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ARTICLE

# Psychological well-being in visually impaired and unimpaired individuals

## A meta-analysis

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ABSTRACT This meta-analysis integrates the results from 198 studies that compared psychological well-being of visually impaired individuals with unimpaired control groups or population norms. On average, visually impaired people showed a strong decline of vision-specific psychological well-being. However, declines in vision-unspecific measures were only small. Furthermore, declines of psychological well-being were stronger in studies with convenience samples (rather than probability samples) and in studies that used population norms as standard for comparison (rather than control groups), in individuals with greater vision loss, in patients with age-related macular degeneration as compared to glaucoma, in adults as compared to children, and, in part, in older studies. These factors should inform researchers and practitioners for developing and implementing interventions aimed at protecting psychological well-being.

KEY WORDS *anxiety, depression, meta-analysis, psychological health, vision-loss*

The prevalence of vision impairment increases with age. For example, Vitale, Cotch and Sperduto (2006) estimated that in the US between 7.8 percent of 12–19-year-olds and 31 percent of adults 60 years and older have incomplete visual acuity, defined as presenting distance visual acuity of 20/50 or worse in the better-seeing eye.

Given the effects of vision loss on daily life (Tuttle and Tuttle, 2004), it is believed that limited vision performance is negatively associated with psychological well-being (PWB). With the term PWB we refer to internal, individual states, such as being free of mental illness, having high levels of positive emotions/low levels of negative emotions, self-acceptance, and being satisfied with life. However, a narrative review of 14 studies by Gish (2002) on the self-concept of visually impaired and sighted children and adolescents found inconsistent results. Most studies from narrative reviews on vision loss in older adults report reduced PWB in visually impaired elderly but not all studies found significant differences (Berman and Brodaty, 2006; Burmedi et al. 2002; Mitchell and Bradley, 2006; Nyman et al., in press).

These narrative reviews could not estimate the size of differences between PWB of visually impaired and sighted individuals, analyze whether some aspects of PWB show stronger declines than others, or test whether the size of differences would vary by other study characteristics. These questions are addressed in the present meta-analysis. Compared to available narrative reviews, we did not limit our focus to a particular eye disease, a particular age-group (e.g. age-related vision loss), or publications in English language. This enabled us to include a larger number of available studies. Based on available narrative reviews, we expected that visually impaired individuals would show, on average, lower levels of PWB than their sighted peers (research question 1).

## EFFECTS OF STUDY CHARACTERISTICS

In the case of research question 2, we expected that the size of the observed differences would vary by study characteristics. We limited our focus on study characteristics that have been reported in most available studies:

*Severity of visual impairment*. We expected that less severe vision impairments may have less negative psychosocial consequences because visual impairment would have fewer aversive effects on PWB.

*Source of information about visual impairment*. Studies using clinical examinations of visual performance were expected to show stronger associations with PWB than studies using patients' self-ratings. The former studies compare individuals with severe visual impairment with unimpaired individuals. Correlative studies with self-ratings of visual impairment often include people with less severe visual impairments who might not be restricted in their lives.

*Source of information about PWB*. Wong et al. (2009) found that visually impaired adolescents reported lower PWB than their healthy peers whereas no significant difference was observed in the parent proxy-reports. Thus, *observers* may sometimes underestimate psychological consequences of vision loss. Therefore, we expected stronger differences between PWB of visually impaired and unimpaired individuals if self-ratings rather than proxy ratings of PWB are used.

*Cause of visual impairment.* Berman and Brodaty (2006) suggested that age-related macular degeneration (AMD) may have stronger aversive effects on PWB than other diagnoses, such as cataract or glaucoma, because at this time AMD is a progressive disease often leading to blindness and there is little in the way of treatment that can slow down progression and none that can restore vision. In addition, a study by Broman et al. (2002) showed that patients with glaucoma and diabetic retinopathy reported larger vision losses, more role difficulties, and worse PWB than patients with cataract. These results led us to expect that patients with AMD, glaucoma, and diabetic retinopathy would show the strongest declines of PWB.

*Age differences.* Tuttle and Tuttle (2004) suggested that those who are visually impaired from infancy would find it easier, since they do not have to learn to live with a new condition. Furthermore, the double burden of other age-associated losses (Mayer and Baltes, 2001) *and* becoming visually impaired may act as a particularly strong threat to the maintenance of positive PWB in old age. Thus, we expected that differences between PWB of visually impaired and unimpaired individuals would become stronger with increasing age.

*Sampling.* Large community-based studies (which draw upon probability samples) may find lower declines of PWB than convenience samples that often include highly distressed individuals who search for help regarding actual vision-related problems.

*Standard of comparison.* We expected stronger declines of PWB if visually impaired people are compared with a group of unimpaired individuals rather than with population norms: general population norms probably include scores of some visually impaired individuals, which would lead to an underestimation of differences between visually impaired and unimpaired individuals.

*Cohort differences/year of publication.* Some negative consequences of visual impairment on daily life and PWB may have become smaller over the last decades due to therapeutic progress and the development and dissemination of low vision services (Scott et al., 1999). Thus, we expected that differences between PWB of visually impaired and normally sighted persons would be smaller in more recent studies.

*Outcomes*. Mental health has been assessed with generic and vision-specific measures. Vision-specific scales, such as the mental health subscale of the National Eye Institute Visual Function Questionnaire (NEI VFQ-25; Mangione et al., 1998) ask for worries about eyesight, and feeling frustrated because of bad eyesight. Generic measures may also ask about worries and frustrations but do not specify the sources of negative feelings (e.g. the mental health subscale of the Medical Outcome Survey SF-36; Ware and Sherbourne, 1992). Thus, we expected larger differences between PWB of visually impaired and unimpaired individuals in vision-specific than in vision-unspecific measures. It is less clear whether the effects of visual impairment would differ between other aspects of global PWB or psychological health, such as depression and anxiety, and we did not state a specific hypothesis.

## METHODS

### Sample

Studies were identified from the literature through electronic databases [PSYCINFO; MEDLINE; CINAHL; EMBASE – search terms: (visual impairment or blindness or low vision or glaucoma or cataract or diabetic retinopathy or retinitis or AMD) and (PWB or subjective well-being or psychological health or mental health or quality of life or depression or anxiety or loneliness or positive affect or life satisfaction or self-concept or self-esteem)], and cross-referencing. Criteria for inclusion of studies in the meta-analysis were as follows:

1 The studies compared visually impaired individuals with normally sighted individuals or with population norms.
2 One or more of the psychological variables of the search terms were assessed.
3 Between-group differences in psychological outcome variables are reported or could be computed.

The search identified 1,493 abstracts. After checking their contents, 235 studies remained. The removed studies provided no comparative, quantitative data from individuals with and without vision loss. After reading the full remaining articles, thirty-seven studies had to be further excluded because they did not allow for computing effect sizes for PWB (number of samples, $k = 22$), did not report separate data of visually impaired and unimpaired individuals ($k = 9$), or duplicated results of other articles ($k$ = 6). After exclusion of such studies, we were able to include 198 articles in the meta-analysis. Studies used in the meta-analysis are listed in the Appendix (available at http://jvi.sagepub.com/).

We entered the year of publication, the sample sizes, the mean age of the visually impaired and unimpaired participants, the percentage of women, of married participants, and of respondents from ethnic minority groups, sampling (1 = large, community-based sample, 2 = convenience sample), the severity of visual impairment (1 = visual impaired/ nonblind, 2 = blind, 3 = mixed), the type of visual condition (1 = AMD, 2 = cataract, 3 = glaucoma, 4 = diabetic retinopathy, 5 = retinitis, 6 = retinoblastoma, 7 = Graves ophthalmopathy; 8 = others/mixed conditions), the methods of assessment of visual impairment (1 = clinical test, 0 = self-rating), the design (1 = comparison with unimpaired control group, 0 = comparison with population norms), the source of information about PWB (1 = self-rating, 2 = rating of parents/ family members, 3 = clinician-rating, 4 = teacher rating), the use of a vision-specific measure of PWB (1 = yes, 0 = no), the method for assessing PWB, and the standardized size of between-group difference in PWB.

If effects were provided for several subgroups in a publication (e.g. different conditions), we entered these into our analysis instead of entering the global association measures. For comparing different outcomes, we coded the effect size (*ES)* for each outcome variable separately. If articles reported data on different outcome variables (e.g. depression, anxiety), the *ES* were also averaged for the analysis of global differences between visually impaired and unimpaired individuals.

## Measures

The studies used, in general, validated measures, although a small minority of studies used single-item indicators. Due to space limitations, we report only the most frequently used instruments:

*Mental health*. For vision-specific mental health, studies used the Mental Health subscale of the NEI VFQ-25 (Mangione et al., 1998; 29 studies) and related scales (7 studies). Global mental health was assessed with the mental health subscale of the SF-36 (Ware and Sherbourne, 1992; 27 studies), the SF-12 (7 studies), and related instruments (24 studies). Sum scores of externalizing and internalizing problem behaviour of children and adolescents were assessed with the Child Behavior Checklist (Achenbach, 1991) and related scales (5 studies).

*Depression* was assessed with the Center for Epidemiological Studies Depression Scale (Radloff, 1977; 13 studies), the Geriatric Depression Scale (Yesavage et al., 1983; 9 studies), and other measures (42 studies).

*Anxiety* symptoms were assessed with the anxiety subscale of the Hospital Anxiety and Depression Scale (Zigmond and Snaith, 1983; 4 studies) and related scales (16 studies).

*Life-satisfaction* was assessed with the Philadelphia Geriatric Center Moral Scale (Lawton, 1975; 3 studies) and related measures (4 studies).

*Positive affect/affect balance* was assessed with single items on the frequency of happiness (4 studies) and related multi-item measures (5 studies).

*Loneliness*. This variable was assessed with single-item indicators (7 studies) and related multi-item scales (1 study).

*Self-concept/self-esteem* were measured with the Tennessee Self-Concept Scale (Fitts, 1965; 5 studies), the Rosenberg Self Esteem Scale (Rosenberg, 1965; 4 studies), and related instruments (17 studies).

## Statistical integration of the findings

Calculations were performed in five steps, using random-effects models and iterative maximum likelihood method (Lipsey and Wilson, 2001).

1 All *ES* were coded so that negative scores indicate lower psychological health of visually impaired as compared to visually intact individuals. We computed *ES* for each study as the difference in PWB between visually impaired and unimpaired individuals divided by the pooled standard deviation. *ES* that differed by more than two standard deviations (*SD*) from the mean *ES* were considered as outliers and set to 2 *SD*. The *ES* estimates were adjusted for biases due to overestimation of the population *ES* (common for small samples). Confidence intervals that include 95 percent of the effects were computed for each *ES*.
2 The homogeneity of *ES* was tested by using the homogeneity statistics *Q*. Significant *Q*-scores indicate that the size of between-group differences varies between studies, depending on study characteristics.
3 *ES* were weighted by the reciprocal of the standard error of the mean. The significance of the mean *ES* was tested by dividing the weighted mean *ES* by the estimation of the standard error of the mean. As a tool

for interpreting the practical significance of correlation coefficients, we used the Binomial Effect Size Display (BESD) which estimates the percentage of individuals with visual impairment and normal vision who show above-median levels of PWB.

4 An analog to the analysis of variance was applied for testing whether the *ES* would differ by categorical variables, such as visual condition. Differences between two individual conditions were interpreted as significant when the 95 percent intervals did not overlap.

5 In order to test the influence of several study characteristics simultaneously, we used weighted least squares regression analyses. Here, studies were again weighted by reciprocal of the standard error of the mean.

## RESULTS

### Descriptive results

The 198 included studies provided data from 311 samples of individuals with visual impairment. The mean age of the visually impaired respondents was 71.37 years ($SD$ = 11.27), and the normally sighted control group members were, on average, 2.8 years younger ($SD$ = 4.6). About 62 percent of the participants were women, 16.5 percent were from ethnic minorities, and 42 percent of the adults were married. About two-thirds of the studies used convenience samples of hospital patients or clients of rehabilitation services.

### Differences in PWB between visually impaired and unimpaired individuals

According to Cohen, between-group differences of $d \geq 0.8$ standard deviation units are interpreted as large, of $d = .50$ as medium, and of $d = .20$ as small. On average, PWB scores of respondents with visual impairment are lower than those of their normally sighted peers, and the differences across all studies are small to moderate (Table 1). According to the BESD, 38.3 percent of the visually impaired individuals as compared to 61.7 percent of the unimpaired individuals show above-median levels of PWB.

When averaging across all well-being measures, we did not find lower PWB of blind compared with of visually impaired people with less severe visual loss, although the differences went in the expected direction. As expected, we found stronger differences between visually impaired and unimpaired individuals if vision impairment is assessed through clinical tests or diagnoses rather than by respondents’ self-ratings. In addition, studies with clinician-rated PWB showed lower declines than studies with patients' self-rating, family members' ratings, and teacher ratings. Furthermore, AMD patients showed stronger declines of PWB than patients with glaucoma.

We also found that visually impaired adolescents and adults had lower levels of PWB than their sighted peers whereas differences were not significant in children (Table 1). As shown by the non-overlap of the 95%-confidence intervals, visually impaired adults showed stronger declines of PWB than children (0–12 years).

Interestingly, declines of PWB were stronger in studies that used population norms rather than a normally sighted comparison group. Declines of PWB were larger in convenience samples than in more representative studies with large community-based samples. Contrary to our expectation, declines of PWB did not become significantly smaller in more recent studies.

In line with our expectations, we found large differences between visually impaired and unimpaired persons on vision-specific mental health measures, whereas differences on global measures were small (Table 1). Vision status explained 23.9 percent of the variance of vision-specific measures of PWB, that is 9.6 times more variance than in vision-unspecific measures (2.5%). According to the BESD, 25.6 percent of the visually impaired respondents as compared to 74.4 percent of the unimpaired would show vision-specific PWB above the median. The difference is much stronger than in vision-unspecific measures (42.1% vs. 57.9%).

We also compared *ES* for other outcomes. As shown in Table 1, we found moderate to large between-group differences in studies that assessed mental health, small to moderate differences in internalizing problem behaviour (e.g. symptoms of anxiety and depression) and life-satisfaction, as well as small differences in depression, anxiety, and positive affect/affect balance. However, no significant between-group differences were found in global self-concept measures and externalizing problem behaviour, such as aggressive behaviour. When analyzing self-concept subscales we found significant small to moderate between-group differences in the family self and social self (which focuses on peer relations). In addition, there were small between-group differences in the academic self-concept, indicating a *better* self-concept in persons with visual impairment.

**Table 1. Differences in psychological well-being between visually impaired and unimpaired individuals**

| | *k* | *d* | 95%–*C.I.* | | *Z* | $Q_w$ | Effect size |
|---|---|---|---|---|---|---|---|
| Psychological well-being | 311 | –.49 | –.52 | –.45 | –27.32*** | 332.02 | Small to moderate |
| Severity of visual impairment | | | | | $Q_B(1,305)=2.74$ | | |
| Blindness | 38 | –.58 | –.76 | –.39 | –6.14*** | 59.64*** | Moderate |
| Mix | 224 | –.52 | –.59 | –.44 | –14.04*** | 222.07 | Moderate |
| Visually impaired but nonblind | 46 | –.39 | –.55 | –.23 | –4.76*** | 30.08 | Small |
| Assessment of visual impairment | | | | | $Q_B(1,308)=13.29$** | | |
| Clinical assessment | 260 | –.56 | –.62 | –.49 | –16.30*** | 308.21** | Moderate |
| Self-rating | 48 | –.27 | –.41 | –.12 | –3.53*** | 4.46 | Small |
| Rater of psychological well-being | | | | | $Q_B(3,307)=12.37$** | | |
| Self-rating | 280 | –.53 | –.60 | –.47 | –16.24*** | 308.13 | Moderate |
| Clinician-rating | 25 | –.15 | –.20 | –.10 | –4.76*** | 2.34 | Very small |
| Rating of parents/family members | 6 | –.69 | –1.13 | –.25 | –3.05** | 5.47 | Moderate to large |
| Teacher rating | 4 | –.56 | –.75 | –.38 | –6.02*** | 0.13 | Moderate |
| Visual condition | | | | | $Q_B(6,88)=14.13$* | | |
| AMD | 22 | –.87 | –1.09 | –.66 | –7.91*** | 31.15 | Large |
| Cataract | 20 | –.66 | –.90 | –.42 | –5.38*** | 9.67 | Moderate |
| Glaucoma | 20 | –.38 | –.61 | –.16 | –3.37** | 8.15 | Small |
| Diabetic retinopathy | 14 | –.88 | –1.08 | –.52 | –5.58*** | 20.52 | Large |
| Retinitis | 8 | –.54 | –.93 | –.15 | –2.71** | 13.50* | Moderate |
| Graves ophthalmopathy | 8 | –.67 | –1.03 | –.32 | –3.71*** | 2.05 | Moderate |
| Retinoblastoma | 4 | –.44 | –.94 | .06 | –1.72 | 8.46* | Small to moderate |
| Age of the respondents | | | | | $Q_B(3,301)=12.66$** | | |
| Children (0–12 years) | 18 | –.15 | –.41 | .11 | –1.12 | 26.21 | |

*(Continued)*

**Table 1. (Continued)**

| | *k* | *d* | 95%–*C.I.* | | *Z* | $Q_w$ | Effect size |
|---|---|---|---|---|---|---|---|
| Adolescents (12–19 years) | 39 | –.31 | –.49 | –.14 | –3.49*** | 46.03 | Small |
| Young/middle-aged adults (20–60 years) | 67 | –.56 | –.69 | –.43 | –8.44*** | 54.36 | Moderate |
| Older adults (> 60 years) | 181 | –.53 | –.61 | –.46 | –13.42*** | 181.83 | Moderate |
| Comparison | | | | | $Q_B(1,309)=3.92$* | | |
| with collected data from a non-impaired control group | 278 | –.48 | –.55 | –.42 | –14.52*** | 258.75 | Small to moderate |
| with norms/results from other studies | 33 | –.68 | –.87 | –.50 | –7.17*** | 56.86*** | Moderate |
| Sample | | | | | $Q_B(1,309)=15.50$** | | |
| Community sample | 93 | –.33 | –.44 | –.23 | –6.22*** | 54.73 | Small |
| Convenience sample | 218 | –.59 | –.66 | –.52 | –15.66*** | 261.79** | Moderate |
| Year of publication | | | | | $Q_B(2,308)=2.16$ | | |
| <1990 | 29 | –.46 | –.67 | –.24 | –4.18*** | 28.22 | Small to moderate |
| 1990–1999 | 58 | –.44 | –.58 | –.29 | –5.89*** | 57.15 | Small to moderate |
| ≥2000 | 223 | –.54 | –.61 | –.46 | –14.33*** | 230.86 | Moderate |
| Global versus vision-specific measure | | | | | $Q_B(1,311)=142.03$*** | | |
| Global well-being | 228 | –.32 | –.39 | –.25 | –9.36*** | 180.46 | Small |
| Vision-specific well-being | 85 | –1.12 | –1.24 | –1.01 | –19.16*** | 138.85*** | Large |
| Outcome variable[1] | | | | | $Q_B(8,321)=53.87$*** | | |
| Mental health sum scales | 153 | –.74 | –.82 | –.65 | –18.17*** | 196.76*** | Moderate to large |
| Vision-specific mental health | 84 | –1.08 | –1.20 | –.97 | –18.45*** | 109.22** | Large |
| Vision-unspecific mental health | 69 | –.34 | –.47 | –.22 | –5.43*** | 34.40 | Small |

**Table 1. (Continued)**

| | *k* | *d* | 95%–*C.I.* | | *Z* | $Q_w$ | Effect size |
|---|---|---|---|---|---|---|---|
| Depression | 89 | –.26 | –.30 | –.21 | –10.93*** | 27.42 | Small |
| Anxiety | 28 | –.20 | –.31 | –.09 | –3.48*** | 17.65 | Small |
| Internalizing problem behaviour | 8 | –.41 | –.68 | –.14 | –2.99** | 6.33 | Small to moderate |
| Externalizing problem behaviour | 9 | –.19 | –.44 | .06 | –1.45 | 34.53*** | |
| Life-satisfaction | 11 | –.41 | –.59 | –.23 | –4.45*** | 9.88 | Small to moderate |
| Positive affect/affect balance | 9 | –.28 | –.43 | –.14 | –3.81*** | 2.30 | Small |
| Loneliness | 13 | –.22 | –.34 | –.09 | –3.50*** | 1.51 | Small |
| Self-concept/self-esteem | 30 | –.30 | –.65 | .06 | –1.63 | 62.72*** | |
| Physical self | 19 | –.41 | –1.11 | .29 | –1.15 | 44.45*** | |
| Family self | 11 | –.49 | –1.12 | .14 | –1.52 | 21.35*** | |
| Social self | 16 | –.43 | –.79 | –.06 | –2.28* | 48.29*** | Small to moderate |
| Academic self | 3 | .37 | .14 | .60 | 3.18** | 4.22 | Small |
| Moral self | 8 | –.72 | –1.65 | .22 | –1.50 | 28.96*** | Moderate to large |

*Notes:* *k*=number of samples; *d*=effect size (negative scores indicate lower psychological well-being in visually impaired than in normally sighted individuals). 95%-*C.I.* = 95% confidence interval of the *ES*; *t*=test of significance of the *ES*; $Q_w$=test of homogeneity of the *ES* within a condition (significant values indicate heterogeneity of *ES*); $Q_B$=test for heterogeneity of *ES* between conditions.

[1] Vision-specificity of mental health scales and sub-aspects of self-concept were not included in the computation of $Q_B$.*$p$<.05, **$p$<.01, ***$p$<.001.

A common problem in meta-analysis is the so-called file drawer problem or publication bias (Lipsey and Wilson, 2001). This means that some studies remain unpublished because of non-significant findings, thus causing an overestimation of the effect size. Missing studies are both hard to detect and to obtain. To solve this problem we utilized a two-step approach suggested by Duval and Tweedie (2000). First, we examined funnel plots to estimate the number of missing studies based upon symmetry assumptions. Second, we imputed the missing values using the 'trim and fill' algorithm (Duval and Tweedie, 2000), added them to the analysis, and re-computed the summary effect sizes. This analysis showed no evidence for an overestimation of effect sizes due to file-drawer problems.

Univariate tests for impacts of study characteristics do not consider the fact that some of these characteristics were not independent from each other (i.e. confounded). For example, measures for vision-specific mental health have mainly been used in adult samples. Thus, we finally computed weighted multivariate regression analyses for analyzing associations of study characteristics with declines of PWB. Separate analyses were computed for the whole data set and for the two most often used outcomes, mental health and depression.

Two dummy variables of vision status were included that compared blind samples and visually impaired people with less severe visual loss (non-blind) samples, respectively, against mixed samples. We did not include the visual condition in the multivariate analysis because only small numbers of studies were available for most kinds of illness. In the regression analysis, negative coefficients indicate that larger scores of the independent variable are associated with stronger declines of PWB of the visually impaired sample.

We found a significant age-effect on PWB and mental health, thus replicating the univariate results (Table 2). Studies with blind individuals showed lower PWB and mental health as well as more depressive symptoms, whereas studies with visually impaired non-blind individuals showed weaker declines of general PWB and of mental health in particular. Studies that compared individuals with visual impairment against population norms and studies with convenience samples showed lower PWB, mental health, and more depressive symptoms than studies with visually unimpaired control groups and more representative samples. Finally, we found that more recent studies revealed weaker declines of PWB.

**Table 2. Multivariate analysis of effects of study characteristics on differences between psychological well-being of visually impaired and unimpaired individuals**

| | Dependent variables | | | | | |
|---|---|---|---|---|---|---|
| | PWB | | Mental health | | Depression | |
| **Independent variables** | ***B*** | β | ***B*** | β | ***B*** | β |
| Vision status: all participants blind (1=yes, 0=no) | –.17* | –.10 | –.40** | –.22 | –.15* | –.18 |
| Vision-status: all participants non-blind (1=yes, 0=no) | .14* | .10 | .25* | .15 | .08 | .14 |
| Clinician-rating of visual abilities (1=yes, 0=no) | –.07 | –.05 | –.01 | –.00 | .07 | .14 |
| Clinician-rating of PWB (1=yes, 0=no) | .14 | .07 | –.30 | –.05 | .07 | .14 |
| Vision-specific well-being measure (1=yes, 0=no) | –.67*** | –.51 | –.65*** | –.54 | | |
| Age | –.01*** | –.27 | –.01** | –.20 | –.00 | –.10 |
| Comparison against norm (1=yes, 0=no) | –.35*** | –.20 | –.37*** | –.23 | –.32** | –.29 |
| Sampling (1=community-based, 2=convenience sample) | –.13* | –.12 | –.26** | –.20 | –.13* | –.27 |
| Year of publication | .01* | .11 | –.01 | –.06 | –.00 | –.03 |
| (Constant) | –14.99** | | 12.34 | | 2.66 | |
| $R^2$ | .39 | | .52 | | .29 | |
| *k* | 293 | | 138 | | 87 | |

*Notes*: Negative regression coefficients indicate that high scores of the independent variable increase the differences between PWB of visually impaired and non-impaired respondents. *$p$<.05, **$p$<.01, ***$p$<.001

As information about age differences of visually impaired and unimpaired respondents was only available for 133 of the 311 samples, we could not include this variable in the multivariate analyses. However, additional univariate weighted regression analyses showed that the size of differences in PWB ($k$ = 129, $B$ = –.01, $\beta$ = –.15, $Z$ = –1.70, *n.s.*), mental health ($k$ = 57, $B$ = .02, $\beta$ = .23, $Z$ = 1.74, *n.s.*) and depression ($k$ = 35, $B$ = .01, $\beta$ = .25, $Z$ = 1.61, *n.s.*) did not vary by the size of these age differences.

## DISCUSSION

The present study reports the first meta-analysis of PWB in visually impaired versus unimpaired individuals. It quantified the average effects of vision loss on a broad range of psychological outcomes and tested for study characteristics that moderate the *ES*, such as age and comparison group.

Available narrative reviews have highlighted that visual impairment is a risk factor for impaired PWB, although the results of individual studies were, in part, inconsistent (Berman and Brodaty, 2006; Burmedi et al., 2002; Gish, 2002; Mitchell and Bradley, 2006; Nyman et al., 2010). Based on a very large number of included studies, the present meta-analysis identified conditions that account for observed differences between results of individual studies. In addition, the tests for statistical significance allow for more reliable conclusions as compared to narrative reviews.

We found that patients with AMD and diabetic retinopathy show above-average declines of PWB, whereas declines of glaucoma patients were smaller than expected. As glaucoma is a leading cause of blindness, strong declines of PWB in glaucoma patients may be limited to individuals with more severe vision loss.

As vision-status explained, on average, 9.2 times more variance of vision-specific PWB than of vision-unspecific PWB, a main question is which measures should be selected for research and clinical practice. Vision-unspecific measures do not assess vision-specific worries and frustrations and may, therefore, underestimate effects of vision loss on PWB. For example, having an eye disease may mainly increase worries about future progression of that condition rather than worries in general. However, limiting the assessment to vision-specific measures narrows the view on PWB. Many factors contribute to general PWB, such as competence, good finances, and social integration (Pinquart and Sörensen, 2000). Thus, it appears (perhaps unsurprisingly) individuals with visual impairments are able to derive positive feelings from domains of life that are not negatively affected by vision loss. Therefore, loss of vision may not have such negative consequences for general PWB. Thus measures should be carefully selected and, for getting a balanced view, researchers and clinicians may use both generic and vision-specific measures.

As indicated by the non-overlap of the 95%-confidence intervals, the *ES* did not differ significantly between vision-unspecific outcomes, except academic self-concept. As only three studies were available on academic self-concept, this result should be interpreted with caution. Nonetheless, the result indicates that visually impaired students may compensate for their vision loss by above-average striving for good grades (Klinkosz et al., 2006) or by overestimating their academic performance.

Interestingly, visually impaired adults showed the strongest decline of PWB which may, in part, reflect difficulties at the labour market or with mastering other age-specific developmental tasks, such as building a family. In addition, those who develop vision loss during adulthood may have more problems with adaptation than congenital blind children (Tuttle and Tuttle, 2004).

The present meta-analysis found stronger impairments of PWB in convenience samples than in larger and more representative community-based samples. This may indicate that studies with convenience samples overestimate PWB problems, because they assess distressed patients who sought help for recent vision-related problems. Alternatively, some of the large community-based studies with no main focus on vision loss may not have reached participants with severe vision loss and lowest PWB if they have not accommodated their instruments to the needs of these persons. Thus, all studies that include items on vision loss should be accommodated to the needs of respondents with severe visual impairment (e.g. providing the questions in an interview format, if needed).

Larger declines of PWB were found in studies that compared PWB of individuals with visual impairment with population norms rather than with a control group of normally sighted people. The controlled studies tried to recruit control group members that are similar to the visually impaired group with regard of background characteristics, such as age and socioeconomic status (SES). Lower SES is associated with lower PWB (Pinquart and Sörensen, 2000) and higher prevalence of vision loss (Rahdi, Cumberland and Packham, 2009). Therefore, studies with well matched control groups may be more likely to isolate pure effects of vision loss whereas studies that compared with population norms may also identify effects of correlates of vision loss, such as low SES.

In multivariate analysis, there was some evidence for the suggestion that differences between PWB of visually impaired and unimpaired individuals have become smaller in recent studies. This observation may be due to improvements and greater availability of low vision rehabilitation services and assistive devices. For example, progress has been made in developing technologies for low vision enhancement, wayfinding, assistive aids, and in greater accessibility of mainstream technologies for people with visual impairments (National Eye Institute, 2010). Even stronger effects of progress in therapy of eye diseases could be expected on the prevalence and severity of vision loss.

Sources of information about vision loss and PWB did no longer affect the outcomes after statistically controlling for the fact that self-ratings are mainly used in large-scale community-based studies. Furthermore, results did not differ between studies by matching according to participants' age. This indicates that the observed results are quite robust with regard to this sample characteristic.

## LIMITATIONS AND CONCLUSIONS

Our meta-analysis has several limitations. First, many studies did not provide information about the circumstances of sight loss. Thus, we could not test for difference between sudden versus gradual onset of vision loss and between congenital versus acquired visual impairment. Second, as only very few studies provided sufficient information about co-morbidities, we were not able to separate the effect of vision loss from effects of co-morbidities. Third, we focused on correlative data that do not allow for conclusions about causality. It is very likely that vision loss is a source of negative feelings or even clinical depression. However, low mental health may also increase (reported) visual impairments as depression leads to poorer self-reports of objective health and performance status (e.g. Schneider et al., 2004) and may inhibit the search for treatment of an eye disease (Penninx et al., 1998). It may also be the case that social explanations such as public attitude to disability may contribute to lower PWB rather than the impairment itself. More longitudinal research would increase our understanding of causality. Fourth, space limitations in this article did not allow for including a separate meta-analysis on studies that compared patients with different degrees of vision without providing comparisons with visually unimpaired individuals. Fifth, our meta-analysis did not address between-group differences in non-psychological indicators of quality of life, such as everyday competence, career, family relations, and other aspects of social inclusion. These effects should be addressed in future meta-analyses. Similarly, psychological effects of vision rehabilitation and psychosocial interventions with individuals with vision loss would be a valuable topic of future meta-analyses. Finally, we were not able to investigate the ways in which visual impairment influences PWB. For example, effects of visual impairment may be mediated through restrictions in everyday competence and independence, impairments of social relations, or lack of other sources of positive well-being (e.g. Horowitz et al., 2005b).

Nonetheless, several conclusions can be drawn from our meta-analysis. First, although visually impaired individuals report lower levels of PWB than normally sighted individuals, differences in vision-unspecific measures are, on average, of small to moderate size, and many individuals appear not to have low levels of PWB at all. Psychological mechanisms that counteract the negative emotional consequences of vision loss may be trying to 'make the best of it', adjusting one's aspiration level, or drawing favourable social comparisons (Wahl, 1997). Second, adults, people with more severe vision loss, and patients with AMD are at higher risk for reduced PWB. Third, we conclude that interventions are needed for visually impaired individuals with low PWB. They may focus on the treatment of the eye disease and, in the case of unchangeable vision loss, on increasing the abilities to cope with visual impairment (Horowitz et al., 2005a). Fourth, because many controlled studies did not match visually impaired and unimpaired individuals according to their age, we conclude that more efforts are needed for increasing the quality of comparative studies. Fifth, as most included studies were cross-sectional, more longitudinal research is needed on the trajectory of vision loss and reduced PWB that might inform the causal pathways of decreasing PWB and increasing vision loss. Sixth, more research is needed on variables that may mediate the effects of vision loss on PWB. Rather than simply comparing PWB of individuals with and without visual impairment, future studies could provide more insight into variables that moderate and mediate the associations of vision loss with PWB. Finally, more research is needed on resources that may buffer the effect of vision loss on PWB.

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## References

ACHENBACH, T. M. (1991) *Manual for the Child Behavior Checklist/4–18 and 1991 Profile*. Burlington: University of Vermont.

BERMAN, K. & BRODATY, H. (2006) 'Psychosocial Effects of Age-related Macular Degeneration', *International Psychogeriatrics* 18: 415–28.

BROMAN, A. T., MUNOZ, B., RODRIGUEZ, J., SANCHEZ, R., QUIGLEY, H. A., KLEIN, R. ET AL. (2002) 'The Impact of Visual Impairment and Eye Disease on Vision-related Quality of Life in a Mexican-American Population', *Investigative Ophthalmology and Visual Science* 43: 3393–8.

BURMEDI, D., BECKER, S., HEYL, V., WAHL, H.-W. & HIMMELSBACH, I. (2002) 'Emotional and Social Consequences of Age-related Low Vision: A Narrative Review', *Visual Impairment Research* 4: 47–71.

COHEN, J. (1992) 'A Power Primer', *Psychological Bulletin* 112: 155–9.

DUVAL, S. J. & TWEEDIE, R. L. (2000) 'Trim and Fill: A Simple Funnel Plot-Based Method of Testing and Adjusting for Publication Bias in Meta-analysis', *Biometrics* 56: 455–63.

FITTS, W. H. (1965) *Tennessee Self Concept Scale*. Nashville: Counselor Recordings.

GISH, R. B. (2002) *Visual Impairment and its Effect on the Development of the Self-concept*. Doctoral thesis, La Mirada: Biola University.

HOROWITZ, A., REINHARDT, J. P. & BOERNER, K. (2005a) 'The Effect of Rehabilitation on Depression Among Visually Disabled Older Adults', *Aging and Mental Health* 9: 563–70.

HOROWITZ, A., REINHARDT, J. P. & KENNEDY, G. J. (2005b) 'Major and Subthreshold Depression Among Older Adults Seeking Vision Rehabilitation Services', *American Journal of Geriatric Psychiatry* 13: 180–7.

KLINKOSZ, W., SENKOWSKI, A. & BRAMBRING, M. (2006) 'Academic Achievement and Personality in University Students Who Are Visually Impaired', *Journal of Visual Impairment and Blindness* 100: 666–75.

LAWTON, M. P. (1965) 'The Philadelphia Geriatric Center Morale Scale', *Journal of Gerontology* 30: 85–9.

LIPSEY, M. W. & WILSON, D. B. (2001) *Practical Meta-analysis*. Thousand Oaks: SAGE.

MANGIONE, C. M., LEE, P. P., PITTS, J., GUTIERREZ, P., BERRY, S. & HAYS, R. D. (1998) 'Psychometric Properties of the National Eye Institute Visual Function Questionnaire (NEI-VFQ)', *Archives of Ophthalmology* 116: 1496–504.

MAYER, K. U. & BALTES, P. B. (eds) (2001) *The Berlin Aging Study: Aging from 70 to 100*. New York: Cambridge University Press.

MITCHELL, J. & BRADLEY. C. (2006) 'Quality of Life in Age-related Macular Degeneration: A Review of the Literature', *Health and Quality of Life Outcomes* 4: 97.

NATIONAL EYE INSTITUTE (2010) *National Plan for Eye and Vision Research*. Available at: http://www.nei.nih.gov/strategicplanning/np_low.asp (retrieved 17 May 2010).

NYMAN, S. R., GOSNEY, M. A. & VICTOR, C. L. (2010) 'Psychosocial Impact of Visual Impairment in Working Age Adults', *British Journal of Ophthalmology*. 94; 1427–32.

PENNINX, B. W., GURALNIK, J. A., SIMONSICK, E. M., KASPER, J. D., FERRUCCI, L. & FRIED, L. P. (1998) 'Emotional Vitality Among Disabled Older Women', *Journal of the American Geriatrics Society* 46: 807–15.

PINQUART, M. & SÖRENSEN, S. (2000) 'Influences of Socioeconomic Status, Social Network and Competence on Psychological Well-being in Later Life: A Meta-analysis', *Psychology and Aging* 15: 187–224.

RADLOFF, L. S. (1977) 'The CES-D Scale: A Self-report Depression Scale for Research in the General Population', *Applied Psychological Measurement* 1: 385–401.

RAHDI, J. S., CUMBERLAND, P. M. & PACKHAM, C. S. (2009). 'Visual Function in Working-age Adults: Early Life Influences and Associations With Health and Social Outcomes', *Ophthalmology* 116: 1866–71.

ROSENBERG, M. (1965) *Society and the Adolescent Self-image*. Princeton: Princeton University Press.

SCHNEIDER, G., DRIESCH, G., KRUSE, A., WACHTER, M., NEHEN, H. G. & HEUFT, G. (2004) 'What Influences Self-perception of Health in the Elderly? The Role of Objective Health Condition, Subjective Well-being and Sense of Coherence', *Archives of Gerontology and Geriatrics* 39: 227–37.

SCOTT, I. U., SMIDDY, W. E., SCHIFFMAN, J., FEUER, W. J. & PAPPAS, C. J. (1999) 'Quality of Life of Low-vision Patients and the Impact of Low-vision Services', *American Journal of Ophthalmology* 128: 54–62.

TUTTLE, D. W. & TUTTLE, N. R. (2004) *Self-esteem and Adjusting With Blindness*. Springfield: Thomas.

VITALE, S., COTCH, M. F . & SPERDUTO, R. D. (2006) 'Prevalence of Visual Impairment in the United States', *Journal of the American Medical Association* 295: 2158–63.

WAHL, H. W. (1997) *Ältere Menschen mit Sehbeeinträchtigung: Eine empirische Studie zur Person-Umwelt-Transaktion*. Frankfurt: Lang.

WARE, J. E. & SHERBOURNE, C. D. (1992) 'The MOS 36-item Short-form Health Survey (SF-36): Conceptual Framework and Item Selection', *Medical Care* 30: 473–83.

WONG, H.-B., MACHIN, D., TAN, S. B., WONG, T.-Y. & SAW, S. M. (2009) 'Visual Impairment and Its Impact on Health-related Quality of Life in Adolescents', *American Journal of Ophthalmology* 147: 505–11.

YESAVAGE, J. A., BRINK, T. L., ROSE, T. L., LUM, O., HUANG, V., ADEY, M. B. ET AL. (1983) 'Development and Validation of a Geriatric Depression Screening Scale', *Journal of Psychiatric Research* 17: 37–49.

ZIGMOND, A. S. & SNAITH, R. P. (1983) 'The Hospital Anxiety and Depression Scale', *Acta Psychiatrica Scandinavia* 67: 361–70.

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