), medium ($d = 0.5$) and large ($d \geq 0.8$) effects according to the convention (Cohen, 1988).

3 Results

3.1 Sample Characteristics

The final sample consisted of 158 male-to-female trans* participants. They were aged between 22 and 77 years with a mean age of 49.78 years (SD = 11.16). All participants had completed GAS and were tested on average 6.32 years after the last surgical procedure (SD = 4.86; range: 0.33 years to 21.42 years). The demographic characteristics of the sample are presented in **Table 3** and **Table 4**.

3.1.1 Group Differences in Demographic Data

The ANOVA revealed a significant difference in age between the three trans* groups [$F_{(2,150)} = 11.35, p < .001, d = 0.77$]. Post-hoc analyses revealed that participants in group 1 were significantly younger than participants in group 2 ($p = .008$) and group 3 ($p < .001$) while participants of group 2 and group 3 did not differ significantly regarding their age ($p = .134$). With respect to civil status, relationship status, educational level and employment status no differences were detected between the three groups (civil status: $\chi^2_{(6)} = 4.45, p = .616$, relationship status: $\chi^2_{(2)} = 0.12, p = .943$, educational level: $\chi^2_{(8)} = 4.51, p = .809$, employment status: $\chi^2_{(2)} = 1.01, p = .604$).

Table 3. Age and Time Interval since Gender-Affirming Surgery

	Group 1			Group 2			Group 3			Statistics		
	Mean	SD	Range	Mean	SD	Range	Mean	SD	Range	F	(df)	p
Age	44.27	10.91	22-65	50.47	10.96	25-75	54.15	9.41	38-77	11.84	156	<.001**
Time since GAS(years)	1.43	0.76	0.3-3.0	5.85	2.18	3.1-10.0	12.77	2.97	10.1-21.4	316.91	150	<.001**

** : $p < .01$

Table 4. Demographic Properties of the Study Sample

	Total Group		Group 1		Group 2		Group 3		Statistics		
	n	%	n	%	n	%	n	%	χ^2	(df)	p
	N = 158		n = 48		n = 62		n = 41				
Civil status									4.45	6	.616
Unwed	84	53.2	30	62.5	31	50.0	19	46.3			
Married	36	22.8	9	18.8	17	27.4	10	24.4			
Divorced	35	22.2	9	18.8	12	19.4	11	26.8			
Widowed	3	1.9	0	0.0	2	3.2	1	2.4			
Relationship									0.12	2	.943
No relationship	84	53.2	24	50.0	33	53.2	21	51.2			
Current relationship	74	46.8	24	50.0	29	46.8	20	48.8			
Same partner as during coming-out as trans*	39	24.7	13	27.1	17	27.4	9	22.0			
Education									4.51	8	.809
University Degree	39	24.7	10	20.8	15	24.6	12	30.8			
University-entrance Diploma (Abitur)	42	26.6	15	31.3	18	29.5	8	20.5			
General Certificate of Secondary Education (Realschulabschluss)	38	24.1	14	29.2	15	24.6	9	23.1			
Certificate of Secondary Education (Hauptschulabschluss)	32	20.3	8	16.7	11	18.0	10	25.6			
No graduation	4	2.5	1	2.1	2	3.3	0	0.0			
Employment									1.01	2	.604
Engaged (student, part-time or full-time employment)	91	57.6	28	63.6	38	64.4	22	53.7			
Not engaged (unemployed, certified unfit for work, retired)	59	37.3	16	36.4	21	35.6	18	43.9			

For 7 subjects the date of gender-affirming surgery was missing. They were therefore excluded from subgroup analyses.

3.2 Quality of Life

3.2.1 Generic Physical and Mental Quality of Life

Before analyzing the SF-12 a reliability analysis was conducted which revealed good reliabilities for PCS (Cronbachs $\alpha = .83$) and MCS (Cronbachs $\alpha = .83$).

Results of the SF-12 are detailed in **Table 5**. The MANOVA revealed a significant main effect of *Group* [$F_{(2,136)} = 3.41, p = .036, d = 0.45$] for PCS. Post-hoc analyses showed that participants of group 3 showed a decreased physical QOL when compared to participants of group 1 ($p = .010$), while group 1 and group 3 did not differ from the participants in group 2 (both $p \geq .049$; p -value corrected for multiple testing).

For MCS of the SF-12 no differences between the three trans* groups emerged [*Group*: $F_{(2,136)} = 2.39, p = .095, d = 0.38$].

Next, the total trans* group was compared to a representative control sample regarding PCS and MCS. As can be seen in **Table 5** there were no significant differences between trans* subjects and the control group with regards to the PCS ($p = .060$). Trans* subjects scored significantly lower on the MCS when compared to the control group ($p < .001$).

Table 5. Results of the Health-related Quality of Life Questionnaire (SF-12)

SF-12 Physical Component Scale						
Group	Mean	SD	ANOVA			Effect size <i>d</i>
			<i>F</i>	(df)	<i>p</i>	
Group 1	51.08	8.87				
Group 2	47.06	11.06	3.41	(2,136)	.036*	0.45
Group 3	45.25	10.58				
Post-hoc analyses ^a						
			<i>t</i>	(df)	<i>p</i>	<i>d</i>
	G1-G2		1.99	94.80	.049	0.20
	G1-G3		2.66	74.27	.010 [†]	0.31
	G2-G3		0.80	94	.425	0.08
t-test ^b						
			<i>t</i>	(df)	<i>p</i>	<i>d</i>
Total Trans* Group	47.31	10.86	-1.89	142	.060	0.16
Controls	49.03	9.35				
SF-12 Mental Component Scale						
Group	Mean	SD	ANOVA			Effect size <i>d</i>
			<i>F</i>	(df)	<i>p</i>	
Group 1	45.43	12.55				
Group 2	46.68	12.27	2.39	(2,136)	.095	0.38
Group 3	51.08	11.74				
Post-hoc analyses ^a						
			<i>t</i>	(df)	<i>p</i>	<i>d</i>
	G1-G2		-0.96	96	.621	0.10
	G1-G3		-2.08	78	.041	0.24
	G2-G3		-1.77	94	.083	0.18
t-test ^b						
			<i>t</i>	(df)	<i>p</i>	<i>d</i>
Total Trans* Group	47.79	12.22	-4.36	142	<.001*	0.37
Controls	52.25	8.10				

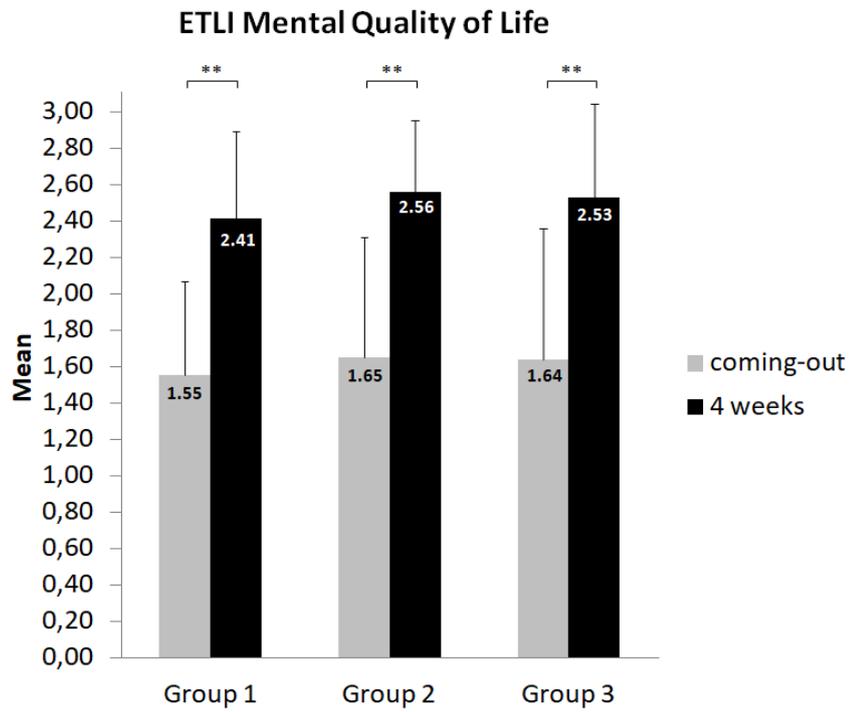
Mean values and standard deviations of the SF-12 physical and mental component scale are presented for the three trans* groups, the total trans* group and the control group respectively. **Group 1 (G1):** participants with GAS 4 months to 3 years ago; **Group 2 (G2):** participants with GAS 3.1 years to 10 years ago; **Group 3 (G3):** participants with GAS 10.1 years to 21.4 years ago. **a:** The t-statistics refer to the post-hoc comparisons of the respective trans* groups. To control for multiple testing the significance threshold was adjusted by $\frac{\alpha}{3} = .017$. **b:** The t-statistics refer to the comparison of the total trans* group and the control sample; Effect sizes are reported as *Cohens d*; *: $p < .05$; [†]: $p < .017$

3.2.2 The Essen Transidentity Quality of Life-Inventory

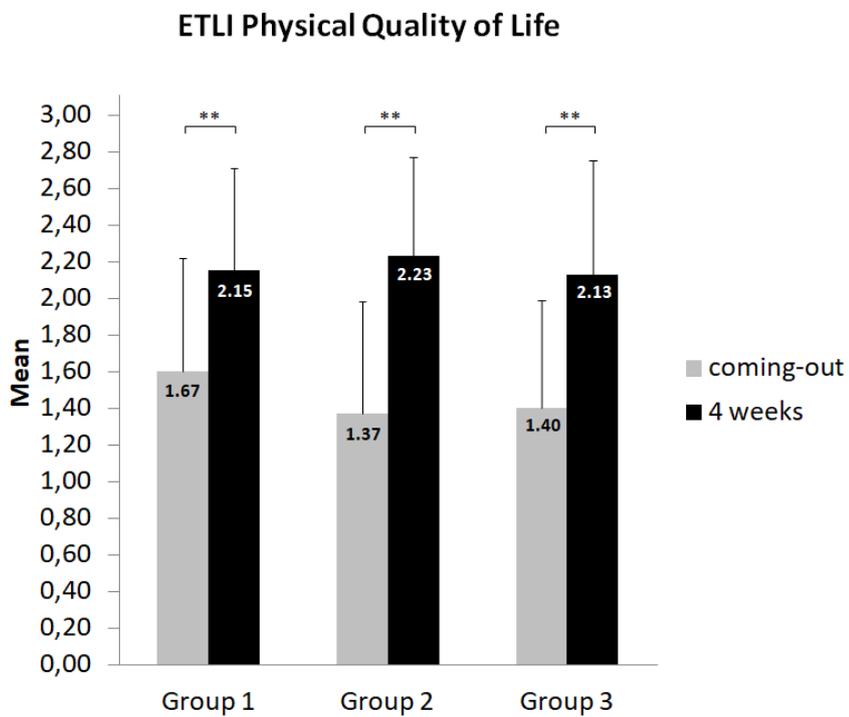
The reliability analysis of the 4-weeks-version of the ETLI revealed good reliabilities for the global score (Cronbachs $\alpha = .89$) as well as for the subscales mQOL (Cronbachs $\alpha = .88$) and sQOL (Cronbachs $\alpha = .84$). For the subscales pQOL (Cronbachs $\alpha = .76$) and QOLd (Cronbachs $\alpha = .76$) reliabilities were satisfactory. Similarly, reliability analysis of the coming-out-version revealed good reliabilities for the global score (Cronbachs $\alpha = .90$), as well as for the subscales mQOL (Cronbachs $\alpha = .89$) and sQOL (Cronbachs $\alpha = .82$). For the subscales pQOL (Cronbachs $\alpha = .73$) and QOLd (Cronbachs $\alpha = .80$) satisfactory reliabilities emerged.

For all subscales and the ETLI global score the rmANOVA revealed a significant main effect of the within-subjects factor *Time* [all $F \geq 94.80$, all $p < .001$, all $d \geq 1.67$] indicating higher QOL scores in the last four weeks when compared to coming-out. There was no main effect for *Group* for neither of the scales [all $F \leq 1.17$, all $p \geq .312$, all $d \leq 0.29$] and no significant *Time* x *Group* interaction [all $F \leq 2.76$, all $p \geq .067$, all $d \leq 0.41$] (see **Figure 2**).

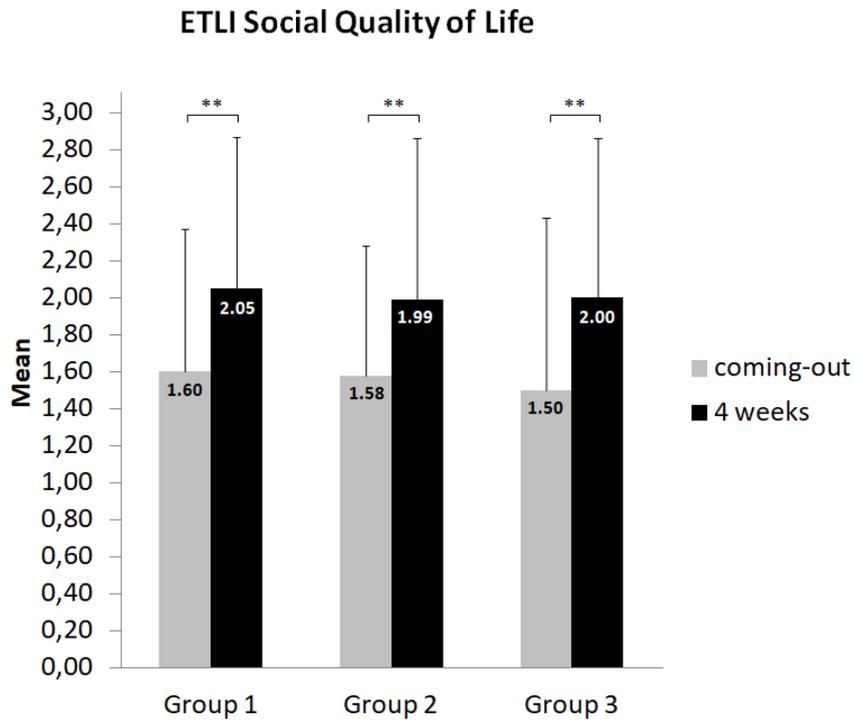
a)



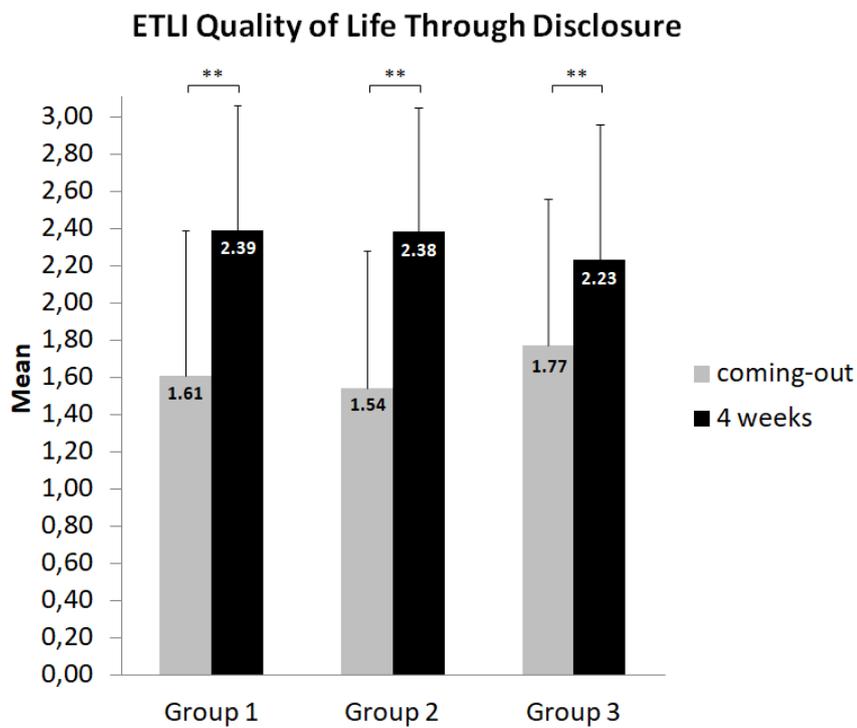
b)



c)



d)



e)

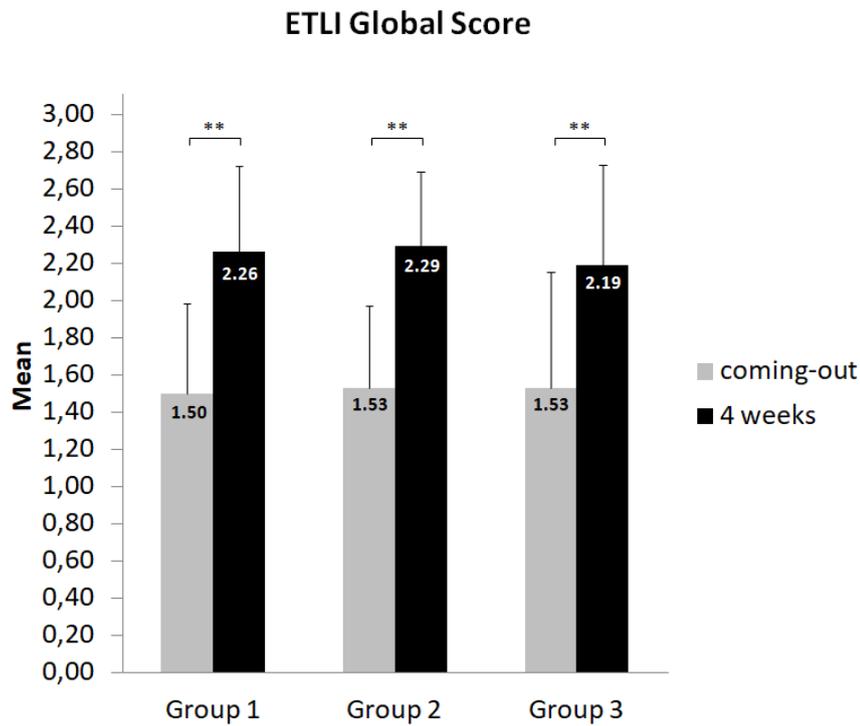


Figure 2. Mean values and standard deviations of the ETLI scales are presented for the three trans* groups separately. **Group 1:** participants with GAS 4 months to 3 years ago; **Group 2:** participants with GAS 3.1 years to 10 years ago; **Group 3:** participants with GAS 10.1 years to 21.4 years ago. As indicated by the bars, quality of life was significantly higher for the 4-weeks-version than for the coming-out-version. This effect can be found on all subscales and for all groups. *: $p < .05$; **: $p < .01$

As there were no group differences, the mean scores and the Δ scores of the ETLI are presented for the total trans* group. As is presented in **Table 6** there were significant increases in QOL scores on all ETLI subscales. As can be seen by the large effect sizes, QOL scores improved very strongly over time. Only for the subscale sQOL was there a slightly smaller improvement.

Table 6. Results of the Essen Transidentity Quality of Life-Inventory

Essen Transidentity Quality of Life-Inventory										
Scale	coming-out		4-Weeks		Δ_{ETLI}		ANOVA			Effect size <i>d</i>
	Mean	SD	Mean	SD	Mean	SD	<i>F</i>	(df)	<i>p</i>	
Mental QOL	1.64	0.64	2.52	0.45	0.89	0.56	368.38	(1,155)	<.001**	3.06
Physical QOL	1.34	0.61	2.18	0.57	0.86	0.65	249.59	(1,153)	<.001**	2.55
Social QOL	1.53	0.83	1.98	0.88	0.44	0.54	99.76	(1,148)	<.001**	1.63
QOL through disclosure	1.65	0.78	2.35	0.68	0.70	0.83	108.48	(1,154)	<.001**	1.67
ETLI Global	1.53	0.51	2.25	0.45	0.72	0.48	323.07	(1,144)	<.001**	2.98

Mean values, standard deviations and the ETLI difference score. $\Delta_{ETLI} = \text{Mean}_{(4 \text{ weeks})} - \text{Mean}_{(\text{coming-out})}$ representing the magnitude of change of ETLI scores between coming-out and the last 4 weeks. Effect sizes are reported as *Cohens d*; *: $p < .05$; **: $p < .01$

3.2.3 Changes in Quality of Life Throughout the Transitioning Process

A rmANOVA was used to analyze the self-constructed item that retrospectively assessed the general QOL at different points of time in the transitioning process (see **Figure 3**). The analysis did not reveal any group differences [*Group*: $F_{(2,147)} = 0.39$, $p = .676$, $d = 0.2$] or a significant *Time x Group* interaction [$F_{(6,441)} = 0.39$, $p = .911$, $d = 0.2$]. For the within-subjects factor *Time* a significant main effect was detected [$F_{(3,441)} = 149.97$, $p < .001$, $d = 2.04$] showing that general QOL increased significantly in the course of the transitioning process. Post-hoc analyses revealed that there was a significant increase in QOL scores from coming-out to the start of hormone intake ($p < .001$) and from the start of hormone intake to surgery ($p < .001$). Scores did not differ significantly between surgery and the last four weeks ($p = .578$). **Figure 3** depicts the changes in QOL over time for the three trans* groups.

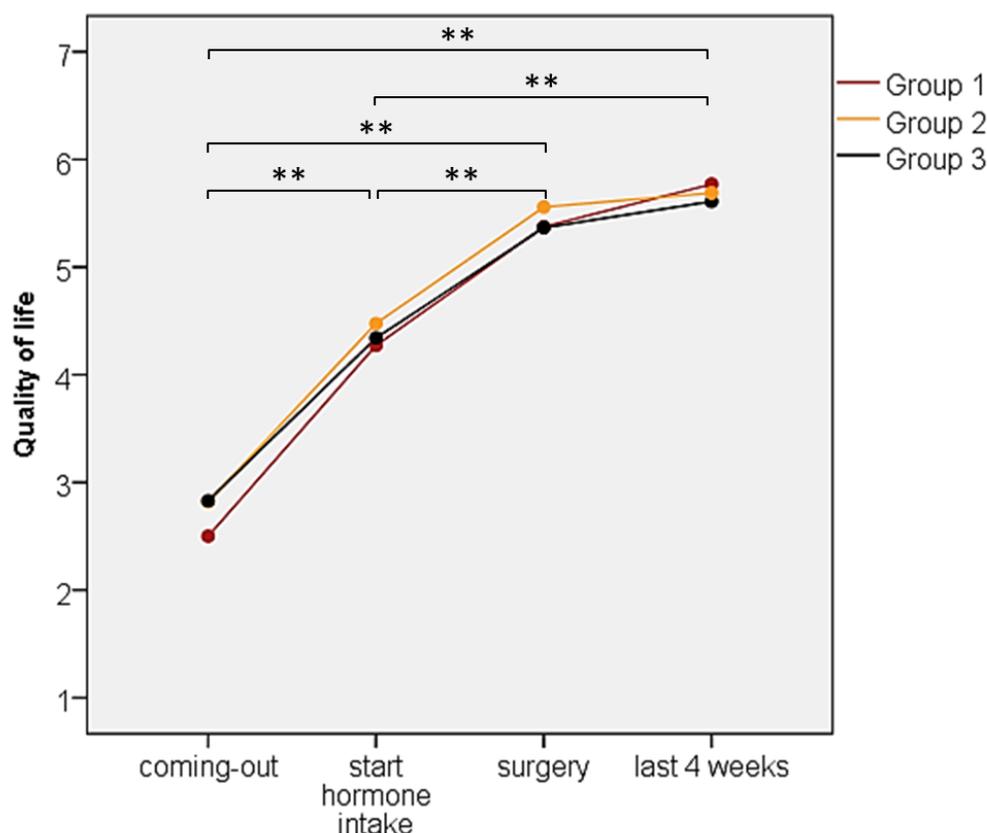


Figure 3. Responses to the item “Please indicate your general quality of life at the different points of time”. A score of 1 indicates a very low quality of life while a score of 7 indicates a very high quality of life. **Group 1:** participants with GAS 4 months to 3 years ago; **Group 2:** participants with GAS 3.1 years to 10 years ago; **Group 3:** participants with GAS 10.1 years to 21.4 years ago; *, $p < .05$; **, $p < .01$

3.3 Psychosocial Resources

3.3.1 The Essen Resource-Inventory

For the 4-weeks-version of the ERI the reliability analysis revealed good and very good reliabilities for the global score (Cronbachs $\alpha = .93$) and the subscales PER (Cronbachs $\alpha = .92$) and SOR (Cronbachs $\alpha = .87$). It was only for the subscale STR that the reliability was insufficient (Cronbachs $\alpha = .54$). Similarly, for the 3-years-version there were good and very good reliabilities for the global score (Cronbachs $\alpha = .93$) and the subscales PER (Cronbachs $\alpha = .92$) and SOR (Cronbachs $\alpha = .86$) while the subscale STR showed an insufficient reliability (Cronbachs $\alpha = .54$).

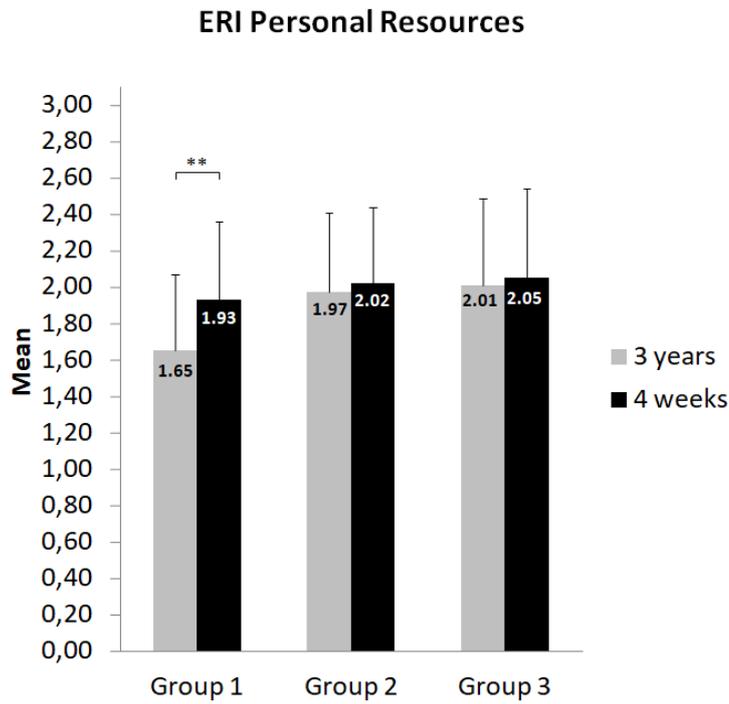
For each scale a rmANOVA was conducted and the three trans* groups were compared. For the subscale PER the ANOVA revealed a significant main effect of *Time* [$F_{(1,121)} = 21.57, p < .001, d = 0.84$] which indicated that there was an overall increase in personal resources over time. Furthermore, a significant main effect of *Group* [$F_{(2,121)} = 3.84, p = .024, d = 0.51$] and a significant *Time x Group* interaction [$F_{(2,121)} = 8.54, p = .001, d = 0.74$] emerged. Subsequently, for each of the three groups separate analyses were conducted to compare the two different time versions. The significance threshold was adjusted for multiple testing by $\frac{\alpha}{3} = .017$. As **Figure 4a** shows, analyses revealed that for group 1 there was a strong increase in personal resources from 3 years to the last 4 weeks [$F_{(1,41)} = 20.39, p < .001, d = 1.40$] while there was no effect of *Time* for group 2 [$F_{(1,48)} = 1.37, p = .247, d = 0.35$] and group 3 [$F_{(1,32)} = 6.14, p = .019, d = 0.87$].

Analyses of the ERI subscale SOR revealed a significant main effect of *Time* [$F_{(1,142)} = 6.88, p = .010, d = 0.46$] which was produced by an overall increase of social resources over time. There was neither a significant main effect of *Group* [$F_{(2,142)} = 0.24, p = .787, d = 0.00$] nor a significant *Time x Group* interaction [$F_{(2,142)} = 2.31, p = .103, d = 0.35$]. **Figure 4b** presents mean values for the three subgroups respectively. As is depicted, group 1 showed a significant increase in social resources over time [$F_{(1,146)} = 6.64, p = .013, d = 0.77$] while group 2 and group 3 did not show any differences between the two versions [both $F \leq 1.43$, both $p \geq .236$, both $d \leq 0.29$].

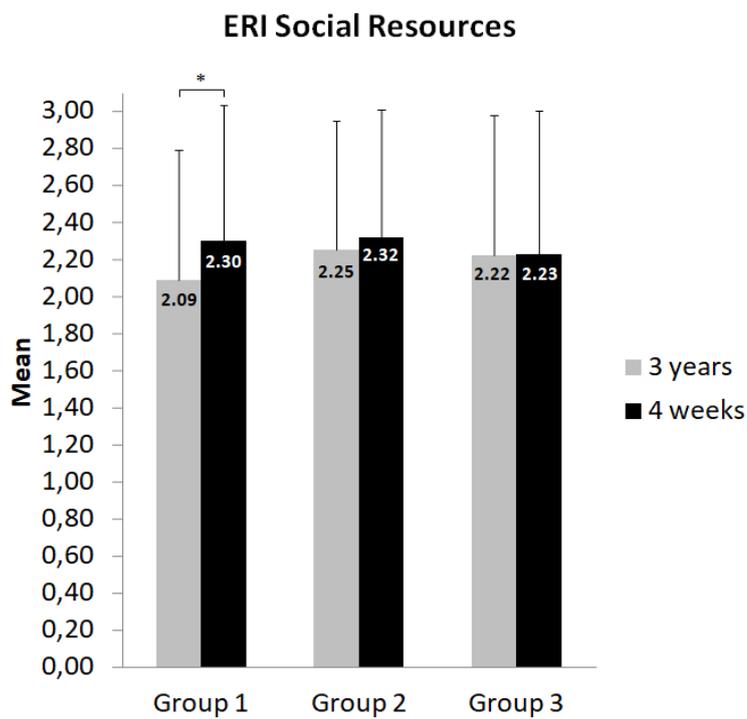
Similarly, analyses of the subscale STR (see **Figure 4c**) revealed a significant main effect of *Time* [$F_{(1,139)} = 13.71, p < .001, d = 1.60$] which was produced by an overall increase of structural resources. No significant main effect of *Group* emerged [$F_{(2,139)} = 1.23, p = .295, d = 0.29$] while the *Time* x *Group* interaction reached significance [$F_{(2,139)} = 3.18, p = .045, d = 0.41$]. Subsequent analyses showed a significant increase in structural resources from 3 years to 4 weeks for group 1 [$F_{(1,48)} = 9.53, p = .003, d = 0.91$] while group 2 [$F_{(1,57)} = 5.58, p = .019, d = 0.63$] and group 3 [$F_{(1,36)} = 0.47, p = .499, d = 0.20$] did not show differences between the two time versions of the ERI after correcting for multiple testing.

For the ERI global score (see **Figure 4d**) the ANOVA revealed a significant main effect of *Time* [$F_{(1,118)} = 19.31, p < .001, d = 0.81$] which was produced by the overall increase in the global score from 3 years to the last 4 weeks. Additionally, a marginally significant main effect of *Group* [$F_{(2,118)} = 2.27, p = .067, d = 0.46$] and a significant *Time* x *Group* interaction [$F_{(2,123)} = 7.60, p = .001, d = 0.70$] were detected. When analyzing the three groups separately, there was a strong increase in overall resources from 3 years to the last 4 weeks for group 1 [$F_{(1,40)} = 19.23, p < .001, d = 1.40$], while there was no main effect of *Time* for group 2 [$F_{(1,47)} = 1.21, p = .278, d = 0.35$] and for group 3 [$F_{(1,31)} = 5.59, p = .025, d = 0.85$] after correcting for multiple testing.

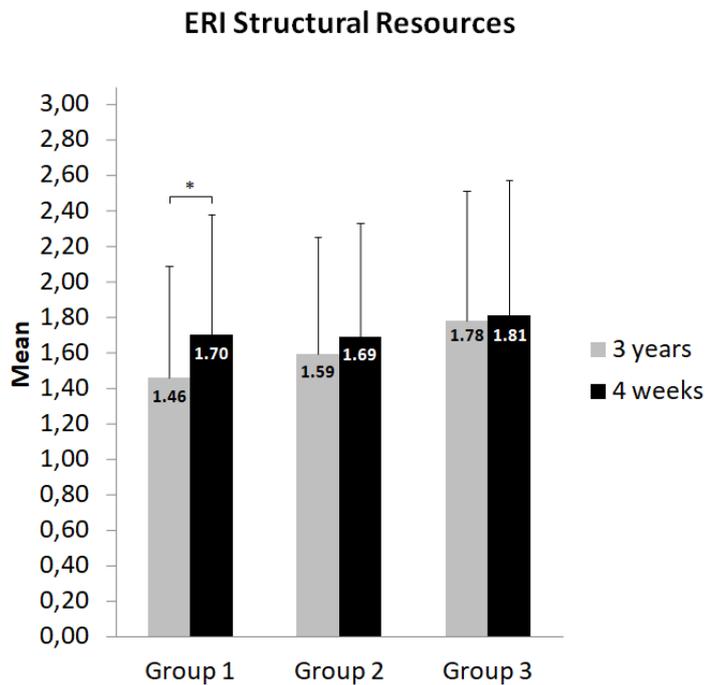
a)



b)



c)



d)

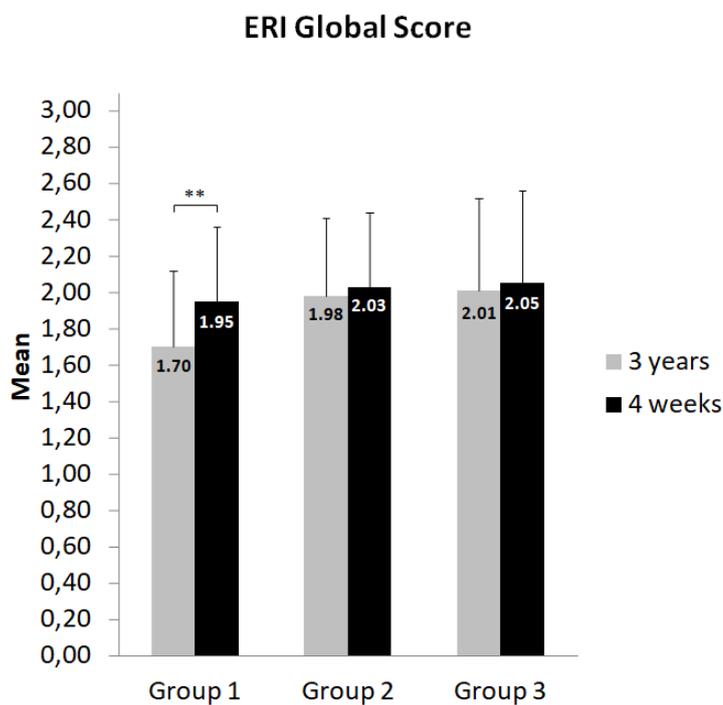


Figure 4. Mean values and standard deviations of the ERI subscales are presented for the three trans* groups respectively. **Group 1:** participants with GAS 4 months to 3 years ago; **Group 2:** participants with GAS 3.1 years to 10 years ago; **Group 3:** participants with GAS 10.1 years to 21.4 years ago. To control for multiple testing the significance threshold was adjusted by $\frac{\alpha}{3} = .017$; *: $p < .017$; **: $p < .01$

Next, the total trans* group was compared to a control sample with regard to the ERI 4-weeks-version. Mean values and standard deviations are depicted in **Table 7**. Trans* subjects showed significantly lower scores than controls on all subscales [all $t \leq -1.97$, all $p \leq .032$, all $d \geq 0.20$] and the ERI global score [$t_{(129)} = -3.31$, $p = .001$, $d = 0.30$].

Table 7. Results of the Essen Resource-Inventory

Essen Resource-Inventory							
Scale	Total Trans* Group		Controls		t-test		Effect size
	Mean	SD	Mean	SD	<i>t</i>	<i>p</i>	<i>d</i>
Personal Resources	2.01	0.44	2.09	0.39	-1.97	.032*	0.19
Social Resources	2.28	0.73	2.47	0.63	-3.14	.001**	0.26
Structural Resources	1.71	0.69	2.03	0.58	-5.50	<.001**	0.46
ERI Global	2.01	0.43	2.14	0.37	-3.13	.001**	0.30

Mean values and standard deviations for the ERI subscales of the total trans* group and the control group. Effect sizes are reported as *Cohens d*, *: $p < .05$; **: $p < .01$

3.3.2 Social Support Scale

Reliability analysis of the SSS revealed a very good internal consistency (Cronbachs $\alpha = .96$).

Results are presented in **Table 8**. The MANOVA revealed that there were no significant differences between the trans* groups in the SSS [*Group*: $F_{(2,74)} = 1.31, p = .277, d = 0.41$]. Trans* persons did not differ significantly from controls regarding the perceived social support [$t_{(156)} = 1.10, p = .271, d = 0.08$]

Table 8. Results of the Social Support Scale

Social Support Scale						
Group	Mean	SD	ANOVA			Effect size
			<i>F</i>	(df)	<i>p</i>	<i>d</i>
Group 1	3.99	0.98				
Group 2	4.10	0.75	1.31	(2,74)	.277	0.41
Group 3	3.97	0.96				
t-test						
			<i>t</i>	(df)	<i>p</i>	<i>d</i>
Total Trans* Group	3.99	0.91	1.10	(156)	.271	0.08
Controls	3.91	0.71				

Mean values and standard deviations of the Social Support Scale are presented for the three trans* groups, the total trans* group and the control group respectively. **Group 1:** participants with GAS 4 months to 3 years ago; **Group 2:** participants with GAS 3.1 years to 10 years ago; **Group 3:** participants with GAS 10.1 years to 21.4 years ago. Effect sizes are reported as *Cohens d*.

3.3.3 The Sense of Coherence Scale

The SOC-13 global scale showed a good internal consistency (Cronbachs $\alpha = .88$).

The MANOVA revealed a significant main effect of *Group* [$F(2,74) = 4.49, p = .015, d = 0.70$]. Post-hoc analyses clarified that participants in group 3 showed significantly higher scores than participants in group 1 ($p = .010$) while participants in group 2 did not differ significantly from group 1 ($p = .316$) and group 3 ($p = .039$). Note that the significance threshold was adjusted by $\frac{\alpha}{3} = .017$ to control for multiple testing. Trans* subjects did not differ significantly from controls ($p = .727$). Results are detailed in **Table 9**.

Table 9. Results of the Sense of Coherence Scale

Sense of Coherence Scale						
Group	Mean	SD	ANOVA			Effect size <i>d</i>
			<i>F</i>	(df)	<i>p</i>	
Group 1	4.71	1.29				
Group 2	4.94	0.96	4.49	(2,74)	.015*	0.70
Group 3	5.37	1.04				
Post-hoc analyses ^a						
			<i>t</i>	(df)	<i>p</i>	<i>d</i>
	G1-G2		-1.01	83.01	.316	0.11
	G1-G3		-2.58	85	.010 [†]	0.28
	G2-G3		-2.10	96	.039	0.21
t-test ^b						
			<i>t</i>	(df)	<i>p</i>	<i>d</i>
Total Trans* Group	4.97	1.11	-0.35	151	.727	0.03
Controls	5.00	0.89				

Mean values and standard deviations of the Sense of Coherence Scale are presented for the three trans* groups, the total trans* group and the control group respectively. **Group 1 (G1):** participants with GAS 4 months to 3 years ago; **Group 2 (G2):** participants with GAS 3.1 years to 10 years ago; **Group 3 (G3):** participants with GAS 10.1 years to 21.4 years ago. **a:** The t-statistics refer to the post-hoc comparison of the respective trans* groups. To control for multiple testing the significance threshold was adjusted by $\frac{\alpha}{3} = .017$. **b:** The t-statistics refer to the comparison of the total trans* group with the control sample. Effect sizes are reported as *Cohens d*; *: $p < .05$; [†]: $p < .017$

3.3.4 Relationship Questionnaire

The reliability analysis of the RQ revealed a good internal consistency (Cronbachs $\alpha = .83$).

Mean values and standard deviations of the trans* groups and control group are presented in **Table 10**. The MANOVA did not reveal significant differences between the trans* groups in regard to the perceived relationship quality [$F_{(2,74)} = 1.67, p = .195, d = 0.41$].

The t-test revealed that trans* subjects showed significantly higher scores on the RQ when compared to controls [$t_{(77)} = 3.89, p < .001, d = 0.44$]. Furthermore, trans* persons responded with a mean value of $M = 4.00$ ($SD = 1.16$) to the item of overall happiness with their relationship, which was significantly higher than the mean score of the control group [$M = 3.70$ ($SD = 0.90$); $t_{(80)} = 2.32, p = .023, d = 0.26$].

Table 10. Results of the Relationship Questionnaire

Relationship Questionnaire						
Group	Mean	SD	ANOVA			Effect size <i>d</i>
			<i>F</i>	(df)	<i>p</i>	
Group 1	22.17	4.53				
Group 2	19.75	5.50	1.67	(2,74)	.195	0.41
Group 3	20.29	5.02				
			t-test			
			<i>t</i>	(df)	<i>p</i>	<i>d</i>
Total Trans* Group	20.64	5.09	3.89	77	<.001**	0.44
Controls	18.40	4.90				

Mean values and standard deviations of the Relationship Questionnaire are presented for the three trans* groups, the total trans* group and the control group respectively. **Group 1:** participants with GAS 4 months to 3 years ago; **Group 2:** participants with GAS 3.1 years to 10 years ago; **Group 3:** participants with GAS 10.1 years to 21.4 years ago. Effect sizes are reported as *Cohens d*; *: $p < .05$; **: $p < .01$

3.4 Psychological Strain

3.4.1 The Symptom Checklist

Before analyzing the SCL-27, a reliability analysis was conducted which revealed a very good reliability (Cronbachs $\alpha = .90$).

Mean values and standard deviations for trans* subjects and controls are presented in **Table 11**. When the different trans* groups were compared no group differences in the SCL scores were detected [*Group*: $F_{(2,147)} = 0.34, p = .709, d = 0.20$]. Afterwards, the total trans* group was compared to a control sample. Trans* subjects showed significantly higher values of psychological strain than controls [$t_{(154)} = 6.91, p < .001, d = 0.55$].

Table 11. Results of the Symptom Checklist

Symptom Checklist						
Group	Mean	SD	ANOVA			Effect size <i>d</i>
			<i>F</i>	(df)	<i>p</i>	
Group 1	0.69	0.55				
Group 2	0.61	0.48	0.34	(2,147)	.709	0.20
Group 3	0.64	0.59				
t-test						
			<i>t</i>	(df)	<i>p</i>	<i>d</i>
Total Trans* Group	0.64	0.52	6.91	154	<.001**	0.55
Controls	0.35	0.40				

Mean values and standard deviations of the Symptom Checklist (SCL-27) are presented for the three trans* groups, the total trans* group and the control group respectively. **Group 1:** participants with GAS 4 months to 3 years ago; **Group 2:** participants with GAS 3.1 years to 10 years ago; **Group 3:** participants with GAS 10.1 years to 21.4 years ago. Effect sizes are reported as *Cohens d*; *: $p < .05$; **: $p < .01$

3.5 Correlations

Table 12 presents the correlations of the different demographic variables and psychometric measures. The most important significant correlations shall be highlighted in the following passage.

Correlation analyses for the demographic parameters showed that there was a moderate negative correlation between age and the SF-12 physical QOL (PCS: $r = -.322, p < .001$) and a weak but significant positive associations between age and the SF-12 mental QOL (MCS: $r = .237, p = .004$) and the sense of coherence (SOC-13: $r = .230, p = .004$). Furthermore, being employed was associated with less psychological strain (SCL: $r = -.240, p = .003$), a higher perceived social support (SSS: $r = .216, p = .008$) and a better physical QOL (PCS: $r = .439, p < .001$). Being in a relationship was correlated with a higher social support (SSS: $r = .294, p < .001$) and a better trans* specific QOL (ETLI: $r = .270, p < .001$).

When looking at the correlations between the different psychometric tests, there were strong negative associations between psychological strain (SCL) and the availability of psychosocial resources (ERI: $r = -.554, p < .001$), social support (SSS: $r = -.542, p < .001$), mental QOL (MCS: $r = -.690, p < .001$), sense of coherence (SOC 13: $r = -.691, p < .001$) and trans* specific QOL (ETLI: $r = -.632, p < .001$). Additionally, high levels of social support (SSS) was moderately associated with mental (MCS: $r = .346, p < .001$) and physical QOL (PCS: $r = .306, p < .001$) and relationship quality (RQ: $r = .382, p = .001$) and strongly associated with a high sense of coherence (SOC-13: $r = .533, p < .001$) and a good trans* specific QOL (ETLI: $r = .662, p < .001$). Mental QOL was further linked to a high sense of coherence (SOC-13: $r = .662, p < .001$) and a good trans* specific QOL (ETLI: $r = .472, p < .001$).

Table 12. Correlations

		1	2	3	4	5	6	7	8	9	10	11	12	13
Age (1)	<i>r</i>	1												
	<i>p</i>													
	N	158												
Time since GAS (2)	<i>r</i>	.331**	1											
	<i>p</i>	.000												
	N	151	151											
Education (3)	<i>r</i> [†]	-.096	.009	1										
	<i>p</i>	.237	.917											
	N	155	148	155										
Employment (4)	<i>r</i> [†]	-.307**	-.091	.287**	1									
	<i>p</i>	.000	.280	.000										
	N	150	143	147	150									
Relationship status (5)	<i>r</i> [†]	.104	-.032	.022	.069	1								
	<i>p</i>	.194	.700	.758	.399									
	N	158	151	155	150	158								
ERI global 4 weeks (6)	<i>r</i>	.041	.014	.079	.102	.154	1							
	<i>p</i>	.649	.881	.375	.259	.082								
	N	129	123	128	123	129	129							
SCL (7)	<i>r</i>	-.124	-.024	-.047	-.240**	-.167*	-.554**	1						
	<i>p</i>	.123	.769	.567	.003	.038	.000							
	N	155	148	152	148	155	127	155						
SSS (8)	<i>r</i>	-.046	-.045	.119	.216**	.294**	.582**	-.542**	1					
	<i>p</i>	.570	.587	.142	.008	.000	.000	.000						
	N	157	150	154	149	157	128	154	157					
SF-12 PCS (9)	<i>r</i>	-.322**	-.287**	.173*	.439**	.156	.130	-.175*	.306**	1				
	<i>p</i>	.000	.001	.040	.000	.063	.165	.038	.000					
	N	143	137	141	139	143	116	141	142	143				
SF-12 MCS (10)	<i>r</i>	.237**	.205*	-.049	.076	.025	.556**	-.690**	.346**	-.101	1			
	<i>p</i>	.004	.016	.564	.374	.764	.000	.000	.000	.230				
	N	143	137	141	139	143	116	141	142	143	143			
SOC-13 (11)	<i>r</i>	.230**	.201*	.151	.161	.199*	.577**	-.691**	.533**	.148	.662**	1		
	<i>p</i>	.004	.016	.065	.053	.014	.000	.000	.000	.084	.000			
	N	152	145	150	145	152	127	150	151	138	138	152		
ETLI global 4 weeks (12)	<i>r</i>	.070	-.108	.005	.178*	.270**	.606**	-.632**	.662**	.213*	.472**	.559**	1	
	<i>p</i>	.404	.207	.950	.036	.001	.000	.000	.000	.013	.000	.000		
	N	146	139	144	139	146	122	144	145	134	134	143	146	
RQ (13)	<i>r</i>	-.199	-.154	.006	.174	.056	.332**	-.156	.382**	.103	.273*	.220	.210	1
	<i>p</i>	.080	.181	.961	.134	.620	.005	.175	.001	.384	.019	.055	.071	
	N	78	77	76	75	80	69	77	77	73	73	77	75	78

r: bivariate correlations (Pearson); *r*[†]: point-biserial correlations (Pearson). *: *p* < .05; **: *p* < .01; **GAS**: Gender-affirming surgery; **ERI**: Essen Resource-Inventory; **SCL**: Symptom Checklist; **SSS**: Social Support Scale; **SF-12 PCS**: Physical Component Scale; **SF-12 MCS**: Mental Component Scale; **SOC-13**: Sense of Coherence Scale; **ETLI**: Essen Transidentity Quality of Life-Inventory; **RQ**: Relationship Questionnaire.

3.6 Predicting QOL – Regression Analyses

Three separate regression analyses were operated to predict generic health-related (SF-12 PCS and MCS) and trans* specific QOL (ETLI global score). Based on theoretical assumptions, the demographic variables age, time interval since GAS, education, employment status, and relationship status were considered as possible predictors for QOL. Furthermore, psychosocial resources (ERI global 4-weeks-version, SOC-13, SSS) and psychological strain (SCL) were evaluated. Before executing the regression analyses correlations were tested (see **Table 12**) and only variables that correlated with the respective dependent variable were entered into the regression model.

3.6.1 Predicting Generic Physical QOL

The variables age, time since GAS, education, employment status, social support (SSS) and psychological strain (SCL) correlated with PCS and were thus tested as predictors. As is shown in **Table 13** the regression analysis revealed two predictors for generic physical QOL: The most important predictor was employment status ($\beta = 0.38$) followed by time interval since GAS ($\beta = -0.26$). Together, these two variables explained 13.0% of the variance.

Table 13. Predictors for Generic Physical Quality of Life

SF-12 Physical QOL								
Predictors	Non-standardized coefficient		Standardized coefficient	<i>t</i>	<i>p</i>	<i>R</i> ²	<i>R</i> ² _{corr.}	<i>F</i>
	<i>B</i>	<i>SE</i>						
								<i>F</i> _(2,127) =18.57*
1. Employment	8.04	1.68	0.38	4.78	<.001**	.154	.052	
2. Time since GAS	-0.05	0.01	-0.26	-3.34	<.001**	.217	.130	

Results of the multiple linear regression analysis using a stepwise method. The final model contains two predictors for the general physical quality of life (SF-12 PCS). **B**: non-standardized regression coefficient; **SE**: standard error of the non-standardized regression coefficient; **β**: standardized coefficient indicating the importance of the predictor variables; **R**²: coefficient of

determination, indicating the amount of variance explained by the regression model; R^2_{corr} : corrected coefficient of determination using Stein's formula; *: $p < .05$; **: $p < .01$

3.6.2 Predicting Generic Mental QOL

The variables age, time since GAS, psychosocial resources (ERI global 4-weeks-version, SOC-13, SSS) and psychological strain (SCL) were correlated with MCS and were thus tested as predictors. Results of the regression analysis are presented in **Table 14**. Four predictors were identified: MCS was best predicted by a low level of psychological strain (SCL: $\beta = -0.42$) followed by a high sense of coherence (SOC-13: $\beta = 0.25$), older age ($\beta = 0.16$) and a high availability of psychosocial resources (ERI global: $\beta = 0.17$). Together, the predictors explained 57.0% of the variance.

Table 14. Predictors for Generic Mental Quality of Life

SF-12 Mental QOL								
Predictors	Non-standardized coefficients		Standardized coefficient	<i>t</i>	<i>p</i>	R^2	R^2_{corr}	<i>F</i>
	<i>B</i>	<i>SE</i>						
								$F_{(4,105)}=38.78^{**}$
1. SCL	-9.61	2.17	-0.42	-4.43	.004**	.503	.458	
2. SOC-13	2.76	1.10	0.25	2.52	.013*	.570	.531	
3. Age	0.18	0.07	0.16	2.36	.020*	.588	.550	
4. ERI Global	4.89	2.32	0.17	2.11	.037*	.606	.570	

Results of the multiple linear regression analysis using a stepwise method. The final model contains four predictors for the general mental quality of life (SF-12). **B**: non-standardized regression coefficient; **SE**: standard error of the non-standardized regression coefficient; **β** : standardized coefficient indicating the importance of the predictor variables; **R^2** : coefficient of determination, indicating the amount of variance explained by the regression model; **R^2_{corr}** : corrected coefficient of determination using Stein's formula; *: $p < .05$; **: $p < .01$

3.6.3 Predicting Trans* specific QOL

The variables employment status, psychosocial resources (ERI global 4-weeks-version, SOC-13, SSS) and psychological strain (SCL) were correlated with the ETLI global score and were therefore tested as predictors for trans* specific QOL. As is presented in **Table 15**, the regression analysis revealed three predictors: The most important predictor for the ETLI global score was a high level of perceived social support (SSS: $\beta = 0.39$), followed by low levels of psychological strain (SCL: $\beta = -0.34$) and a high availability of psychosocial resources (ERI global: $\beta = 0.23$). Together, the predictors explained 59.9% of the variance.

Table 15. Predictors for Trans* specific Quality of Life

ETLI Global Score								
Predictors	Non-standardized coefficients		Standardized coefficient	<i>t</i>	<i>p</i>	<i>R</i> ²	<i>R</i> ² _{corr.}	<i>F</i>
	<i>B</i>	<i>SE</i>	<i>B</i>					
								<i>F</i> _(3,110) =59.32**
1. SSS	0.19	0.04	0.39	5.34	<.001**	.457	.421	
2. SCL	-0.29	0.06	-0.34	-4.87	<.001**	.590	.563	
3. ERI Global	0.25	0.08	0.23	3.12	.002**	.624	.599	

Results of the multiple linear regression analysis using a stepwise method. The final model contains three predictors for the trans* specific quality of life (ETLI). **B**: non-standardized regression coefficient; SSS. Social Support Scale; SCL. Symptom Checklist; **SE**: standard error of the non-standardized regression coefficient; **β** : standardized coefficient indicating the importance of the predictor variables; ***R*²**: coefficient of determination, indicating the amount of variance explained by the regression model; ***R*²_{corr.}**: corrected coefficient of determination using Stein's formula; *: *p* < .05; **: *p* < .01

4 Discussion

4.1 Summary of the Results

The present study aimed to systematically investigate QOL, available psychosocial resources and psychological strain in trans* women at the end of their transition. Additionally, predictors of QOL in trans* women were investigated.

In the current study trans* women showed high levels of generic physical QOL which resembled the general population while mental QOL was reduced. Trans* specific QOL had strongly increased when comparing QOL at coming-out with QOL at the end of the transition. Physical QOL was predicted by employment status and a short time interval since GAS. Mental and trans* specific QOL were predicted by a high availability of psychosocial resources and low levels of psychological strain. While trans* subjects scored significantly lower than controls on all dimensions of the ERI, levels of social support and sense of coherence resembled the general population. Relationship quality was even higher in trans* subjects. Even at the end of the transition, trans* subjects showed almost twofold levels of psychological strain when compared to the general population.

4.2 Evaluation of the Hypotheses

Hypothesis 1: *At the end of their transition trans* women do not differ from the general population regarding their health-related mental and physical QOL.*

General health-related QOL was measured with the short-form health survey (SF-12, Bullinger & Kirchberger, 1998). In line with the hypothesis, the present study revealed high levels of physical QOL in trans* subjects which resembled the general population. This finding is in accordance with previous studies that could find comparably high levels of physical QOL in trans* persons and in the general population (Weyers et al., 2009; Wierckx et al., 2011; Motmans et al., 2012; Lindqvist et al., 2017). Importantly, these studies assessed QOL using the long version of the health survey (SF-36) which comprises 36 items that can be divided into 8 subscales. Additionally, the formation of a MCS and PCS is possible (Ellert & Kurth, 2004); therefore these studies can be

compared to the present results. Using the Quality of Life Questionnaire of the World Health Organization (WHOQOL-BREF) which assesses physical, mental, social and environmental QOL, De Vries et al. (2014) found the same levels of QOL in trans persons and controls as in the present study.

The existing literature indicates that HT (Murad et al., 2010; Newfield et al., 2006; Gómez-Gil et al., 2012; Gorin-Lazard et al. 2012, 2013; Bartolucci et al., 2014) and GAS (Lawrence, 2003; De Cuypere et al., 2005; Klein & Gorzalka, 2009; Ainsworth & Spiegel, 2010) are significantly associated with an improvement of QOL in trans* persons. As the present study sample consisted of persons who had all received gender-affirming medical treatment and were at the end of their transition, it is probable that physical QOL was high in the current sample. All participants had received GAS at least 4 months before study participation. Therefore, it is likely that pain or physical complaints resulting from surgery should have largely declined in all participants.

When comparing the three subgroups, participants of group 1 (i.e. those participants who had received surgery within the last three years) showed a significantly higher physical QOL than participants of group 3. This effect may be due to improvements of surgical techniques which may have led to better functional outcomes and fewer complications which consequently resulted in higher physical QOL. Indeed, in their review Horbach et al. (2015) report that some surgical techniques for neovaginoplasty performed before 2000 resulted in high complication rates and are therefore no longer used as first-line treatment options. Unfortunately, the operating surgeon, surgical techniques and the occurrence of post-surgical complications were not assessed in the current study. Another explanation for the differences in physical QOL between the trans* subgroups might be the significant difference in age. Participants in group 1 had a mean age of 44 years (range 22-65) while participants of group 3 had a mean age of 54 years (range 38-77). It is possible that the observed differences in QOL were not per se produced by the different time intervals since GAS but by differences in age. Research investigating age effects on physical QOL in large epidemiologic studies (e.g. Bullinger & Kirchberger, 1998; Bowling et al., 1999) has reported a decrease in physical QOL with older age. As age and time since GAS are highly correlated, it is logical that the three groups, which were classified based on the time interval since GAS, differ in age. The existing age differences of the subgroups do not therefore reflect short-comings in relation to the experimental methods but rather a natural condition. Many factors may

influence physical QOL of trans* people. Some of these include time interval since GAS and age.

Contrary to the expectations, mental QOL was significantly reduced in the current sample. High levels of mental well-being and QOL were expected as all study subjects had completed transitioning. Several studies have indicated improvements of QOL throughout the transitioning process (De Vries et al., 2014; Lindqvist et al., 2017). Furthermore, research by Weyers et al. (2009), Ainsworth and Spiegel (2010), Gorin-Lazard et al. (2012) and Motmans et al. (2012) showed high levels of mental QOL in trans* people that did not differ from controls. On the other hand, research done by Newfield et al. (2006), Wierckx et al. (2011), Gómez-Gil et al. (2014) and Lindqvist et al. (2017) has revealed a reduced mental QOL in trans* persons. A more in depth look at the existing research reveals that the different studies have deviating designs, sample characteristics and methods of assessment such as cross-sectional, retrospective and longitudinal study designs. Some studies include only trans* men or trans* women while others have used mixed samples. Some studies include only pre- or post-operative participants while others include subjects at different stages in the transitioning process. However, no systematic pattern can be detected that may explain the deviating results. Therefore, future research systematically examining mental QOL in trans* people is needed to clarify these ambiguities.

When comparing the three trans* subgroups, no differences regarding mental QOL could be observed. As mentioned above the three subgroups differed significantly in relation to their age. As in physical QOL, age dependent decreases in mental QOL have been observed in epidemiologic studies (e.g. Bullinger and Kirchberger, 1998; Bowling et al., 1999). In the present sample the negative effects of aging on mental QOL seem to have diminished. One possible explanation for this effect may be the long-term stabilization of mental QOL due to stabilization in the new gender role after transitioning and a broad availability of resources and protective factors.

Hypothesis 2: *Trans* specific QOL will be significantly higher at the end of transitioning than at the beginning (i.e. at the time of a person's coming-out as being trans*).*

The present study was the first to investigate trans* specific QOL using the ETLI (Tagay et al., 2018). In line with the hypothesis, a strong improvement in physical, mental and social QOL and the dimension QOL through disclosure of being trans* were detected when comparing QOL at coming-out with QOL in the last four weeks. These findings are in accordance with studies that have revealed an improvement of generic QOL throughout the transitioning process (De Vries et al., 2014; Lindqvist et al., 2017). The peculiarity of the investigation of trans* specific QOL using the ETLI is that specific aspects positively or negatively influencing QOL in trans* people can be investigated. Especially large improvements occurred for the ETLI subscales pQOL and mQOL. Trans* specific physical QOL includes the aspects of feeling comfortable with one's body or experiencing that one's body is attractive. Trans* specific mental QOL comprises the dimensions of "feeling trapped" in the wrong body, feeling helpless in the context of the gender dysphoria or suffering from minority stress. As the physical appearance and sex characteristics change in the course of the transition, it is plausible that trans* people start to feel more comfortable with their own body and experience fewer strains which may consecutively enhance physical and mental QOL.

Dhejne et al. (2016) describe disclosure as a protective factor for mental health in trans* people. In line with this, QOL through disclosure proved to be an important aspect of trans* specific QOL (Tagay et al., 2018) and is included in the ETLI as one independent subscale. In the present study a strong increase of the ETLI subscale QOLd was detected when comparing QOL at coming-out with the last four weeks. Coming-out as defined in the ETLI is the time of the first disclosure of being trans* to a person of the social environment. At this time it may still be difficult for some trans* people to be open about being trans*. Handling being trans* in a confident manner may still develop and may increase over time. The ETLI subscale QOLd comprises aspects as being able to openly talk about being trans* or being self-confident about being trans*. Therefore, it is plausible that QOL resulting from disclosure evolves over time and has strongly increased after GAS.

No differences between the subgroups emerged. All groups showed the same pattern of improvement on all subscales of the ETLI and the global score. Possibly, for a high

trans* specific QOL it is important *that* a person has transitioned and not *when* the transition occurred.

When taking a look at the single item asking participants to indicate their overall QOL at coming-out, at the start of HT, at GAS and in the last four weeks a significant increase in QOL scores was detected in all three subgroups. Interestingly, a nearly linear increase in QOL scores was detected between coming-out and GAS while no further significant improvement in QOL occurred after GAS. This indicates the importance of HT and GAS as especially meaningful steps in the transition. The importance of GAS for well-being and QOL in trans* people has first been outlined by Benjamin (1966) in his book *The Transsexual Phenomenon* and has subsequently been supported by several authors (e.g. Hage & Karim, 2000; De Cuypere et al., 2005; Bouman et al., 2014; Horbach et al., 2015). Similarly, HT has been associated with an improved QOL (Newfield et al., 2006; Murad et al., 2010; Gómez-Gil et al., 2012; Gorin-Lazard et al., 2012, 2013; Bartolucci et al., 2014).

Hypothesis 3: High levels of social support is an important predictor for a high QOL in trans* women.

The third research question addressed the identification of predictors for QOL in trans* women at the end of transitioning. So far, research investigating protective factors and psychosocial resources in trans* people is scarce. Several studies have consistently pointed towards the important role of social and familiar support for QOL in trans* persons (Gómez-Gil et al., 2012; Motmans et al., 2012; Simons et al., 2013; Davey et al., 2014; Dhejne et al., 2016; Ott et al., 2017). Social support was therefore hypothesized to be one important predictor for QOL. Other predictors for QOL were investigated exploratively.

Surprisingly, social support was not found to be an important predictor for generic physical and mental QOL. The regression analysis revealed that a high generic physical QOL was best predicted by being employed and by a short time interval since GAS. These findings are in line with studies that have found a positive association between QOL and being employed in trans* people (Motmans et al., 2012; Gómez-Gil et al., 2014; Auer et al., 2017) as well as in the general population (Michelson et al., 2000; Miller & Dishon, 2006). Miller and Dishon (2006) argue that being employed can

enhance someone's QOL by ensuring income, structuring everyday-life and offering opportunities for social contacts. These factors may play an important role in the present sample as well. Additionally, having an employment may play an especially important role in trans* persons as it may be an indicator for the successful integration into society after transitioning which consecutively enhances QOL and well-being. In this study two open questions were included in the ERI asking respondents to indicate the most positive and negative life-events of the last three years. Of the 90 persons that answered the question about negative life-events, 33 indicated that they had experienced a loss of employment or had had difficulties to find a new job. Many of the respondents perceived these adversities in the context of them being trans*. Further, of the 85 participants that answered the open question about the most important positive events, 38 indicated a new employment, professional success or a high support through colleagues and superiors as especially positive experiences. This supports the hypothesis of an especially important role of employment for QOL in trans* people and aligns the results of the regression analysis.

A short time interval since GAS was revealed as a second important predictor for physical QOL. As discussed above, this effect may be caused by an improvement of surgical procedures resulting in better optical and functional results and fewer complications which consequently results in higher physical QOL. Nevertheless, these two predictors explain only 13% of variance. Therefore, many other factors seem to influence physical QOL that have not been identified in this study.

Generic mental QOL was predicted by low levels of psychological strain, a high sense of coherence, older age and a high availability of psychosocial resources as assessed with the ERI. Together these predictors explained 57% of the variance. A low level of psychological strain was the most important predictor for a high mental QOL. The present findings are in accordance with existing studies that have consistently reported low levels of mental QOL in persons with high psychological strain or mental disorders (Mendlowicz & Stein, 2000; Alonso et al., 2004; Dey et al., 2012).

Interestingly, social support was not identified as an independent predictor. Instead, personal resources were found to be important for mental QOL. Especially, SOC seems to play an important role for a high mental QOL in trans* women. SOC has been identified as an important coping resource having stress-buffering effects in the general

population (for review see Erikson and Lindström, 2006) that may thereby enhance mental QOL and well-being. SOC describes the person's ability to flexibly react to life changes and to integrate (adverse) experiences into the own biography. This is based on the confidence that a specific life event is predictable, manageable and meaningful (Antonovsky, 1993). Trans* people feel "trapped in the wrong body". The process of transitioning implies a radical change of their identity (Senf, 2008) and may be accompanied by severe strains. Therefore, the ability to integrate possible negative experiences connected to being trans* into the own biography and to come to terms with one's life may be a very important resource in this context.

Furthermore, a high availability of psychosocial resources as assessed with the ERI predicted mental QOL. The ERI global score summarizes the subscales PER, SOR and STR. Though, personal resources represent the most important resource dimension of the ERI having the highest influence on the global score. Thus, especially personal resources that originate within someone's personality seem to play an important role for mental QOL in trans* women. The present findings correspond to several studies that have revealed a positive association between a good mental QOL and personal resources such as self-efficacy, optimism and hope for success in different patient groups and healthy subjects (e.g. Turosz, 2011; Guillamón et al., 2013; Milaniak et al., 2014; Thorsteinson et al., 2017).

Older age was found to be another meaningful predictor for a high mental QOL. This is surprising given that mental QOL has been found to decrease with older age (Bullinger & Kirchberger, 1998; Bowling et al, 1999). When comparing mental QOL of the three trans* subgroups no differences in mental QOL could be detected although the three groups showed significant age differences. It was hypothesized above that possibly stabilization in the new gender role and a good availability of resources function as protective factors diminishing the decrease of QOL in older age. However, age seems to be a protective factor for mental QOL itself. In this aspect trans* persons seem to differ from the general population. Many trans* people have experienced a discrepancy between their biological sex and their gender identity for many years. They are often forced to show gender role behavior that contradicts their gender identity. When they finally align their body with their gender identity this is probably experienced as a huge relief. In the context of this very special biography age possibly plays a very different role for QOL than in non-trans* people. Furthermore, age might also play a moderating role in mental QOL. A large

epidemiological study (European Union Agency for Fundamental Rights, 2014) reported that trans* people became more open about their condition with older age. As disclosure of being trans* has been found to be an important dimension of QOL in trans* people (Tagay et al., 2018), it is conceivable that the positive effects of age on generic mental QOL may be related to the participants' increasing disclosure with older age. To shed more light on the factors influencing QOL in trans* people future studies should incorporate a detailed analysis of predictors, their interrelations and possible mediating and moderating effects.

In line with the hypothesis, a high trans* specific QOL was best predicted by social support which explained 42% of the variance. This finding suggests that for the very peculiar aspects that influence QOL in trans* women social support plays a very important role. Several previous studies reporting positive associations between social and familiar support and QOL (Motmans et al., 2012; Gómez-Gil et al., 2014; Simons et al., 2013; Bartolucci et al., 2014; Davey et al., 2014; Dhejne et al., 2016; Ott et al., 2017) have underlined the eminent importance of social support for QOL in trans* people. Ott et al. (2017) have underlined the important stress buffering function of social support in the context of minority stress (Ott et al., 2017). As many trans* people experience stigma and discrimination (Coleman et al., 2012; Hendricks & Testa, 2012; European Union Agency for Fundamental Rights, 2014), being supported by their families, partners and peers can have a highly protective effect to help them cope with the different stressors in life. Similar to generic mental QOL, a low level of psychological strain and a high availability of psychosocial resources as indicated by the ERI were identified as further predictors for trans* specific QOL. Together these predictors explain nearly 60% of the variance.

To summarize, generic mental QOL and trans* specific QOL seem to be dependent on low levels of psychological strain and a high availability of resources. Social support is an especially important resource for trans* specific QOL. Generic physical QOL on the contrary seems to be more dependent on sociodemographic parameters.

Hypothesis 4: *Compared to the general population trans* women show a lower diversity of available psychosocial resources.*

The fourth hypothesis was based on the scarce literature that has investigated resources in trans* people. In their review, Dhejne et al. (2016) constituted that trans* people receive or perceive themselves to receive less social support than controls. Additionally, Davey et al. (2014) reported lower levels of social support in trans* women.

In line with the hypothesis assuming a lower diversity of available resources, trans* subjects scored significantly lower than controls on all resource dimensions of the ERI. However, no differences could be detected on the SSS and the SOC-13. Further, trans* participants scored significantly higher on the RQ than the general population. The current results hint towards the important role of the applied test instruments measuring the parameters of interest. Even though high correlations were found between the different questionnaires measuring similar constructs, the current findings underline that deviating result patterns may be found for different questionnaires. The current results were compared to normative data of the respective test instruments. This might explain the deviating results of (not) existing differences between trans* persons and controls. In line with this, one possible explanation for the ambiguous results that have been found in different studies investigating QOL in trans* people could be the application of different test instruments having different sensitivities and different normative samples.

Trans* women indicated a significantly higher satisfaction with their relationship than controls. The transition and the change of gender represent a radical change in someone's life and identity (Senf, 2008). Still, this does not only concern the trans* persons themselves but is also a serious change for their partners, families and social environment (Dierckx et al., 2016). Many relationships or marriages do not withstand the coming-out or transition. In the current sample, approximately 25% of the respondents indicated that they were still living with the same partner as at the time of their coming-out. Probably, only the very stable relationships have endured the transition and are nowadays characterized by a high satisfaction of the partners. Trans* persons who have experienced a breakup of old relationships because of their transition, or because of any other reason, may have very consciously chosen a new partner after their transition. This may have led to a high relationship satisfaction as well.

Hypothesis 5: *The availability of psychosocial resources will increase in the course of transitioning.*

The existing literature on resources in trans* people is very scarce, especially, research regarding the development of resources throughout the transitioning process is missing. Therefore, the present study aimed to exploratively investigate the changes in available resources. As several studies showed positive effects of gender-affirming treatments and an improvement of QOL throughout transitioning, it was expected that the availability of resources might improve as well.

For the total study sample a strong increase on all ERI subscales occurred when comparing the scores of the 3-years-version with the 4-weeks-version. Interestingly, subgroup analyses revealed that this effect was produced by improvements of participants of group 1: When looking at the two versions of the ERI for each subgroup separately, the availability of psychosocial resources had increased within the last three years only for those participants who had received GAS within the last three years. For these subjects the reference point of the 3-years-version of the ERI was pre-operative. This finding hints towards the importance of GAS for the development and improvement of different psychosocial resources. Existing research has shown an enhanced well-being and better QOL following GAS (Ainsworth and Spiegel, 2010; Lindqvist et al., 2017) that might possibly stimulate the development of psychosocial resources. Tugade and Frederickson (2006) discuss the effects of positive emotions on the development of resources and coping strategies. The authors outline that positive emotions can broaden a person's thought and action repertoire and may enhance personal resources and coping strategies. In line with this, the improvement of available resources following GAS in the current study may be due to an elevated mood and well-being after the physical adaptation of the body to the gender identity. In the long-term, this enhanced availability of resources can in turn positively influence QOL. In accordance with this, several studies have found a positive association of QOL and psychosocial resources (e.g. Motmans et al., 2012; Gómez-Gil et al., 2014; Davey et al., 2014). Still, the causal relationships and possible moderating effects of gender-affirming procedures, psychosocial resources and QOL in trans* people remain to be further investigated.

The post-operative long-term development of resources was further examined by comparing the three subgroups regarding their SSS, RQ and SOC-13 scores. These

questionnaires assess the availability of the respective resources in the last four weeks. No differences in social support and relationship satisfaction were found between the three subgroups. Similarly, when looking at the 4-weeks-version of the ERI no appreciable differences between the three subgroups could be detected either. These findings suggest that the development of resources is especially stimulated shortly after GAS while the availability of resources stabilizes over time. Importantly, it should be noted that the comparison of the means of the three subgroups may not be sensitive enough to detect long-term changes in available resources of an individual person. Longitudinal studies will be needed to reliably address this issue.

However, participants in group 3 showed a significantly higher SOC than participants in group 1. There are two possible explanations for the observed finding. Firstly, it is possible that SOC slowly develops and stabilizes in the years after GAS and the completion of transitioning. The change of gender role and physical sex may be such a radical and stirring change in someone's life that it may take some time to adapt to the life-changes and to settle in the new gender role. Possibly, some time is needed to process these changes and to integrate the experiences into one's own biography. In the context of such turbulences it may take some time for the SOC to grow. An alternative explanation for the observed effect may be the age differences. As mentioned before, the three subgroups differed significantly regarding their age. In their review including 127 studies that have applied the SOC-13, Eriksson and Lindström (2005) found that SOC increases with older age. Therefore, the observed differences may also be caused by older age of participants in group 3.

Hypothesis 6: *Trans* women show higher levels of psychological strain than the general population.*

In accordance with the hypothesis, significantly higher levels of psychological strain were found in trans* women than in the general population. Indeed, trans* subjects scored nearly twice as high as the control group. The current findings resemble previous research that has revealed a higher risk in trans* people to suffer from psychological strain and psychiatric co-morbidities (Davey et al., 2014; Duisin et al., 2014; Heylens et al., 2014b; Reisner et al., 2015; Dhejne et al., 2016). Notably, Heylens et al. (2014a) reported current prevalence of psychiatric co-morbidities in trans* people of 38% while

the life-time prevalence of 70% was much higher. Therefore, the estimates of psychiatric co-morbidities may often be underestimated.

Heylens et al. (2014b) found a reduction of psychological symptoms in the course of the transition. The study alludes to the importance of gender-affirming medical treatment for mental health improvements in trans* individuals. Similarly, in their review Dhejne et al., (2016) conclude that psychopathology improved in the course of the transition. Although psychological strain in the current sample was high even at the end of the transition, it is possible that levels of strain were even higher at earlier stages of the transition. In this case gender-affirming treatments would have also been beneficial for mental health in the current sample. Unfortunately, no data is available about psychological strain of the study participants in the past.

In many cultures trans* people are stigmatized and experience discrimination (Coleman et al., 2012; Hendricks & Testa, 2012). A large epidemiological study conducted in 2011 constituted that 54% of trans* people reported to have experienced discrimination due to being trans* (European Union Agency for Fundamental Rights, 2014). The experienced stigmatization and discrimination because of belonging to a minority group has been referred to as minority stress (Meyer, 2003; Coleman et al., 2012). Minority stress increases the vulnerability in trans* people to develop mental health problems as anxiety or depression (Meyer, 2003). Compared to trans* men, trans* women have reported more often to experience discrimination (European Union Agency for Fundamental Rights, 2014). As the current sample consisted of trans* women only this may be one possible explanation for the high levels of psychological strain found in this study.

Davey et al. (2015) have assessed interpersonal problems in trans* people using the Inventory of Interpersonal Problems (Barkham et al., 1996). They revealed that compared to a control group trans* participants had higher difficulties when it came to being sociable as well as supportive of and involved with others. The authors argue that these difficulties have probably resulted from the fact that trans* people have lived with a discrepancy between the inner sense of self and the outer appearance. It is likely that they had to hide their true gender identity which may have led to insecurities in social interactions or a low self-esteem. Additionally, many trans* people may have experienced discrimination or rejection which may have led to difficulties in trusting other people. As a consequence of their interactional difficulties, trans* individuals may be at a

higher risk of developing affective disorders. In fact, the higher rates of psychiatric disorders refer to affective disorders such as depression and anxiety disorders while no higher rates of major psychiatric disorders such as schizophrenia or bipolar disorders have been reported in trans* persons (Dhejne et al., 2016).

Social support may have an especially important protective function to maintain mental health and QOL in trans* people in the context of minority stress and interpersonal problems. The importance of social support for trans* specific QOL is supported by the present study and has been identified as a very important resource in a plethora of studies (Motmans et al., 2012; Gómez-Gil et al., 2014; Simons et al., 2013; Bartolucci et al., 2014; Davey et al., 2014; Dhejne et al., 2016; Ott et al., 2017). Social support has further been found to enhance mental health as was reported by Yang et al. (2016) who have revealed that social support reduced anxiety symptoms in Chinese trans* women.

4.3 Evaluation of the Methods

The major limitation of this study is its cross-sectional design. To investigate differences in the long-term post-treatment development of resources and QOL, the study sample was divided into three different subgroups. This allowed comparing recently transitioned individuals with those whose transition dates back many years. Importantly, the observed results are based on the means of the subgroups. Therefore, in this design no information about the long-term development of one single individual is available. Changes of an individual's trans* specific QOL and psychosocial resources were evaluated by comparing scores of the last four weeks with the retrospective assessments as provided by the ERI and ETLI questionnaires. Importantly, retrospective assessments may be imprecise. Furthermore, a memory bias may occur as has previously been described by Blome and Augustin (2015). According to the authors, it is possible that the current mood may stain the judgment of a memory in a positive or negative way. Future studies should therefore implement a prospective longitudinal study design to reliably assess changes in QOL, available resources and psychological strain throughout the transitional process.

Another important limitation to this study is the representativeness of the sample. Only about 42% of the contacted persons participated in the study. There was insufficient

information about the demographic characteristics of the non-respondents available. Therefore, no conclusions about demographic properties characterizing the responding vs. non-responding subjects can be drawn. When interpreting the present data it should be considered that the present results may be influenced by some kind of selection bias. Additionally, only trans* women were considered. This was due to the fact that all participants were recruited at the local clinic which offers male-to-female gender-affirming procedures only. Several studies have reported sex differences in trans* men and trans* women regarding QOL (Motmans et al., 2012; Auer et al., 2017), mental health (Duisin et al., 2014) and the experience of discrimination (European Union Agency for Fundamental Rights, 2014). Therefore, sex differences seem to exist on different levels. A generalization of the present results to the total group of trans* people is thus not possible. Future studies should incorporate a cooperation with other clinics to enable an investigation of trans* men and trans* women.

Another limitation to the study is its sample size. In total, 158 subjects participated in the current study. The total sample was divided into three different subgroups including 41 to 62 participants each. Missing data was addressed using test-by-test deletion. For some of the investigated parameters (e.g. the RQ, which was only filled in by participants being in a relationship) the sample size of the respective subgroups was moderate. Future studies with larger samples could improve the power and reliability of the results. Still, as the prevalence of trans* in the general population is relatively low, the current sample is of respectable size.

Furthermore, it is important to mention the way of assessing the parameters of interest. In the present study standardized and internationally acknowledged questionnaires were used which allowed for a reliable assessment of the different parameters and comparison of the present results to results of other studies. Still, the assessment was purely based on the participant's self-evaluation. Thus, an objective measurement is missing. Furthermore, medical information regarding the applied medical treatments and possible complications of surgery which may have an important influence on someone's QOL was not considered in the present study. However, the heart of this study was to evaluate QOL, perceived psychosocial resources and psychological strain which are exclusively subjective parameters and can best be assessed using self-evaluation questionnaires. Still, it would be important to objectively assess psychiatric symptoms and the prevalence of valid psychiatric diagnoses e.g. with the help of standardized

clinical interviews. In this case however, it is important to consider possible effects of socially desirable answers of the participants. As participants in the present study filled in the questionnaires while being at home alone, it can be expected that social desirability effects should have played a minor role in this study. However, social desirability effects will have to be considered as a more important factor in studies implementing standardized clinical personal or telephone interviews. Still, such interviews could support the reliable assessment of mental health in trans* people after their transition and could furthermore be used to estimate the necessity of supportive counseling or treatment options. The implementation of such assessments should therefore be considered in future studies.

4.4 Conclusions and Future Directions

The present study was the first to systematically investigate the availability of different psychosocial resource dimensions and their impact on QOL in trans* women after GAS. Further, it was the first to assess trans* specific QOL. The study sample is characterized by a high heterogeneity regarding the time interval since GAS and includes persons who have transitioned up to 21 years ago. This allows interesting insights into the long-term development of the variables of interest. This study emphasizes the importance of GAS for the development of different psychosocial resources. It further underlines the importance of personal resources especially for mental and trans* specific QOL. Still, it becomes obvious that compared to the general population trans* women show a lower availability of resources and higher levels of psychological strain.

The current study has several limitations that should be addressed in future studies: Future research should incorporate a prospective longitudinal design including a large sample of trans* men and trans* women. The clinical assessment of psychiatric diagnoses should be considered as well as the inclusion of medical information regarding the applied medical treatments and possible complications of surgery. Such research can shed more light on the individual development of resources, QOL and mental health in trans* people. Future research should further consider the plurality of gender identities and should aim to investigate QOL, well-being, mental health and psychosocial resources in people who perceive only some extent of gender incongruence or who decide to live between the binary male and female gender roles. Such research will be beneficial to estimate the necessity of counseling or supportive

psychotherapy interventions in trans* people at different stages of their transition and may be helpful to develop suitable offers in health care. Offering specialized counseling or medical services can have a highly beneficial potential in supporting personal growth and the development of psychosocial resources thereby enhancing QOL and well-being in trans* people.

5 Summary

In trans* people the subjectively perceived gender identity does not match the biological sex assigned at birth. Many trans* people transition, i.e. they decide to adapt their physical sex characteristics with the preferred gender and to change their social gender presentation. The process of transitioning may be accompanied by severe strains. Therefore, the availability of psychosocial resources that play an important role in quality of life (QOL) and in resilience to psychological strain is of special interest. However, research systematically investigating QOL, psychosocial resources, psychological strain and their interrelations in trans* people is missing. The present study aimed to fill this gap.

Using a cross-sectional design, a total of 557 male-to-female trans* persons who had received gender-affirming surgery (GAS) at the local clinic between 1995 and 2015 were contacted via mail and sent a set of questionnaires. Psychosocial resources were assessed using the Essen Resource-Inventory, the Sense of Coherence Scale and the Social Support Scale. QOL was assessed with the Short Form Health Survey and the Essen Transidentity Quality of Life-Inventory. Psychological strain was assessed using the Symptom Checklist.

In total, 158 persons (42% of the contacted) participated in the present study. Trans* women in the current study showed high levels of generic physical QOL which resembled the general population, while mental QOL was reduced. Trans* specific QOL had strongly increased when comparing QOL at coming-out with QOL at the end of the transition. Physical QOL was best predicted by employment status and a short time interval since GAS. Mental and trans* specific QOL were predicted by a high availability of psychosocial resources and low levels of psychological strain. Even at the end of the transition trans* subjects showed a lower diversity of psychosocial resources and almost twofold levels of psychological strain when compared to the general population.

This study reveals that QOL and psychosocial resources develop in the course of the transition and underlines the importance of gender-affirming treatment. It further emphasizes the importance of psychosocial resources for QOL. Still, deficits in resource diversity and psychological strain become obvious. This emphasizes the importance of offering specialized counseling or medical services to support personal growth and to enhance QOL and well-being in trans* people.

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Appendix

A. Abbreviations

APA	American Psychiatric Association
DSM	Diagnostic and Statistical Manual
ERI	Essen Resource-Inventory
FTM	female-to-male trans* person
GAS	gender-affirming surgery
HT	hormone therapy
ICD	International Classification of Disease
MCS	mental component scale
mQOL	mental quality of life (ETLI)
MTF	male-to-female trans* person
PCS	physical component scale
pQOL	physical quality of life (ETLI)
PER	personal resources (ERI)
QOL	quality of life
QOLd	quality of life through disclosure (ETLI)
RQ	Relationship Questionnaire
SCL	Symptom Checklist
SOC	sense of coherence
SOC-13	Sense of Coherence Scale
SOR	social resources (ERI)
sQOL	social quality of life (ETLI)

SSS Social support Scale

STR structural resources (ERI)

WPATH World Professional Association of Transgender Health

B. Index of Tables

Table 1:	Diagnostic Criteria for Transsexualism According to ICD-10	11
Table 2:	Diagnostic Criteria for Gender Dysphoria According to DSM-V	12
Table 3:	Age and Time Interval Since Gender-Affirming Surgery	31
Table 4:	Demographic Properties of the Study Sample	32
Table 5:	Results of the Health-related QOL Questionnaire	34
Table 6:	Results of the Essen Transidentity QOL-Inventory	39
Table 7:	Results of the Essen Resource Inventory	45
Table 8:	Results of the Social Support Scale	46
Table 9:	Results of the Sense of Coherence Scale	47
Table 10:	Results of the Relationship	48
Table 11:	Results of the Symptom Checklist	49
Table 12:	Correlations	51
Table 13:	Predictors for Generic Physical QOL	52
Table 14:	Predictors for Generic Mental QOL	53
Table 15:	Predictors for Trans* specific QOL	54

C. Index of Figures

Figure 1:	Flow-chart Depicting the Process of Including Participants Into the Study Sample	25
Figure 2:	Results of the Essen Transidentity QOL-Inventory	36
Figure 3:	Development of Overall QOL Throughout the Transition	40
Figure 4:	Results of the Essen Resource Inventory	43

D. Covering Letter



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Sehr geehrte Frau Muster,

wir wenden uns an Sie, da Sie einen Wechsel durchlaufen haben, von dem bei Ihrer Geburt angelegten Geschlecht hin zu dem Geschlecht, welches sich für Sie stimmig anfühlt. Auf Ihrem Weg haben Sie sich an uns gewandt und in der Klinik für Urologie unsere Hilfe gesucht. Ein solcher Wechsel der Geschlechtsidentität bedeutet eine große Veränderung und ist häufig mit psychosozialen Schwierigkeiten und Belastungen verbunden. Dennoch haben Sie diesen Weg erfolgreich gemeistert, wovon wir großen Respekt haben.

Wir interessieren uns besonders dafür, was Ihnen geholfen hat, mit möglichen Belastungen und Schwierigkeiten umzugehen und wie es Ihnen heute mit Ihrer neuen Geschlechtsidentität geht. Wir möchten Sie daher einladen, an unserer Studie teilzunehmen. Ziel des Forschungsprojektes ist es, die psychosozialen Ressourcen und das Wohlbefinden von Trans* Personen nach der geschlechtsangleichenden Operation zu untersuchen. Die Erkenntnisse dieser Studie sollen uns dabei helfen, psychologische und medizinische Angebote für Trans* Personen zu erweitern und die Qualität der Behandlung ständig zu verbessern. Wir würden uns daher sehr freuen, wenn Sie unser Projekt durch Ihre Teilnahme unterstützen.

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In der beigefügten Patienteninformation erhalten Sie wichtige Informationen zu Umfang und Ablauf dieser Studie. Wenn Sie an dem Forschungsprojekt teilnehmen möchten, möchten wir Sie bitten, den beigefügten Fragebogen zu beantworten und in dem beigefügten Rückumschlag kostenfrei an uns zurück zu senden. Diese Studie ist ein Kooperationsprojekt der Klinik für Urologie des Universitätsklinikums Essen und der Klinik für Psychosomatische Medizin und Psychotherapie des LVR-Klinikums Essen. Aus organisatorischen Gründen ist der Rückumschlag an die Klinik für Psychosomatik adressiert.

Wir bedanken uns schon jetzt sehr herzlich für Ihre Teilnahme und verbleiben

mit freundlichen Grüßen

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E. Participant Information



- Patienteninformation -

Studie zu psychosozialen Ressourcen und Lebensqualität von Trans* Personen

Klinik und Poliklinik für Urologie,
Kinderurologie und Urologische
Onkologie
Sektion Rekonstruktive Urologie
Sektionsleiter Dr. med. Jochen Hess

Sehr geehrte Teilnehmerin,

vielen Dank, dass Sie sich für eine Teilnahme an unserer Studie interessieren. Hier finden Sie alle wichtigen Informationen zu Ziel, Umfang und Ablauf der Studie:

Was ist das Ziel der Studie?

Ziel dieses Forschungsprojektes ist es, die psychosozialen Ressourcen und die Lebensqualität von Trans* Personen nach der geschlechtsangleichenden Operation zu untersuchen. Die Erkenntnisse dieser Studie sollen dabei helfen, psychologische und medizinische Angebote für Trans* Personen zu erweitern und die Qualität der psychologischen und medizinischen Versorgung zu verbessern.

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Was erwartet mich bei einer Teilnahme?

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Bei Interesse senden wir Ihnen nach Abschluss des Projektes gern eine Zusammenfassung der wichtigsten Studienergebnisse zu. Wenn Sie dies wünschen, markieren Sie bitte die entsprechende Option auf der Einverständniserklärung.

Das Forschungsvorhaben ist durch die Ethikkommission der Universität Duisburg-Essen zustimmend beurteilt worden.

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Bei Fragen zur Studie wenden Sie sich bitte telefonisch oder per E-Mail unter den unten aufgeführten Kontaktdaten an Herrn Dr. Jochen Heß, an Herrn PD Dr. Sefik Tagay oder an Frau Anja Breidenstein.

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Curriculum Vitae

Der Lebenslauf ist in der Online-Version aus Gründen des Datenschutzes nicht enthalten.