Original Article

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Comparison of Physical Fitness and Mental Health among Transgenders and Cisgenders: A Cross-sectional Study

Physiology Section

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ABSTRACT

Introduction: Physical fitness is a state of maintaining good health through a proper diet and regular exercise. Due to modern evolution and advancements in telecommunications, there has been a decline in physical activity and a significant inclination towards a sedentary lifestyle. Consequently, the prevalence of Non Communicable Diseases (NCD) such as diabetes, hypertension and carcinoma is steadily rising. Awareness about physical fitness and regular exercise can lead to more beneficial outcomes in people's lives.

Aim: To assess physical fitness and mental health among transgenders and cisgenders.

Materials and Methods: This cross-sectional study was conducted at Kanyakumari Government Medical College, Nagercoil, Tamil Nadu, India from June 2022 to November 2022 among 60 cisgenders (males and females) and 30 transgenders, aged 18-35 years. Cardiopulmonary efficiency tests were performed and the physical fitness index was calculated. The mental health of all three groups was assessed using the Satisfaction With Life Scale (SWLS). The data were entered into Excel and the results were tabulated. Statistical analysis was conducted using one-way Analysis of Variance (ANOVA) with Bonferroni correction for numerical variables. A p-value of <0.05 was considered statistically significant.

Results: The study revealed that pulmonary efficiency tests, such as breath-holding time and respiratory endurance tests, were significantly (p-value <0.05) higher among males compared to females and transgenders. All three groups had poor fitness indices. Most of the transgenders (60%) reported being extremely satisfied with their lives compared to cisgenders.

Conclusion: All group- men, women and transgender individuals- were on the overweight-to-obese side. Men were able to perform the breath holding time and respiratory endurance test better than transgender individuals and women. All three groups- men, women and transgender individuals- had poor-to-average fitness indices.

Keywords: Cardiopulmonary efficiency tests, Physical activity, Satisfaction with life scale

INTRODUCTION

Transgender persons include different groups of individuals whose gender identities or expressions are incongruent with the sex they were assigned at birth [1]. In contrast, cisgender persons comprise the social majority, whose gender identities or expressions are congruent with their assigned sex at birth [1]. The International Classification of Diseases 11th Revision (ICD-11) no longer classifies gender incongruence within the chapter on mental and behavioural disorders but instead places it in the chapter on conditions related to sexual health [1]. According to the 2011 census, the total population of transgender individuals in India is around 488,000. Studies consistently document a high prevalence of adverse health outcomes in the transgender population, including Human Immunodeficiency Virus (HIV) and other sexually transmitted infections, mental health distress and substance use and abuse [2]. However, many other health areas remain understudied and population-based representative samples and longitudinal studies are few. Routine surveillance efforts for transgender population health are scarce [2].

Transgender individuals are thought to have negative experiences when engaging in physical activity due to specific barriers related to gender identity, transphobic experiences, a lack of awareness about transgender people and discriminatory sports policies [3]. This could indicate that engagement in physical activity is low among the transgender population [3,4]. Moreover, there is a lack of research that addresses the physical fitness of transgender individuals. Considering transgender health underscores the need to explicitly account for sex and gender pathways in epidemiological research and public health surveillance [2,4-6]. A good understanding of transgender health will pave the way for developing appropriate interventions to improve the health of this population.

This study uses these measures to assess the general and mental health of transgender and cisgender individuals. The aim of this study was to compare the physical fitness and mental health of transgender individuals with cisgender individuals. The primary objective was to assess the physical fitness of transgender individuals and age-matched cisgender individuals using a cardiopulmonary efficiency test. The secondary objective was to assess the mental health of transgender individuals and age-matched cisgender individuals (both males and females) using the SWLS.

MATERIALS AND METHODS

This study was conducted in the Research Lab of Kanyakumari Government Medical College, Nagercoil, Tamil Nadu, India. It was a comparative cross-sectional study that was carried out over six months, from June 2022 to November 2022. The Institutional Ethical Clearance (IEC) was obtained (Ref No S-019/IEC/2022). The questionnaire was provided to the subjects and informed consent was obtained. The subjects were given clear instructions about the procedures.

Inclusion criteria: Healthy cisgendrs and transgenders who belonged to the age group of 18 to 35 years were included in the study.

Exclusion criteria: Individuals suffering from diabetes mellitus, hypertension, alcoholism, liver and kidney diseases, respiratory and cardiac illnesses, malignancies, or other severe illnesses were excluded from the study.

Sample size: A snowball sampling technique was used to recruit the samples. Samples were divided into three groups: Group I for males, Group II for females and Group III for transgenders,

respectively. Each group consisted of 30 members who belong to the age group of 18 to 35 years.

Body Mass Index (BMI) [7,8]: Height and weight were measured and BMI was calculated by the formula:

$$BMI = \frac{\text{Weight (in kg)}}{\text{Height}^2\ (m^2)}$$

According to the National Heart, Lung, and Blood Institute (NHLBI), BMI is calculated as weight in kilograms divided by the square of the height in meters (kg/m^2) and is categorised into four groups according to the Asian-Pacific cut off points: underweight (<18.5 kg/m^2), normal weight (18.5-22.9 kg/m^2), overweight (23-24.9 kg/m^2), and obese (≥25 kg/m^2) [7,8].

Determination of resting pulse, respiratory rate and blood pressure [9]: The baseline heart rate, respiratory rate and blood pressure were measured after five minutes of rest in the supine position. Blood pressure was measured using a standardised digital sphygmomanometer.

Breath holding test [9]: The subject was asked to take a maximum inspiration after maximum expiration, then hold their breath by plugging their nose for as long as possible. The maximum time the subject could hold their breath was recorded.

40 mm Endurance test (Flack's Air Force Manometer Test) [9]: The subject was instructed to take a deep breath, close the nostrils, and blow into rubber tubing to raise the mercury column to the 40 mm Hg level in the manometer. The subject was then asked to maintain the mercury level at 40 mm Hg for as long as possible, and the duration was recorded.

Determination of Physical Fitness Index (PFI) [9]: The PFI was calculated by measuring heart rate after performing the Harvard Step Test (HST), which is a common method used to assess cardiorespiratory fitness. It is based on heart rate recovery following a given workload of five minutes. The subject was instructed to step up and down on a 51 cm high bench for five minutes or until exhaustion. Exhaustion is defined as the point at which the subject cannot maintain the stepping rate for 15 seconds when the rate of stepping is set at 30 cycles per minute. Each cycle constitutes one step up and one step down. Immediately after completing this protocol, the subject was asked to sit down. The pulse was counted at intervals of 1 to 1.5 minutes, 2 to 2.5 minutes, and 3 to 3.5 minutes. The fitness index was calculated as follows:

$$\text{Fitness Index [10]} = \frac{\text{duration of exercise in sec} \times 100}{2 \times (\text{sum of pulse counts during recovery})}$$

Fitness index scoring: >90- Excellent; 80-89- Good; 65-79- High Average; 55-64- Low average; <55 Poor [10].

Assessment of mental health: The SWLS was used [1,11]. This scale includes five statements that subjects may either agree or disagree with. Participants will respond using a 1-7 scale, where the numbers indicate the level of agreement or disagreement with each statement as follows: 7- Strongly agree; 6- Agree; 5- Slightly agree; 4- Neither agree nor disagree; 3- Slightly disagree; 2- Disagree; 1- Strongly disagree. Finally, the scores for each statement will be summed. A total score of 31-35 indicates Extremely satisfied; 26-30 indicates Satisfied; 21-25 indicates Slightly satisfied; a score of 20 indicates Neutral; 15-19 indicates Slightly dissatisfied; 10-14 indicates Dissatisfied; and 5-9 indicates Extremely dissatisfied [11].

STATISTICAL ANALYSIS

The data were entered into Excel and the results were tabulated. Statistical analysis was conducted using one-way ANOVA with Bonferroni correction for numerical variables. A p-value <0.05 was considered statistically significant.

RESULTS

[Table/Fig-1] shows the age, height, weight, BMI, pulse rate, respiratory rate, Systolic Blood Pressure (SBP) and Diastolic Blood Pressure (DBP) of all the members of the three study groups: men (n=30), women (n=30), and transgenders (n=30). It is evident from the table that all three groups- men, women, and transgenders- fall into either the overweight or obese category.

Study variables	Men	Women	Transgenders
Age (years)	30±0.8	30±0.7	31±0.8
Height (cm)	168±2	156±0.9	168±1
Weight (kg)	65±2	58±2	69±3
BMI (kg/m^2)	23.1±0.6	23.7±0.8	24.5±1
Pulse rate (min)	78±2	77±2	83±3
Respiratory rate (min)	15.4±0.1	15.3±0.2	15.1±0.3
Systolic BP (mmHg)	120±3	107±2	120±3
Diastolic BP (mmHg)	86±2	72±2	84±2

[Table/Fig-1]: Physical characteristics and demographic details.

[Table/Fig-2] displays the breath-holding times of men, women and transgender individuals in seconds. From the table, it can be inferred that men can hold their breath for a significantly longer duration compared to transgender individuals and women.

Parameter	Men	Women	Transgenders
Breath holding time (seconds) (M±SD)	35±14	26±28	26±11

[Table/Fig-2]: Breath holding time.

[Table/Fig-3] displays the duration for which men, women and transgender individuals could perform the respiratory endurance test, measured in seconds. It can be observed that men could maintain the mercury level at 40 mmHg for a significantly longer duration than transgender individuals. Furthermore, the transgender group could maintain the mercury level for a significantly longer duration compared to women. ANOVA was used to determine significance among the groups, while Bonferroni correction was applied to find significance within the groups. There was a significant difference between men and women, as well as between men and transgender individuals and between female and transgender with a significant p-value of <0.05.

Parameter	Men	Women	Transgenders	F-value	p-value
40 mmHg endurance test (seconds) (M±SD)	27±18*	16±10*	21±9*	5.46	0.0061

[Table/Fig-3]: Respiratory endurance test.
ANNOVA was used to find significance among groups *p<0.05

[Table/Fig-4] displays the number of subjects who fall under the fitness index rating in each group. The fitness index was on the lower side in women and transgenders when compared to men however there was no significant association between the physical fitness index and cisgender and transgender individuals.

Physical fitness index	Excellent >90 (n%)	Good 80-89 (n%)	High average 65-79 (n%)	Low average 55-64 (n%)	Poor <55 (n%)
Men (n=30)	1 (3.4)	0	4 (13.3)	6 (20)	19 (63.3)
Women (n=30)	0	0	1 (3.33)	7 (23.3)	22 (73.3)
Transgenders (n=30)	0	0	2 (6.7)	6 (20)	22 (73.3)

[Table/Fig-4]: Asssociation between the genders and physical fitness index.
Fisher's exact test- p-value is 0.8

[Table/Fig-5] displays the scores on the SWLS among three groups. In the scoring for SWLS maximum transgenders lied in the group of extremely satisfied and satisfied categories among three groups. However, there was no significant association between life satisfaction and cisgender and transgender individuals.

Satisfaction with life scale	Extremely satisfied 31-35 (n%)	Satisfied 26-30 (n%)	Slightly satisfied 21-25 (n%)	Neutral 20 (n%)	Slightly dissatisfied 15-19 (n%)	Dissatisfied 10-14 (n%)	Extremely dissatisfied 5-9 (n%)
Men (n=30)	9 (30)	8 (26.7)	4 (13.3)	0	5 (16.7)	1 (3.3)	3 (10)
Women (n=30)	7 (23.3)	5 (16.7)	9 (30)	0	5 (16.7)	2 (6.7)	2 (6.6)
Transgenders (n=30)	18 (60)	8 (26.6)	2 (6.7)	0	2 (6.7)	0	0

[Table/Fig-5]: Asssociation between the genders and Satisfaction With Life Scale (SWLS).
Fisher's exact test p-value is 0.9

DISCUSSION

The NCDs are the leading cause of death worldwide and are emerging as a global health threat [12]. NCDs account for 71% of all deaths globally, with 77% of these deaths occurring in middle- and low-income countries [12]. There has been a decrease in physical activity due to a more sedentary lifestyle [9]. Inadequate physical activity is responsible for approximately 30% of all deaths, mainly due to heart disease, diabetes and colon cancer [9]. Rising levels of obesity are also contributing to these diseases [9]. This issue has reached epidemic proportions in many parts of the developing world and is beginning to affect developing countries like India as well [8]. Obesity, if present in adolescence, often leads to obesity in adult life [9]. In this study, as shown in [Table/Fig-1], all three groups- men, women and transgender individuals- were into the overweight or obese category. This finding was in accordance with the study by Conron KJ et al., which found no differences in obesity by gender identity [13]. This may be due to a lack of awareness regarding regular exercise and a balanced diet. Many are more concerned about their day-to-day income and thus do not spare time to engage in physical activity.

Physical fitness is understood in two closely related meanings: general fitness, which refers to a state of health and wellbeing and specific fitness, which is a task-oriented definition based on the ability to perform specific aspects of sports or occupations. It results from regular exercise, proper diet and nutrition and adequate rest for physical recovery [9]. Sharma A et al., stated that physical fitness is defined as a set of attributes or characteristics that individuals possess or achieve, which relate to their ability to perform physical activity. Physical activity is defined as any bodily movement produced by skeletal muscles that result in energy expenditure [12]. A higher level of physical fitness is associated with lower rates of cardiovascular disease and has positive effects on depression, anxiety, mood status and self-esteem [12].

Cardiorespiratory fitness refers to the overall capacity of the cardiovascular and respiratory systems and the ability to carry out prolonged strenuous exercise [12]. It is one of the most frequently cited measurable components of physical fitness [12]. In the present study, breath holding time, the 40 mmHg endurance test and the HST to assess cardiorespiratory fitness were used. Men held their breath for a longer duration compared to transgenders and women. Men performed the respiratory endurance test for a longer duration than transgenders, who outperformed women.

The muscle power of men and transgenders may have given them an advantage in performing the tests better than women. Additionally, more men engage in physical activity as part of their profession or hobbies, which may contribute to their better performance compared to transgenders and women, who may not be accustomed to such exercises. Physical fitness is considered one of the most important health markers and a predictor of morbidity and mortality related to various NCDs [12].

From [Table/Fig-1], it can be seen that all three groups- men, women and transgenders- exhibit poor-to-average physical fitness indices. The poor-to-average physical fitness indices of both cisgenders and transgenders indicate a lack of awareness among both groups regarding their fitness. Impaired physical fitness in today's modern world may be attributed to a sedentary lifestyle, a Western diet and the use of electronic gadgets. Furthermore, in the busy lives led by individuals, time is invested in education and profession but not in physical activity. Jones BA et al., observed that, in comparison to transgender individuals, cisgender individuals (both males and females) engage in significantly more physical activity [3]. In transgenders, stigmatisation can present an additional barrier to accessing physical fitness facilities.

The study by Anderssen N et al., concludes that transgender individuals reported significantly lower life satisfaction than cisgender individuals [1]. However, in this study, most transgender individuals were extremely satisfied with their lives, as inferred from [Table/Fig-2]. This may be due to the fact that they focus primarily on day-to-day living, as well as the lack of family commitments and job stress. Once they find a community to live with, they feel that they have no other needs in life other than food and shelter. They do not regret their gender transition and are happy with their new selves. Men and women are distributed across all categories, but more men fall into the 'extremely satisfied' and 'satisfied' categories compared to women. Cisgender individuals have families to support, children to care for, careers to manage and goals to achieve. These never-ending responsibilities create stress and lead to lower life satisfaction when compared to transgender individuals.

Limitation(s)

Sample size was not calculated statistically and hence was small. In the future, other modalities of physical fitness, such as bicycle ergometers and autonomic function tests, with a higher sample size could also be assessed.

CONCLUSION(S)

All groups- men, women and transgender individuals- were on the overweight-to-obese side. Men were able to perform the breath holding time and respiratory endurance test better than transgender individuals and women. All three groups- men, women and transgender individuals- had poor-to-average fitness indices. Regular physical activity contributes to achieving body fitness. Being physically active can even reduce the incidence of diseases such as diabetes, hypertension and obesity. The transgender individuals exhibited a high level of satisfaction in their lives, though this was not statistically significant.

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