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Type of Study:     Basic science     Case report, series     Retrospective     Prospective  
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## **TITLE**

Effects of Corrective Strabismus Surgery on Social Anxiety and Self-Consciousness in Adults

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## **ABSTRACT**

**Purpose:** The full psychosocial impact of strabismus surgery has yet to be fully determined. We performed a questionnaire based pre-post interventional study to evaluate the effect strabismus surgery had on private self-consciousness, public self-consciousness and social anxiety using a validated self-consciousness survey instrument.

**Methods:** Patients who underwent strabismus surgery completed a demographics and a self-consciousness scale form both pre- and post-operatively (self-consciousness scale (SCS), Scheier & Carver, 1985). The total and subscale (private self-consciousness, public self-consciousness, and social anxiety) summative scores were compared using the Wilcoxon signed-rank test with statistically significant relationships defined as  $p < 0.05$ . Total and subscale (private self-consciousness, public self-consciousness, and social anxiety) summative scores were analyzed and then subdivided by strabismus type, years of education, and marital status.

**Results:** An overall improvement was found post-operatively in total scores ( $p = 0.012$ ), public self-consciousness scores ( $p = 0.009$ ), and social anxiety ( $p = 0.028$ ). While improvement in scores was noted in private self-consciousness scores ( $p = 0.188$ ), significance was not achieved for this subscale. When subdivided according to strabismic and demographic subgroups, significant improvement was only noted in esotropic patients, college graduates, married/living partner/widowed patients, and separated/divorced patients.

**Conclusions:** This study suggests that beyond functional and cosmetic improvements, strabismus surgery can result in a statistically significant improvement in measures of public self-consciousness and social anxiety, with most effect noted in esotropic, college graduate, and non-single patients.

## INTRODUCTION

Strabismus is defined as ocular misalignment. Basic types of strabismus include esotropia, exotropia, hypotropia or hypertropia, though many other variants and combinations exist. The incidence of adult onset strabismus is estimated to be about 4%<sup>2, 9, 10</sup>. Common complaints include diplopia, headaches, blurred vision, and cosmetic concerns that arise from having one fixating eye and one non-fixating eye<sup>2</sup>. These symptoms often lead to functional problems with reading, driving, or working<sup>2</sup>. Even if no functional impairment exists, the presence of strabismus has been correlated with increased difficulty in finding and obtaining employment<sup>14</sup>. Additionally, strabismus has been found to be associated with higher levels of depression and anxiety at a rate 10 times higher than found in the general population<sup>1</sup>.

Treatment of strabismus depends on the patient's symptoms and the type and extent of the misalignment. While glasses, patching or prisms may improve symptoms, often surgical correction must be performed. Traditionally, successful strabismus surgery is defined as post-operative horizontal deviation less than 8-10 prism diopters, vertical deviation less than 2-5 prism diopters, resolution of diplopia or restored binocular fusion<sup>2, 4, 8</sup>. While these measures serve as good guidelines for anatomic success, a complete understanding of the psychosocial benefits strabismus surgery offers has yet to be fully determined. In fact, even with traditionally defined successful strabismus surgery and a societally deemed normal appearance, a small subset of patients still regret having strabismus surgery<sup>1</sup>. Understanding the psychosocial implications may help to shape our perception of patient satisfaction, patient experience, and patient quality of life, measures that are becoming more prominent in the current healthcare setting<sup>10</sup>.

We performed a questionnaire based pre-post interventional study to evaluate the effect strabismus surgery had on private self-consciousness, public self-consciousness and social anxiety using the self-consciousness scale (SCS) developed by Scheier & Carver in 1985. This particular test was chosen because it has good internal consistency, test-retest correlation, and has shown previous success in demonstrating itself to be a useful measure of a patient's psychosocial state in various diseases such as Alzheimer's disease and Hemophilia A<sup>7, 6, 13</sup>. This study aimed to determine if surgical intervention resulted in psychosocial implications with regard to private self-consciousness, public self-consciousness and social anxiety.

## METHODS

This is an IRB approved pre-post interventional study of adult patients who met our eligibility criteria, defined as age >18 years old, undergoing surgical correction of strabismus and who had the ability to complete a written questionnaire. The same pediatric ophthalmologist (JFM) performed all patient care and surgical procedures. Patients' completed a demographics form and the self-consciousness scale form pre-operatively and 6 months post-operatively. Consent was obtained to extract patients' strabismus type from their medical record.

The self-consciousness scale was rated on a Likert-type rating scale ranging from 0 to 3 (e.g. 0 = "not at all like me", 3 = "a lot like me"). Changes in total and subscale (private self-consciousness, public self-consciousness, and social anxiety) summative

scores were compared with the Wilcoxon signed-rank test with statistical significance defined as  $p < 0.05$ . This non-parametric test was used because some of the variables were highly skewed. Hence, the median was used to denote central tendency. In order to keep statistical analysis uniform, the Wilcoxon signed-rank test was used for changes in all variables. Total and subscale (private self-consciousness, public self-consciousness, and social anxiety) summative scores were analyzed and then subdivided by strabismus type, years of education, and marital status.

## RESULTS

95 adult patients met our eligibility criteria; 55.3% were female. 44.7% were male. Based on chart review of diagnoses 31.9% had esotropia, 28.7% had exotropia, 14.8% had some variant of vertical strabismus and 24.4% had a combination of horizontal and vertical strabismus in primary position. The majority of the patients were Caucasian (81.9%) and a majority of patients had completed college or graduate school (51.1% college graduates and 29.8% graduate school education). 52.1% were employed full time with 9.6% employed part time. The greatest percent described themselves as employed in clerical jobs, sales and management positions. 61.1% of the patients were the main financial provider. 6.4% considered themselves as disabled while 17% were retired. More than half the patients were married, living with their partner or widowed (58.5% married, 4.3% living with their partner, 3.2% widowed). 26.6% labeled themselves as single, with 7.4% considered separated or divorced. 28% of patients had received some form of counseling in the past for mental illness. Basic characteristics of the patients are provided in table 1.

Data indicated an overall improvement post-operatively in total scores ( $p=0.012$ ), public self-consciousness scores ( $p=0.009$ ) and social anxiety ( $p=0.028$ ) (table 2). When subdivided according to strabismic and demographic subgroups, improvement was noted in esotropic patients (total  $p=0.004$ ; public self-consciousness  $p=0.034$ ; private self-consciousness  $p=0.015$ ; anxiety  $p=0.019$ ), college graduates (total  $p=0.035$ ), married/living partner/widowed patients (total  $p=0.006$ ; public self-consciousness  $p=0.021$ ; private self-consciousness  $p=0.021$ ; anxiety  $p=0.047$ ) and separated/divorced patients (total  $p=0.018$ ; public self-consciousness  $p=0.0017$ ; anxiety  $p=0.039$ ) (table 3). While improvement in scores was noted in overall private self-consciousness scores, all other forms of strabismus, high school graduates, graduate school graduates and single patients' significance was not achieved for these subscales

## CONCLUSIONS

This study aimed to determine if surgical intervention could have psychosocial implications with regard to a person's private self-consciousness, public self-consciousness and social anxiety. Pre-operative and post-operative total scores from the self-consciousness scale revealed a statistically significant reduction in both public self-consciousness and social anxiety following strabismus surgery, but not in private self-consciousness.

Private self-consciousness is a person's inclination to fixate on inner thoughts or feelings, which is commonly represented by people's beliefs, aspirations, values or

feelings<sup>3, 13</sup>. In contrast, public self-consciousness is how a person believes an imagined or real person perceives them, which generally influences people's behaviors, mannerisms, and expressive qualities<sup>3,13</sup>. Simply stated, people's self-consciousness is influenced by how one thinks of oneself versus how one believes others perceive them<sup>3</sup>. Social anxiety is derived from awareness of public self-consciousness and manifests when one believes they are inadequately presenting oneself appropriately<sup>13</sup>.

It is estimated that 18.9% of adults in the United States have some type of mental health illness and that about 8.0% of adults in the United States receive mental health services defined as inpatient/outpatient treatment/counseling or having used prescription medications<sup>15</sup>. In our study, 28% of patients reported seeking counseling for mental health issues, which is significantly higher than the average population. There appears to be a strong correlation between mental health illness and strabismus. Recent studies have indicated that children with strabismus were found to have a three-fold increased incidence of developing mental illness by adulthood<sup>11, 12</sup>. Additionally, the prevalence of mental health illness has been found to be higher in patients with adult onset non-paralytic strabismus compared to the general population<sup>5</sup>.

Strabismus is a deviation from what society deems normal ocular alignment. Strabismus surgery provides a means to reconcile a patient's actual appearance with society's expectation of normative appearance. In short, strabismus surgery can help treat a patient's social anxiety and public self-consciousness by helping the patient to feel more normal according to societies standards.

There was not a statistically significant improvement in private self-consciousness scores overall after strabismus surgery which may suggest that the anxiety and self-consciousness from strabismus is influenced more by how one believes others perceive them and not by a patients' own set of values or feelings towards themselves. Another possibility is that changes to internal constructs related to self-consciousness may take more time and some individuals may benefit from mental health interventions to facilitate the process. Furthermore, our study indicated that spouses or significant others appear to have a significant influence on a patients public self-consciousness and social anxiety. Non-single patients had statistically significant improvement in their self-consciousness scores while single patients did not.

In this study esotropic patients were the only type of strabismus that showed statistically significant improvement in their self-consciousness scores. When subdivided by years of education, statistically significant improvement in scores was only noted in the total score of patients who were college educated, indicating a lesser influence by education compared to marital status and strabismus type.

This study is limited by a homogenous patient population given the study was performed at a single center by only one practitioner. Additionally, the study was non-blinded and patients took the same questionnaire twice, which can lead to patients learning or attempting to guess the hypothesis and thus answer accordingly. Additionally, the self-consciousness scale only covers a small subsection of a patient's psychosocial makeup. Further studies investigating different psychosocial factors would be helpful in further elucidating the psychosocial impact of strabismus surgery.

This study suggests that beyond functional and cosmetic improvements, strabismus surgery can result in a statistically significant improvement in measures of

self-consciousness and social anxiety, especially in esotropic, college graduates, and non-single patients.

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## TABLES

Table 1. *Patient Characteristics.*

Characteristics	Total (N=94)	Total (%)
Gender		
Male	42	44.7
Female	52	55.3
Strabismus Type		
Esotropia	30	31.9
Exotropia	27	28.7
Vertical	14	14.8
Mixed	23	24.4
Ethnicity		
African American	7	7.4
Caucasian	77	81.9
Hispanic/Latino	8	8.5
Asian	1	1.1
Other	1	1.1
Highest Level of Education		
High School	18	19.1
College	48	51.1
Graduate	28	29.8
Employment Status		
Full Time	49	52.1
Part Time	9	9.6
Disabled	6	6.4
Retired	16	17.0
Unemployed	4	4.3
Homemaker	6	6.4
Other	4	4.3
Main Financial Provider		
Yes	58	61.1
No	36	37.9
Marital Status		
Single	25	26.6
Married	55	58.5
Living with Partner	4	4.3
Widowed	3	3.2
Divorced	5	5.3
Separated	2	2.1
Counseling		
Yes	26	28
No	67	72



Table 2. *Self Consciousness Scale: Total Scores*

	Pre-Median	Post-Median	Z-Score	P-Value
Total	29.00	27.00	2.517	<b>0.012</b>
Sub-Section				
Private	11.00	10.00	1.316	0.188
Public	12.00	11.00	2.628	<b>0.009</b>
Social Anxiety	8.00	7.00	2.202	<b>0.028</b>

Table 3. *Self Consciousness Scale: Subdivided by Strabismus Type, Years of Education and Marital Status.*

	Pre-Median	Post-Median	Z-Score	P-Value
Total				
Esotropia	35.00	27.00	2.874	<b>0.004</b>
Exotropia	27.00	28.50	0.244	0.808
Vertical	24.00	22.00	0.598	0.550
Mixed	32.00	27.00	1.196	0.232
Private				
Esotropia	12.00	10.00	2.426	<b>0.015</b>
Exotropia	9.00	10.00	0.631	0.528
Vertical	9.00	8.00	0.442	0.658
Mixed	11.00	10.00	0.365	0.715
Public				
Esotropia	13.00	12.00	2.117	<b>0.034</b>
Exotropia	12.00	11.50	0.612	0.541
Vertical	9.00	8.00	1.484	0.138
Mixed	12.00	11.00	1.026	0.305
Social Anxiety				
Esotropia	9.00	8.00	2.342	<b>0.019</b>
Exotropia	7.00	7.50	0.876	0.381
Vertical	6.00	7.00	0.943	0.345
Total				
HS	35.00	40.00	0.673	0.501
College	27.00	24.50	2.103	<b>0.035</b>
Graduate	29.00	26.00	1.654	0.098
Private				
HS	12.00	13.00	0.493	0.622
College	10.00	8.50	1.377	0.169
Graduate	12.00	10.00	0.716	0.474
Public				
HS	12.50	15.00	1.024	0.306
College	11.00	9.50	1.747	0.081
Graduate	12.00	11.00	1.812	0.070

Social Anxiety					
HS	9.50	10.00	0.253	0.801	
College	7.00	6.00	1.610	0.107	
Graduate	8.00	7.00	1.839	0.066	
Total					
Single	32.00	36.50	0.470	0.638	
M/L/W	27.00	23.50	2.739	<b>0.006</b>	
Div/Sep	37.00	29.00	2.371	<b>0.018</b>	
Private					
Single	12.00	12.50	0.976	0.329	
M/L/W	10.00	8.00	2.316	<b>0.021</b>	
Div/Sep	12.00	12.00	0.730	0.465	
Public					
Single	12.00	12.50	0.507	0.612	
M/L/W	12.00	10.00	2.304	<b>0.021</b>	
Div/Sep	17.00	14.00	2.388	<b>0.017</b>	
Social Anxiety					
Single	9.00	9.00	0.131	0.896	
M/L/W	7.00	6.50	1.988	<b>0.047</b>	
Div/Sep	7.00	4.00	2.060	<b>0.039</b>	

HS: High School. M/L/W: Married, Living with Partner, or Widowed. Div/Sep: Divorced or Separated