

Implementing strabismus-specific psychosocial questionnaires in everyday clinical practice: mental health and quality of life in the context of strabismus surgery

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ABSTRACT

Background Strabismus can have a great negative impact on the quality of life and the well-being of affected patients. In the past, these aspects were often neglected and, compared with somatic functioning, placed in the background. The aim of our study is to elicit factors influencing satisfaction with strabismus surgery, quality of life and expectations of surgery in order to better predict who will benefit the most and who may need further support.

Methods We made a selection of suitable questionnaires to assess psychosocial aspects of strabismus and decided for Adult Strabismus 20 Questionnaire, Amblyopia and Strabismus Questionnaire, Diplopia Questionnaire, Expectations of Strabismus Surgery Questionnaire and Hospital Anxiety and Depression Scale. We then translated these measures (if not available in German). The patients filled out these forms as part of their preoperative orthoptic and ophthalmological assessment as well as approximately 3 months after strabismus surgery.

Results We enrolled 59 patients in this study. Postoperative strabismus-related quality of life was higher after surgery and anxiety and depression levels were lower. Satisfaction with surgery was lower with higher postoperative angle and diplopia; the latter was also a determinant of lower postoperative quality of life. Higher expectations of strabismus surgery were present with higher depression levels and higher preoperative strabismus angle.

Conclusion Our data indicate that strabismus surgery may cause a significant improvement in several psychosocial domains. There is evidence that psychosocial factors can have significant impact on expectations with surgery. Hence, it is important to consider mental health aspects of this disease in order to treat patients in the best possible way.

INTRODUCTION

The overall prevalence of all forms strabismus in adults ranges from 2.5% to 4% in Germany¹ and the USA, respectively.^{1,2} While somatic factors are of great importance for patients suffering from strabismus, psychological factors are often ignored and treated as

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Strabismus surgery can not only improve visual but also psychosocial functioning. Mental health factors can also influence satisfaction with the surgical intervention.

WHAT THIS STUDY ADDS

⇒ This study shows that strabismus-specific questionnaires are a practical tool to be integrated in everyday clinical practice. Both mental health and visual function improve after surgery. Patients with higher preoperative angle and depression levels have higher expectations of surgery.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ The present study shows the practicability of the questionnaires in everyday clinical practice and may help to implement this in other departments, so that mental health aspects of this disease receive more consideration and will be more widely assessed. A larger multicentre study is planned, which will be assessing psychosocial aspects on a bigger collective.

less important, although strabismus can have a negative impact on the social life of those affected as early as in childhood.³ As adults, patients with strabismus suffer more often from social phobia,⁴ are at a disadvantage when looking for a romantic partner⁵ and are judged to be less attentive by the people they talk to.^{6,7}

This indicates that early and adequate therapy for strabismus and the associated somatic and psychosocial effects are necessary. Studies show that successful medical treatment is associated with a decrease in psychiatric disorders and an improvement in quality of life (QOL).^{8–12}

Thus far, only few studies evaluated the psychosocial factors that influence patient satisfaction after strabismus surgery. Adams *et*

al report that some patients' expectations of the operation were not met despite objective medical success and that they even expressed regret about the procedure.⁸

Until now, we lack longitudinal studies on expectations, QOL and levels of anxiety and depression in patients with strabismus. The aim of our study is to make a selection of suitable questionnaires for testing QOL, in order to evaluate practicability in everyday clinical practice, and to record whether expectations, QOL, anxiety and depression levels change after the surgery.

By examining the expectations and patient satisfaction with the surgery as well as the possible influencing factors related to it (depression, anxiety and QOL), we aim to be able to make better prognoses about the success of the treatment and to ensure patient satisfaction in the long term even in psychologically impaired patients.

MATERIAL AND METHODS

Participants

In this study, we included adult patients with strabismus scheduled for strabismus surgery in the Department of Ophthalmology at the University Hospital Bonn between December 2020 and April 2022. Patients had to be at least 18 years of age and have sufficient knowledge of the German language, needed to be literate and had to have adequate cognitive abilities according to our clinical impression. Patients with mental disabilities were excluded. In patients with physical limitation, we offered help in filling out the questionnaires. Fifty-nine patients gave their informed consent on the day of their preoperative assessment.

Patient and public involvement

Patients were first involved in this study when suggesting criticism or suggestions for improvement concerning the translated questionnaires. After the suggestions of several patients, we adjusted the font size and clarified wording in two forms. Research questions and outcome measures were developed after reviewing already existing literature on psychosocial aspects of strabismus.

Surgery

Three different surgeons performed strabismus surgery. They determined the decision for surgery and surgical dosage independently of this study. There were different surgical goals, depending on the patient, such as reduction of misalignment, diplopia and asthenopic and other accompanying symptoms, cosmetic improvement and overall increased functionality.

Concerning the type of surgery, they performed combined recess and resection in esotropia and exotropia and recession of the inferior oblique muscle for vertical misalignment.

Measures

In accordance to previous literature,^{8 13} we made a selection of suitable questionnaires for this study. If possible, we used questionnaires previously validated in German

language. If not available, questionnaires previously validated in English were translated into German and translated back several times with the help of a native speaker and experienced ophthalmologists. The patients completed the questionnaires as part of their preoperative assessment and for most patients 3 months after surgery at their visit in our department.

As validation test of the translated questionnaires, the first 10 patients were asked to fill out the questionnaires in the presence of a physician involved in the study and subsequently were asked for criticism or suggestions for improvement. After the suggestions of several patients, we adjusted the font size in the Diplopia Questionnaire and clarified the wording of two items in the Expectations of Strabismus Surgery Questionnaire (ESSQ). The subsequent patients completed the forms unassisted. When handing in, we checked whether every question has been answered. If not, we asked them to complete the missing items.

Follow-up

The second examination took place about 3 months after the surgery as part of a postoperative check-up. Patients filled out the same questionnaires, with the exception of the ESSQ (see below), which asked about the fulfilment of the previously expressed expectations in a modified form. In addition, we distributed a specially designed questionnaire to assess overall satisfaction with the outcome. If patients did not attend the postoperative assessment, the angle of deviation measured the day after surgery was used for the analysis and the psychosocial questionnaires were completed via telephone interview. Online supplemental table 1 presents an overview of all used questionnaires.

Bias

All individuals who fulfilled the inclusion criteria were asked to participate and the great majority did, but as only individuals who chose to join were included, this could be a source of selection bias. In addition, some participants completed the questionnaires by phone or in the presence of a physician who offered help with filling out the forms, which may also be a source of bias.

Demographics and clinical data

We collected data on age, sex, previous ophthalmic disease and other pre-existing conditions as well as their treatment. Patients received a full orthoptic assessment preoperatively and 3 months postoperatively, including the alternate prism cover test to measure deviation size and direction at distance and near.

Adult Strabismus 20 Questionnaire

The AS-20 Questionnaire is a validated, strabismus-specific QOL questionnaire with 20 items by Hatt *et al* that takes into account both functional and psychosocial aspects.¹⁴ The test consists of 20 items with four subscales: self-perception, interaction, reading and general QOL. A high score indicates a higher QOL.

In the course of our study, we discovered that another German version of the AS-20 Questionnaire had already been produced by Schrank and Augner,¹⁵ whereupon we compared the translations and found minor discrepancies. Due to better comparability, we decided to continue using our version in the course.

Amblyopia and Strabismus Questionnaire

van de Graaf *et al* developed the Amblyopia and Strabismus Questionnaire (A&SQ), a strabismus-specific QOL instrument with 26 items.¹⁶ It contains five subscales: fear of losing the better eye, distance estimation, visual disorientation, double vision and social and cosmetic problems. The number of possible answers of the A&SQ ranges from two to six, higher scores indicate a lower QOL.

Expectations of Strabismus Surgery Questionnaire

The ESSQ is a strabismus-specific psychosocial measure to assess patients' expectations on post-surgical outcomes developed by McBain *et al*.¹⁷ It consists of three subscales: intimacy and appearance, social relationships and visual function. Higher scores indicate higher expectations on the outcome of the procedure. According to the authors, a score of 3 means an expectation of the respective item to 'remain the same', while a score of 4 means an expected improvement. Furthermore, a score of 1 or 5 signifies the expectation of significant deterioration or improvement, respectively.¹⁷ Apart from the ESSQ, we issued the same questionnaires in the postoperative survey. We modified the latter to the extent that it no longer inquired about the expectations of the operation, but rather the changes resulting from it.

Diplopia Questionnaire

In order to record the presence of double images separately, we used the Diplopia Questionnaire. This measure was developed by Holmes *et al* and includes the question of double images in seven different viewing directions or head positions.¹⁸

Hospital Anxiety and Depression Scale

We used the fourth updated edition of the German version of the Hospital Anxiety and Depression Scale (HADS-D), developed by Herrmann and Buss, to record the level of depression and anxiety.¹⁹ The original English version was published by Zigmond and Snaith.²⁰

The instrument consists of 14 items. Items linked to anxiety relate in particular to generalised anxiety disorder and panic symptoms but not to specific phobias. Lower scores represent lower levels of anxiety or depression.

Satisfaction with Strabismus Surgery Questionnaire

We assessed satisfaction with the surgical outcome with a self-developed questionnaire. Using a Visual Analogue Scale, we asked the participants to rate between 0% and 100% how satisfied they were with the surgical result. We also asked to state whether their expectations of the strabismus surgery were met.

Statistics

We performed descriptive statistics (mean, SD) on demographic data and used paired sample t-tests to examine whether individual size of deviation and diplopia changed postoperatively.

As we found no significant differences between the angles at distance and near, we only considered angle at distance as a predictor in the following analyses.

Further on, we formed the subscales of the questionnaires according to the original literature.^{14 17 18 21} We then measured Cronbach's alpha to calculate the internal consistency of the psychosocial and strabismus-specific measures. Again, subsequent evaluation for differences in the subscales preoperatively versus postoperatively was carried out using t-tests for paired samples. We evaluated the questionnaire about surgery satisfaction separately.

Regression analyses

We conducted four multivariable linear regression models with the respective summary scores of the questionnaire as outcome and adjusted for various potential predictors (see online supplemental figure 1). The four summary scores were for satisfaction with surgery (model 1), for QOL measured by AS-20 Questionnaire (model 2), for QOL measured by A&SQ (model 3) and for expectations of strabismus surgery measured by ESSQ (model 4).

We adjusted models 1–3 for age, sex, postoperative angle, the presence of postoperative diplopia, expectations of surgery and preoperative score of anxiety and depression. As we used expectations of surgery as outcome in model 4, we did not adjust for it as covariate and otherwise used the same predictors as in models 1–3 except for preoperative rather than postoperative angle and diplopia.

RESULTS

We included a total of 59 patients with strabismus (32 women and 27 men) with a mean age of 44.75 years (SD=16.80 years, range=19–85 years) in this study. Four participants ultimately did not undergo surgery, so only preoperative data were available for analysis. In one patient, surgery could not be performed due to comorbidities, two patients decided against surgery, and in one patient, strabismus surgery was not deemed necessary during the preoperative assessment. Eight patients did not show up for the postoperative follow-up appointment 3 months later. In these, we carried out the psychosocial examination via telephone interview and used the angle of deviation measured the day after surgery for further analyses. Another patient did not show up for the postoperative follow-up appointment and could not be reached by telephone for completing the questionnaires after surgery. Complete datasets were, therefore, available for a total of 54 patients. **Table 1** provides preoperative demographic and clinical data.

Table 1 Patient demographics and preoperative clinical assessment

Sex		
Male, n (%)	27	(45.7)
Female, n (%)	32	(54.2)
Age, mean (years) (SD)		
	44.8	(16.8)
Previous strabismus surgery		
Yes, n (%)	13	(22.0)
One, n (%)	8	(13.6)
Two or more, n (%)	5	(8.5)
No, n (%)	46	(78.0)
Angle of deviation at distance (cm/m ²), mean (SD)		
	27.8	(14.4)
Type of deviation		
Esodeviation, n (%)	26	(44.1)
Exodeviation, n (%)	32	(52.5)
Hyperdeviation and hypodeviation, n (%)	2	(3.4)
Manifest strabismus, n (%)	45	(76.3)
Latent strabismus, n (%)	14	(23.7)
Diplopia, n (%)	34	(57.6)

Validity of psychosocial and strabismus-specific questionnaires

For most of the subscales of the psychosocial and strabismus-specific questionnaires, reliability, as measured by Cronbach's α , was above 0.8, which corresponds to a good value. For the A&SQ subscale 'fear of losing the better eye', a value of 0.6 was measured, equivalent to

questionable reliability. In two cases, Cronbach's α was 0.77 and 0.79, respectively, corresponding to an acceptable value.

Postoperative changes in psychosocial and strabismus-specific scores

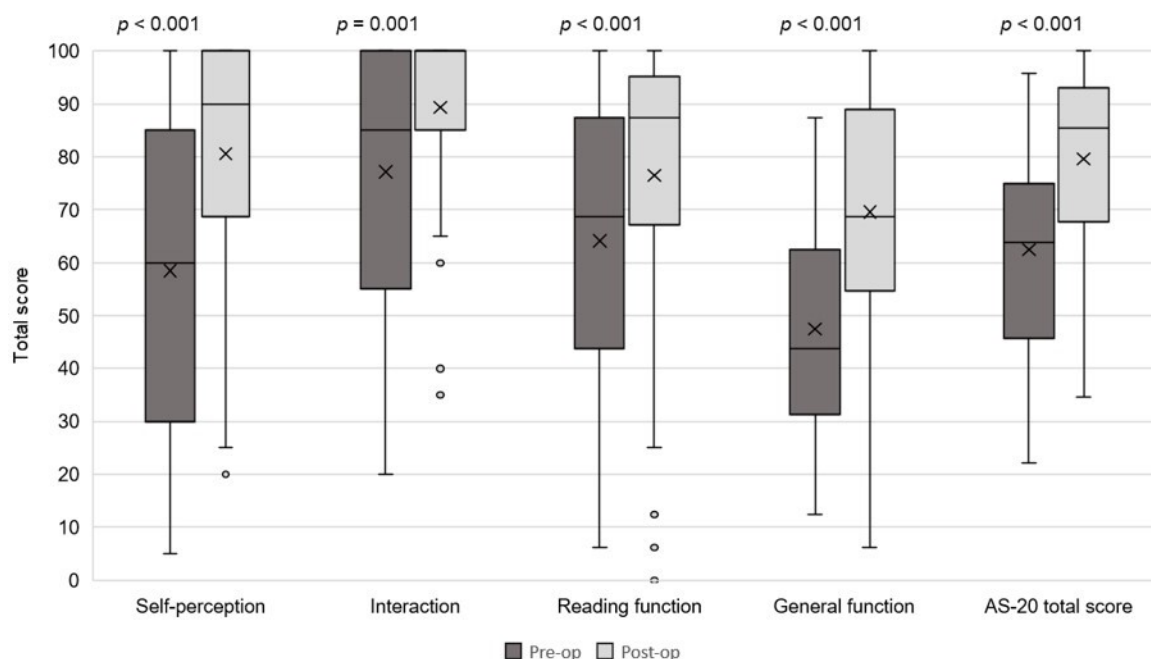
Preoperatively, 57.6% (34 patients) of participants stated double vision compared with 31.5% (17 patients) in the postoperative survey. Concerning the extent of diplopia of patients experiencing double vision, there was a significant reduction from a preoperative average score of 55.83 (SD=26.01) in the Diplopia Questionnaire to a postoperative average score of 25.30 (SD=35.3) ($p<0.001$).

There was also significant improvement on all subscales of both quality-of-life specific questionnaires. These findings are presented in figures 1 and 2.

Considering the overall change, the largest improvement related to the AS-20 Questionnaire was found in the subscales 'general function' and 'self-perception' ($|\Delta|=22.57$ and 22.13 , respectively). In contrast to the AS-20 Questionnaire, the mean score in the A&SQ decreased compared with the preoperative measurement, as lower scores in this questionnaire are associated with decreased strabismus-specific symptom burden.

There was also a significant improvement in both the anxiety and depression subscale of the HADS preoperatively versus postoperatively (online supplemental figure 2).

Within the ESSQ, we could not observe a difference when comparing preoperative ESSQ and modified postoperative ESSQ, which measures fulfilment of the previous expectations. Preoperatively, average total score was 3.61, while postoperatively, the mean total ESSQ score was 3.55.

**Figure 1** Preoperative and postoperative Adult Strabismus 20 Questionnaire scores.

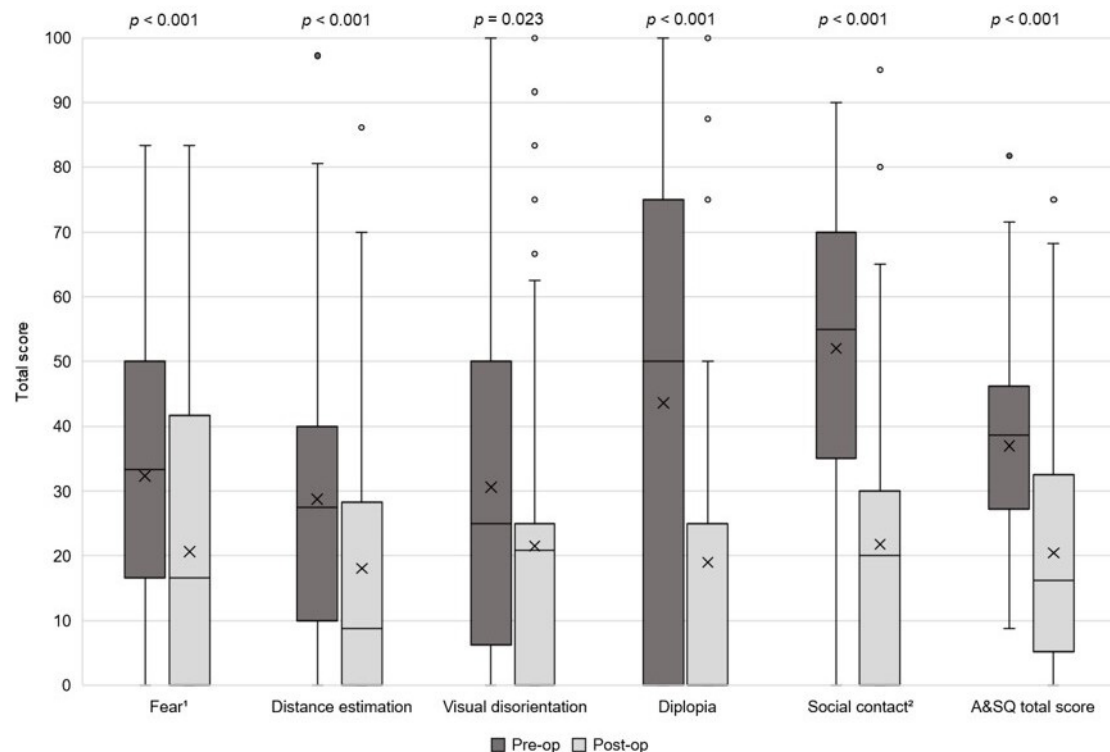


Figure 2 Preoperative and postoperative Amblyopia and Strabismus Questionnaire scores.

With regard to surgery satisfaction, most of the respondents stated that their expectations of the operation had been fulfilled. On the Visual Analogue Scale, average satisfaction was 86.20% (SD=22.89). Five patients stated that their expectations were either ‘not met’ or ‘rather not met’, even though, from a strabismological point of view, four of these five persons had good postoperative findings. Possible predictors regarding satisfaction with the operation are considered in the following.

Multivariable linear regression

Satisfaction with surgery

In model 1, we found a lower postoperative satisfaction with a higher postoperative angle ($\beta=-0.91$ per degree, 95% CI -1.55 to -0.27 , $p=0.007$), higher postoperative diplopia ($\beta=-0.23$ per unit score, 95% CI -0.43 to -0.02 , $p=0.03$) and a strong trend with higher levels of anxiety ($\beta=-1.85$ per unit score, 95% CI -3.74 to 0.04 , $p=0.05$). We found no association with the other covariates (see figure 3).

Health-related QOL

Both QOL measures were associated with the postoperative extent of diplopia (model 2: $\beta=-0.21$ per unit score, 95% CI -0.38 to -0.04 , $p=0.02$; model 3: $\beta=0.32$ per unit score, 95% CI 0.18 to 0.46 , $p<0.001$, respectively). We found no other associations.

Expectations of surgery

We found higher expectations with higher preoperative angle ($\beta=0.01$ per degree, 95% CI 0.001 to 0.01 , $p=0.02$)

and higher levels of depression ($\beta=0.06$ per unit score, 95% CI 0.03 to 0.09 , $p<0.001$). We found no other associations (see figure 4).

DISCUSSION

Our study indicates that patients with strabismus not only suffer from physical symptoms such as diplopia or reduced stereopsis but also are limited in terms of their mental health and QOL. In addition, it provides evidence that strabismus surgery leads to an improvement in all subcategories of strabismus-related QOL as well as to reduced anxiety and depression levels. Although strabismus affects many individuals, comparatively few studies exist that address the psychosocial aspects of this condition. In our study, many patients expressed their gratitude and said that they felt their condition was taken seriously after filling out the questionnaires.

In addition to the AS-20 Questionnaire as a quality-of-life measure, we also used the A&SQ. van de Graaf *et al* examined the differences between the two forms using factor analysis and found that both questionnaires examine similar QOL aspects, but the AS-20 Questionnaire assesses various functional complaints that are not found in the A&SQ.²²

There was significant improvement in the AS-20 Questionnaire postoperatively, in terms of both the subscales and the total score. The total score in our study was comparable to the findings of Glasman *et al*¹⁰ and Sim *et al*²³ but lower than the reported mean of Hatt *et al*.²⁴

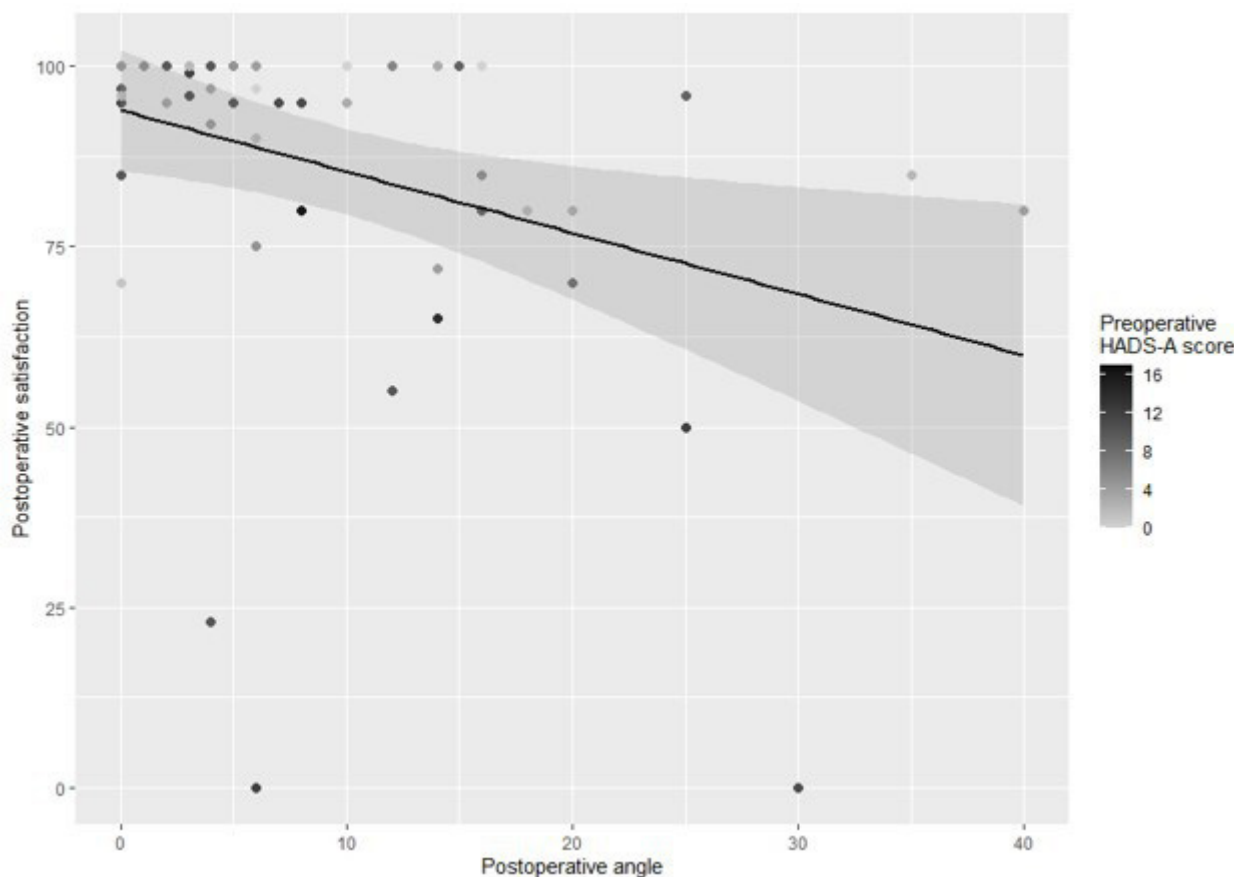


Figure 3 Scatterplot of postoperative satisfaction and postoperative angle stratified by preoperative Hospital Anxiety and Depression Scale-A score.

With regard to possible factors influencing postoperative QOL, only the degree of diplopia was found to be a significant predictor.

While the other questionnaires were developed specifically for patients with strabismus, the HADS was designed as an instrument for detecting anxiety and depression in individuals with any physical illness in an outpatient clinic context.²⁰ As there are significant correlations between patient rating and the assessment of the correct disease by a professional, it is a practical and reliable screening tool.²⁰ The preoperative HADS scores in this study indicate that the strabismus patients experience more anxiety and depression than the general population in Germany.²⁵

Postoperatively, we found a significant improvement in both subscales. While the scores for the anxiety level were still elevated in comparison to general population, the average score for depression was even below the normative value. A study conducted by Bez *et al* found that, using the HADS but also the Liebowitz Anxiety and Depression Scale, patients with strabismus suffered significantly more often from social phobia than control subjects.⁴ They measured comparatively high mean scores on both HADS subscales for patients with strabismus, with control subjects scoring even higher. This could be because their

control subjects, too, suffered from ophthalmological conditions and were admitted to hospital for treatment.

Our study, too, indicates a potentially impaired mental health of patients with strabismus. The assessment of psychological well-being is, therefore, essential and provides the opportunity for early intervention. According to one study, patients tend to regret their surgery in case of stronger social anxiety and avoidance behaviours despite a favourable clinical outcome.⁸ However, it is important to note that not every person suffering from strabismus experiences psychological symptoms. Also, the goal of a psychosocial assessment should be to identify patients with higher levels of distress and to provide them with psychological support in the future, if desired. This screening is not intended to label affected individuals as mentally unstable or to give them an additional psychiatric diagnosis.

We found that preoperative angle and preoperative depression levels were predictors for expectations of strabismus surgery. McBain *et al*, who found similar average ESSQ scores to our results, also reported a correlation between depression and expectations.¹⁷ A possible explanation for this could be that patients attribute the lack of psychological well-being to the underlying physical illness, which raises the expectation that appropriate

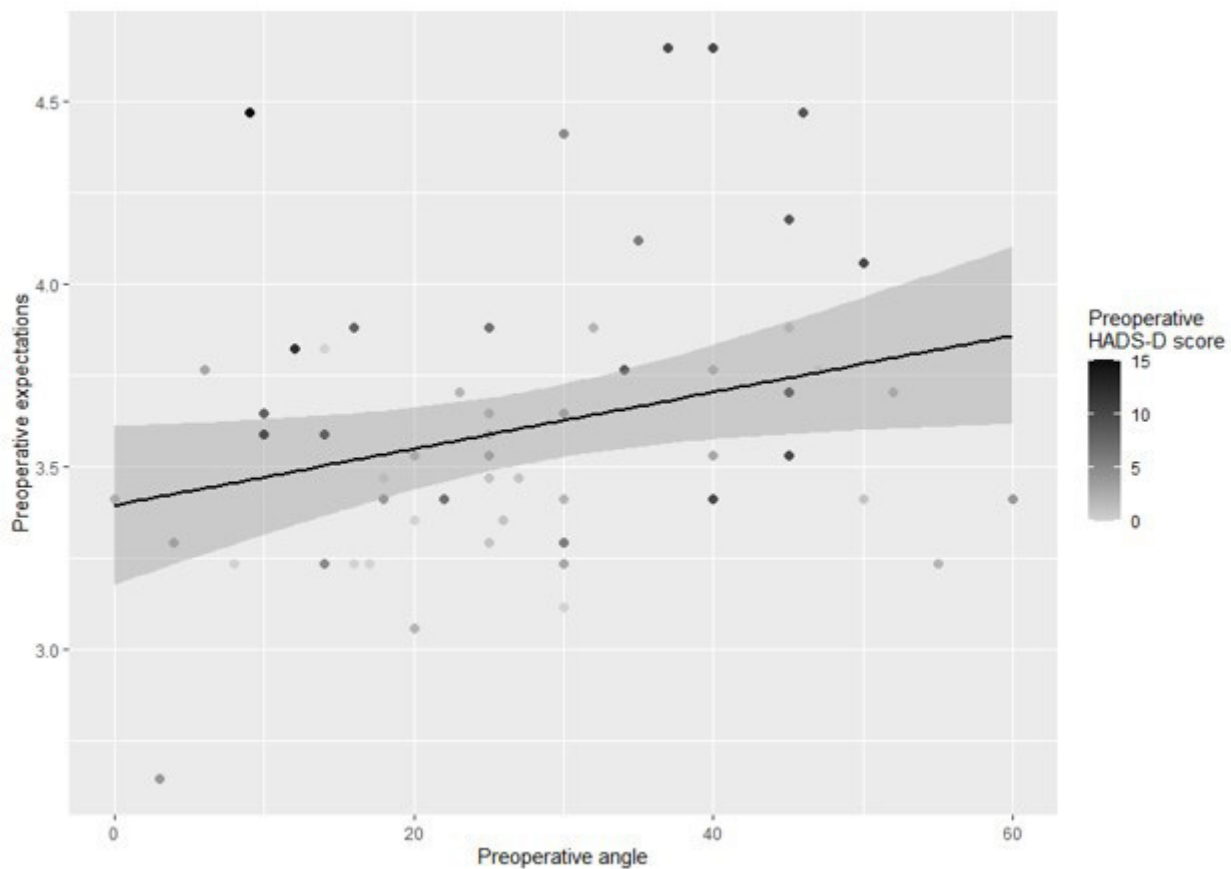


Figure 4 Scatterplot of preoperative expectations and preoperative angle stratified by preoperative Hospital Anxiety and Depression Scale-D score.

treatment will not only cure the strabismus itself but possibly also alleviate the depressive mood associated with it. According to McBain, patients with higher levels of anxiety and depression may see surgery as the key to a better QOL and may be disappointed if these comparatively high expectations are not met.¹⁷

When comparing the preoperatively measured expectations of strabismus surgery with the postoperatively perceived changes, no significant difference could be found. This shows that the patients' expectations were met but not exceeded and could also indicate that detailed information was provided in advance, through which patients mostly had realistic expectations of the intervention.

To the best of our knowledge, this study was the first to use both strabismus-specific QOL questionnaires as well as to assess expectations of surgery, anxiety and depression levels both preoperatively and postoperatively. We were able to show that the questionnaires are practicable and integrable in the routine of an outpatient clinic.

There are several limitations to our study. Due to its design as a pilot study and lower number of operations due to the COVID-19 pandemic, we only included a moderate sample size, which limits generalisability of results. Moreover, while some participants completed the questionnaires on the phone, others filled them out in the presence of a physician involved in this study,

which could be a possible source of bias. Furthermore, in patients who did not attend postoperative check-ups, the deviation angle measured the day after surgery was used for the analysis instead.

In conclusion, it is essential also to consider psychosocial outcomes when evaluating the success of strabismus surgery, as there is evidence that mental health factors can have a noticeable impact on expectations of surgery.

Future research on strabismus and its psychosocial aspects could continue to use the translated questionnaires, which were well received overall and understandable for patients. This provides the opportunity to identify and possibly help patients with abnormal scores early. The present study is a pilot study that will be followed by a large-scale multicentre study so that larger patient collectives, too, can be investigated.

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Competing interests None declared.

Patient and public involvement Patients and/or the public were involved in the design, or conduct, or reporting, or dissemination plans of this research. Refer to the Methods section for further details.

Patient consent for publication Consent obtained directly from patient(s)

Ethics approval This study involves human participants. The study obtained ethical approval from the ethics committee of the University Medical Faculty in Bonn (Germany) (approval ID: 423/20). The study held approval of the responsible ethics committee and data collection was in accordance with the Declaration of Helsinki. Participants gave informed consent to participate in the study before taking part.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available upon reasonable request. Data consists of the patients' questionnaire responses and orthoptic examination results used for the statistical analyses and of the translated questionnaires.

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