The effect of amblyopia on self-esteem in children.

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ABSTRACT

Purpose In an investigation of the psychosocial impact of amblyopia on children, the perceived self-esteem of children who had been treated for amblyopia was compared with that of age-matched controls. The influence of amblyopia condition or treatment factors that may impact self-perception scores was also explored.

Methods Children with a history of treatment for amblyopia (n=47; age 9.2 $\pm$ 1.3 years) and age-matched controls (n=52; age 9.4 $\pm$ 0.5 years) completed a standardised age-appropriate questionnaire based evaluation of perceived self-esteem (Harter Self Perception Profile for Children). Their vision characteristics and treatment regimen were also recorded. Bivariate correlation analysis was used to investigate the amblyopic characteristics and treatment factors that may have influenced self-perception scores in the amblyopic group.

Results Children treated for amblyopia had significantly lower social acceptance scores than age-matched control children. In other areas related to self-esteem, including scholastic competence, physical appearance, athletic competence, behavioural conduct and global self worth, amblyopic children gave scores similar to those of control children. Within the amblyopic group, a lower social acceptance score was significantly correlated with a history of treatment with patching but not with a history of strabismus or wearing of glasses.

Conclusions Self-perception of social acceptance was lower in children treated for amblyopia compared with age-matched controls. A reduction in these scores was associated with a history of patching treatment but not with a history of strabismus or spectacle wear.

KEYWORDS

Amblyopia, strabismus, self-esteem, psychosocial,

INTRODUCTION

Amblyopia is the most prevalent visual disorder in children, affecting approximately three percent of the population.[1,2] It is clinically defined by a difference of two lines in visual acuity between eyes in the absence of ocular pathology, and in the presence of a predisposing amblyogenic factor (such as strabismus, anisometropia or deprivation) during the period of development of the visual system (from birth to about 8 years of age).[3] Amblyopia is usually treated by correction of the underlying condition (surgery or refractive correction with glasses or contact lenses) followed by a period of occlusion or atropine penalisation of the non-amblyopic eye to promote neurodevelopment of the affected visual pathways. Treatment has traditionally been applied only during childhood, the time of optimum plasticity of visual development, although recent randomised controlled treatment trials have provided evidence for successful treatment outcomes in older children and adolescents.[4]

The psychosocial impact of strabismus and amblyopia and their treatment on an individual's quality of life have gained recent attention in the literature.[5-8] Early literature, mainly anecdotal, reported on the psychological implications of cosmetically obvious strabismus,[9,10] but more recent studies have examined the effect of strabismus and amblyopia on an adult's self-esteem, interpersonal relationships and employability.[11-13] These studies have provided an understanding of the adults' perspective on the psychosocial impact of amblyopia, but few studies have specifically investigated the impact of the condition and its treatment from the perspective of a child with amblyopia.

Children from about six years of age have been reported to develop a negative perception towards individuals with strabismus and children with noticeable strabismus are viewed negatively by teachers,[14] although, following strabismus surgery improvements in social, emotional and functional measures of a child's health status have been reported [5].

Many children with amblyopia need to wear glasses to correct their refractive error, even after completion of occlusion or penalisation amblyopia therapy. Individuals who wear glasses rate themselves lower in terms of their physical attractiveness,[15] which, as well as affecting psychological well-being, can affect motivation and behaviour.[16] While quality of life scores are lower in adult spectacle wearers than in either contact lens wearers or adults who have had refractive surgery,[17] recent studies of self-esteem in myopic children have found self-perception scores are not associated with spectacle wear,[18-20] nor do they change when refractive correction was changed to contact lenses. [21]

Treatment of amblyopia by either occlusion or atropine penalisation was found to be reasonably well accepted by both the child and the parent during randomized controlled treatment trials.[7,22,23] However, more recent studies have found that most children report feeling self-conscious and ashamed during amblyopia treatment, particularly due to patching or wearing glasses, and that it was the responses of their peers that most influenced their feelings of embarrassment,[8] and children currently wearing glasses or with a history of wearing eye patches are approximately 35% more likely to be victims of physical or verbal bullying.[24]

Some conditions that cause amblyopia, such as infantile esotropia, present very early in life and are therefore treated early in life, while other acquired strabismic conditions may not manifest until later in early childhood. Treatment regimens also differ between aetiological groups, in that some amblyopic children will have undergone surgery for strabismus or media opacity, while others will have required refractive correction for accommodative strabismus or anisometropia. Some children will undergo patching for up to six months while others with greater depth of amblyopia, as is often the case with deprivation amblyopia, may continue on patching for more prolonged periods. Perhaps children detected and treated by patching before they enter school and begin to more formally socialise with their peer group are less likely to feel self-conscious or ashamed of treatment than those who are of school age when patched and are acquiring a sense of self in general and self-esteem in particular.[25]

The self-esteem of a child that has been treated for amblyopia or the relative influence of condition or treatment factors that may be associated with reduced self-esteem have not previously been reported. Exploring self-esteem results across aetiological sub-groups may be informative as well as examining both the wearing of glasses and influence of patching regime within the analysis of self-esteem in amblyopic children.

In this study we measured the self-perception profile of children who had been treated for amblyopia from a range of causes and compared their results with an age-matched control group. The relationships between self-perception scores and various subject characteristics implied by the literature to have psychosocial impact (history of strabismus, wearing of glasses, patching regimen and visual acuity deficit) were tested.

METHOD

Participants

Ninety-nine children participated in this study, including 47 children who had been treated for amblyogenic conditions (age 9.2 ± 1.3 years) and 52 age-matched control subjects (age 9.4 ± 0.5 years). Parents of potential amblyopic group subjects were identified from the files of a private paediatric ophthalmology practice. Sixty-six percent of potential subjects were contactable by letter and telephone and were invited to participate; of these 90% agreed to participate in the study. Control subjects were recruited from a local primary (elementary) school via a letter to parents outlining the purpose of the study; 60% of invited students were granted parental consent to participate in the study. Signed consent was obtained from participating children and their parent.

All children had received ophthalmological treatment for the underlying amblyogenic condition (surgery or refractive correction) so did not have cosmetically obvious strabismus at the time of the study and had concluded occlusion or penalisation treatment. All subjects were carried in full-term pregnancies and had no known neurological or ocular disorder (other than refractive error or their amblyogenic conditions).

Vision assessment

Information regarding clinical diagnosis, cycloplegic refraction (within the previous 12 months) and previous treatment, particularly with regard to patching regimen, was obtained from the patient records of the amblyopic subjects. From this clinical information, the subjects were grouped with respect to amblyopic aetiology[26] as follows:

- Infantile esotropia – history of esotropia prior to 12 months of age (n=7).
- Acquired strabismus – history of strabismus occurring after 12 months of age (n=15).
- Anisometropic – ≥1.00 dioptre difference in mean spherical refractive error and/or ≥ 1.50 D between the eyes in astigmatism[27] (n=9)
- Mixed – history of both strabismus and anisometropia (n=9)
- Deprivation – history of disturbance of monocular image clarity e.g. monocular cataract (n=7)

Strabismic subjects were all aligned to within 15 prism dioptres by refractive correction, by previous surgery or by both.

Subjects who were treated with patching (n=32) were grouped with respect to their age when patched and duration of patching as follows:

- Age when patched
  - Wore patch when of school age (greater than 5 years of age) (n= 23)
  - Wore patch before school age (less than 5 years of age) (n=9)
- Duration of patching
  - Period of treatment by patching extended beyond 12 months (n=21)
  - Period of treatment by patching was less than 12 months (n=11)
- Period elapsed since last patched
  - Patched within previous 12 months (n=5)
  - Not patched within previous 12 months (n=27)

Visual acuity (VA) was measured using a 3 m logMAR chart, and scored on a letter by letter basis for each eye separately with the current optical correction (based on cycloplegic refraction measured within previous 12 months). Level of binocular function was assessed with the Randot Preschool stereopsis test,[28] chosen for its lack of monocular cues and because the task could easily be completed in a short time by the age group being tested. Suppression was confirmed by the Mirror-Pola technique[29] if no stereoscopic response was obtained on the Randot test.

Self-esteem assessment

Self-esteem was assessed with the Self Perception Profile for Children (SPPC), an age-appropriate, standardised measure that has been used extensively to measure self-esteem in children in several different groups of children. [30-32] The psychometric properties of the SPPC, including validity and reliability, have been independently established.[33] This instrument, which has been used in studies of self-esteem in myopic children,[18,19] was chosen because it provides testing across several domains important to children's lives as well as testing global self-worth. The child completed a 36 item self-reporting scale consisting of six specific domains described below. Six questions were asked in each domain, each consisted of two logically opposed statements, for example, "Some kids would rather play outdoors in their spare time BUT other kids would rather watch TV". To reduce response bias, half of the items started with the more positive statement. The child indicated which statement was "more true" of themselves and indicated whether the statement was "really true for me" or "sort of true for me". Items were scored from one to four, where four indicated the most and one represented the least adequate self-judgment.

Subscale scores were calculated by averaging the response to each item within a domain. Thus, the SPPC gives six mean values, one from each domain, that range from one to four. Age-appropriate normative data are available for the SPPC test.[32] The six domains assessed by the SPPC are:

- Scholastic Competence – the child's perception of their competence or ability within the realm of scholastic or school related performance.
- Social Acceptance - the degree to which the child is accepted by peers or feels popular.
- Athletic Competence – the child's perception of competence in sports and outdoor games.
- Physical Appearance – the degree to which the child is happy with the way he/she looks, likes his/her height, weight, body, face, hair, or feels that they are good-looking.
- Behavioural Conduct – the degree to which children like the way they behave, do the right thing, act the way they are supposed to, avoid getting into trouble and do the things they are supposed to do.
- Global Self-Worth - the extent to which the child likes him/herself as a person, is happy with the way they are leading their life and is generally happy with him/herself. This is a global judgement of worth as a person, rather than a domain specific competence or adequacy.

Subjects also completed tests of fine motor skills (Bruiniks Oseretsky Test of Motor Proficiency[34]) and the developmental eye movement (DEM[35]) test of reading eye movements during the test session; these findings are presented elsewhere.[36] Complete assessment of perceived self-esteem, vision, fine motor skills and DEM took about 45 minutes per subject and was completed within one test session by all subjects

The study was conducted in accordance with the requirements of the Queensland University of Technology Human Research Ethics Committee and the guidelines of the Declaration of Helsinki.

Statistical Analysis

The results from the amblyopic group were compared with those of the control group using independent samples t-test (Statistical Package for the Social Sciences – SPSS V14), the criterion for statistical significance was 0.05. One-way ANOVA was used to test for differences between aetiological sub-groups. When statistically significant differences

were found between sub-group means, Bonferroni *post-hoc* tests were used to examine where differences lay. Where the data were not normally distributed, non-parametric chi-squares tests were used to test for differences between groups. Pearson's correlation coefficients were calculated to explore the relationships between amblyopia condition and treatment characteristics and self perception scores; the criterion for statistical significance was 0.05.

RESULTS

Sample characteristics

Table 1 presents the mean age, gender, and vision measures for the amblyopic and control children together with the proportion of the groups with a history of strabismus, history of patching and who wore glasses. These data are also shown for each amblyopia aetiology sub-group. The amblyopic and control groups were not significantly different in age or gender.

On average the subjects with amblyopia had 0.07 logMAR VA in the better eye and 0.44 logMAR in the worst eye. In the control group there was very little difference between eyes (-0.03 logMAR in the better eye; -0.01 logMAR in the worst eye). In addition to significant differences between the amblyopic and control group and between subgroups ($p<0.05$), *post hoc* testing indicates that participants whose amblyopia was caused by visual deprivation had the worst VA in their amblyopic eye and the`greatest inter-ocular VA difference compared to all other amblyopia subgroups and controls.

The stereopsis scores were not normally distributed, but rather there was a floor and ceiling effect because there were many control subjects whose stereopsis was equal to or better than the highest stereoacuity level tested (40") and many amblyopes who could not pass the test at any level. Subjects were therefore grouped according to their stereopsis level; "nil" if no stereoscopic response could be measured, "reduced" if response indicated stereopsis between 800 and 60 seconds of arc and "normal" if response indicated stereopsis better than or equal to 40 seconds of arc. The majority of control group subjects (96%) had normal stereopsis (≤ 40")[37] compared with only six percent of the amblyopic group. All subjects with infantile esotropia had no measurable stereopsis, whilst, all anisometropic amblyopes had some measurable level of stereopsis, with 22% of the anisometropes having normal stereopsis. The variation in level of stereopsis was significant both between the amblyopic and control groups ($\chi 2_{(df=2)} = 80.63$; $p<0.001$) and between subgroups ($\chi 2_{(df=10)} = 117.06$; $p<0.001$)(Table 2).

Amblyopic children were more likely to have had strabismus, to have worn a patch and to wear glasses. Sixty-six percent of the amblyopic group had a history of strabismus, 83% wore glasses and 68% had a history of having worn a patch. Of the control group, none had a history of strabismus or patching and four children (8%) currently wore glasses. All of the amblyopic children and all but one of the controls had been advised to wear their glasses full time. Of the 32 amblyopic children who had been patched, 23 (72%) were more than 5 years old when patched and 21 (66%) were patched for more than 12 months duration. Whilst none of the amblyopic group was currently undergoing patching, five had been patched within the 12 months prior to participation in the study.

Perceived Self-Esteem Scores

Table 2 presents the self-perception domain score mean and standard deviation for the amblyopic and control children. Children with amblyopia had significantly lower scores on the social acceptance domain 'feels accepted by peers' or 'feels popular' than age-matched control children ($t_{(df=97)} = -2.553$, $p = 0.012$). No significant differences were found between the amblyopic and control groups in the other four domain specific judgments (scholastic competence, athletic competence, physical appearance and behavioural conduct) or in global perception of worth or esteem as a person (global self worth).

Table 2: Mean (standard deviation) SPPC domain scores

	Amblyopic (n = 47)	Control (n= 52)	$t_{(df=97)}$	p
Scholastic competence	3.03 (0.65)	2.89 (0.63)	1.030	0.306
Social acceptance	***3.00 (0.70)***	***3.31 (0.50)***	***-2.553***	***0.012***
Athletic competence	3.07 (0.67)	3.15 (0.58)	-0.646	0.520
Physical appearance	3.35 (0.45)	3.42 (0.42)	-0.711	0.479
Behavioral conduct	3.20 (0.69)	3.23 (0.53)	-0.261	0.794
Global self-worth	3.50 (0.47)	3.53 (0.40)	-0.257	0.796

Table 1: Age, visual acuity and refractive characteristics (n=99). Mean (SD)

	Total Amblyopia Group	Control	**Tests for difference Between Amblyopia and Control Group**		Infantile Esotropia	Acquired Strabismus	Anisometropia	Mixed	Deprivation	**One-Way ANOVA Between Amblyopic aetiology groups and control group**	
	N = 47	N=52	[a] $t_{(df=97)}$ [b] $\chi 2_{(df=1)}$ [c] $\chi 2_{(df=2)}$	p	N=7	N=15	N=9	N=9	N=7	[a] $F_{(5,93)}$ [b] $\chi 2_{(df=5)}$ [c] $\chi 2_{(df=10)}$	p
Age (years)	9.2 (1.3)	9.4 (0.5)	-1.086 [a]	0.280	9.2 (1.4)	9.1 (1.3)	9.5 (0.9)	9.2 (1.9)	9.1 (0.9)	0.397 [a]	0.850
Gender (% Female)	23 (49%)	24 (46%)	0.07 [b]	0.47	3 (43%)	10 (67%)	3 (33%)	3 (33%)	4 (57%)	4.02 [b]	0.547
Strabismic (% Yes)	31 (66%)	0 (0%)	***49.93*** [b]	***<0.001***	100%	100%	0%	100%	0%	***99.0*** [b]	***<0.001***
Wears glasses (% Yes)	39 (83%)	4 (8%)	***56.95*** [b]	***<0.001***	4 (57%)	15 (100%)	9 (100%)	9 (100%)	2 (29%)	***99.29*** [b]	***<0.001***
Wore Patch (% Yes)	32 (68%)	0 (0%)	***52.31*** [a]	***<0.001***	4 (57%)	10 (67%)	3 (33%)	9 (100%)	6 (86%)	***62.86*** [a]	***<0.001***
Stereopsis Nil	30 (64%)	0 (0%)			7 (100%)	12 (80%)	0 (0%)	6 (67%)	5 (71%)		
Stereopsis 800" – 60"	14 (30%)	2 (4%)	***80.632*** [c]	***<0.001***	0 (0%)	2 (13%)	7 (78%)	3 (33%)	2 (29%)	***117.06*** [c]	***<0.001***
Stereopsis ≤ 40"	3 (6%)	50 (96%)			0 (0%)	1 (7%)	2 (22%)	0 (0%)	0 (0%)		
VA Best Eye (logMAR)	0.07 (0.11)	-0.03 (0.05)	***5.687*** [a]	***<0.000***	0.10 (0.13)	0.08 (0.09)	0.04 (0.09)	0.08 (0.12)	0.03 (0.13)	***1.92*** [a]	***0.098***
VA Worst Eye (logMAR)	0.44 (0.67)	-0.01 (0.05)	***4.849*** [a]	***<0.001***	0.33 (0.25)	0.21 (0.20)	0.29 (0.19)	0.25 (0.19)	1.51 (1.29)**	***20.95*** [a]	***<0.001***
Inter-Ocular Difference in VA (logMAR)	0.38 (0.65)	0.02 (0.03)**	***3.945*** [a]	***<0.001***	0.23 (0.27)	0.13 (0.16)	0.21 (0.12)	0.22 (0.15)	1.47 (1.19)**	***25.14*** [a]	***<0.001***

Impact of aetiology

There were significant differences between the amblyopic subgroups in social acceptance scores ($F_{(5,87)}$=3.14, p = 0.012), and *post hoc* Bonferroni tests confirmed these differences were significant between the acquired strabismic and control groups (Table 3). The deprivation group recorded the same mean score as the acquired strabismic group, however this was not identified by *post hoc* tests as significantly different from the control group, due to smaller sample size and larger standard deviation. Similarly, the anisometropia group scored as highly has the control group (Figure 1).

Table 3: Social Acceptance mean (standard deviation) for amblyopic subgroups and control group.

	Infantile Esotropia	Acquired Strabismus	Anisometropia	Mixed	Deprivation	Control	STATISTICAL SIGNIFICANCE One-Way ANOVA	
	N=7	N=15	N=9	N=9	N=7	N=52	$F_{(5,87)}$	p
SOCIAL ACCEPTANCE	3.07 (0.81)	***2.76 (0.70)****	3.44 (0.39)	3.07 (0.56)	2.76 (0.91)	***3.31 (0.50)****	***3.14***	***0.012***

** *Post Hoc* Bonferroni confirms significant difference between groups (p<0.05)

Figure 1: Mean Social Acceptance subscale scores for amblyopia aetiological subgroups and control children. Error bars represent ± 1 SE.

Determinants of social acceptance score within amblyopic group

Table 4 presents the Pearson correlation coefficients calculated within the amblyopic sample between social acceptance score and amblyopia condition factors (history of strabismus and VA measures) and treatment factors (wears glasses and history of treatment by patching). As well as a number of significant correlations between the condition and treatment characteristics measured in this study, only a history of patching significantly correlated with social acceptance score (p<0.05).

Table 4: Correlations between vision and treatment characteristics and social acceptance score of amblyopic group. Pearson correlation co-efficients presented.

	Wears glasses	History of patching	VA in Best Eye	VA in Worst Eye	Inter-ocular VA difference	Social Acceptance Score
History of Strabismus	0.272	0.182	0.201	***-0.383***	***0-.427***	-0.152
Wears glasses		0.054	0.047	***-0.468***	***-0.488***	0.013
History of patching			-0.031	0.139	0.148	***-0.328****
VA in Best Eye				0.241	0.083	-0.211
VA in Worst Eye					***0.987***	-0.256
Inter-ocular VA difference						-0.228

***** Correlation is significant at the 0.01 level (2-tailed).***

**** Correlation is significant at the 0.05 level (2-tailed).***

The influence of amblyopia condition or treatment factors that may impact on social acceptance score was further investigated by testing for differences in self-esteem between treatment or condition sub-groups (Table 5). No significant difference was found between amblyopic children with a history of strabismus and those without, or between those who did or did not wear spectacles or between levels of refractive error. A significant difference in social acceptance score was found between those amblyopic children who had a history of treatment by patching (n=32) and those who did not (n=15) ($t_{df=45}$ = -2.328; p=0.024)

Table 5: Influence of condition or treatment factors on social acceptance score.

		n	Social Acceptance Score Mean (Std Deviation)	[a] $T_{(df=45)}$ [b] $F_{(3,43)}$	Sig.
Strabismus	Yes	31	2.92 (0.68)	-1.034 [a]	0.446
	No	16	3.15 (0.73)		
Wears Glasses	Yes	39	3.00 (0.64)	0.087 [a]	0.931
	No	8	2.98 (0.98)		
Wore Patch	Yes	32	2.85 (0.71)	***-2.328*** [a]	***0.024***
	No	15	3.33 (0.55)		
Level of refractive correction	Nil	8	2.98 (0.98)	0.602 [b]	0.618
	+0.25D to +2.75	16	3.11 (0.62)		
	+3.00D to +5.75D	16	3.03 (0.58)		
	>+6.00D	7	2.689 (0.80)		

Amongst the amblyopic children who were treated by patching (n=32), no significant difference was seen in social acceptance scores between those who were patched when

of pre-school or school entry age (more than 5 years of age (n=23)) and those who were not (n=9). Thus being of school age when patched does not appear to be of significance. Further, no significant difference was seen in social acceptance scores between those whose patching treatment continued for more than 12 months (n=21) and those whose patching duration was less than 12 months (n=11) ($p>0.05$) (Table 6). Duration of patching seems to have no effect. Social acceptance score did not significantly differ between those who had been patched within the 12 months prior to participation in the study (n=5) and those whose patching was terminated more than 12 months previously.

Table 6: Social acceptance score of amblyopic participants treated by patching

		Social Acceptance Score Mean (SD)	STATISTICAL SIGNIFICANCE t-test	
			$t_{(df=30)}$	p
Age when patched	Wore patch when of school age (n= 23)	2.92 (0.65)	0.971	0.339
	Wore patch before of school age (n=9)	2.65 (0.86)		
Duration of patching	More than 12 months (n=21)	2.76 (0.75)	-0.905	0.373
	Less than 12 months (n=11)	3.00 (0.64)		
Period elapsed since patched completed	More than 12 months (n=5)	2.60 (0.56)	-0.832	0.342
	Less than 12 months (n=27)	2.89 (0.74)		

DISCUSSION

The measurement of perceived self-esteem by use of a standardised age-appropriate questionnaire in this study revealed that children who had been treated for amblyopia had lower social acceptance scores than age-matched control children. Lower social acceptance scores were particularly found for subjects whose amblyopia was caused by acquired strabismus, all of whom wore glasses and two-thirds of whom had been treated with patching and for those with deprivation amblyopia who had the greatest amblyopic VA deficit. Lower social acceptance score was found to be correlated with a history of patching, but not with wearing glasses or with a history of strabismus.

In other areas related to self-esteem, including scholastic competence, physical appearance, athletic competence, behavioural conduct and global self worth, the

amblyopic children gave scores similar to those of control children. While fine motor skills[38] and on reaching and grasping have been recently reported to be reduced in amblyopia,[39] our sample of amblyopia children perceived their athletic competence as highly as their peers.

Previous studies have suggested that the necessity to wear glasses or an eye patch can draw negative attention to a child,[8,24] with resultant victimisation or bullying and negative psychosocial effects. Our findings suggest that this negative attention impacts on the measure of self-esteem that relates to social acceptance. Studies of self-esteem in myopic children showed that whilst lower self-perception scores were associated more visual discomfort symptoms, they did not relate to magnitude of refractive error,[19] and did not vary with type of spectacle lens worn.[18] Our findings support the conclusion that wearing glasses does not impact on a child's self-esteem and does not vary with magnitude of refractive correction.

Together with the findings that wearing glasses does not significantly impact on self-esteem in myopic children,[18,19] our results suggest that it is wearing an eye patch, rather than glasses, that creates the sense of being less well accepted and is potentially responsible for the stigma that has been reported to be associated with amblyopia therapy.[8]

The findings of this study are important given the evidence from recent treatment trials which have specifically investigated the improvement in amblyopia that can be achieved through spectacle correction alone.[27,40,41] Evidence now exists that for some children with amblyopia, both strabismic[41] and anisometropic[27], correction of refractive error alone can sufficiently improve visual acuity to the point that patching would no longer be considered necessary.[42] Our study indicates that spectacle wear does not contribute to reduced social acceptance in amblyopic children and emphasises the importance of exploring refractive correction as a first line of attack to treat amblyopia, with the hope that patching with its potential negative psychosocial effects may be minimised or avoided altogether. Indeed, it has now been established that reduced amounts of patching are as effective as full time patching,[43,44] and monitored occlusion trials have demonstrated positive dose-response improvement in VA for up to 400 hours of patching with most improvement occurring in the first six weeks of patching.[42,45] Whilst not explored in this study, the use of atropine for penalisation rather than use of an occlusive patch has been suggested to have less social consequences and better acceptance by some amblyopic children.[22]

Clinicians are faced with the challenge of designing treatment regimens that are effective in restoring vision with minimal psychosocial side-effects. Our study provides evidence that amblyopia can impact on the self-esteem domain related to social interaction. There may be a psychosocial benefit to the child if patching is minimised and limited to times of day when the child has less interaction with social peers.

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REFERENCES

1. Attebo K, Mitchell P, Cumming R, Smith W, Jolly N, Sparkes R. Prevalence and causes of amblyopia in an adult population. *Ophthalmology* 1998;**105**(1)**:**154-159.
2. Brown SA, Weih LM, Fu CL, Dimitrov P, Taylor HR, McCarty CA. Prevalence of amblyopia and associated refractive errors in an adult population in Victoria, Australia. *Ophthal Epidemiol* 2000;**7**(4)**:**249-258.
3. Daw NW. Visual Development - second edition. 2nd ed. New York: Springer Science+Business Media, Inc., 2006.
4. The Pediatric Eye Disease Investigator Group. Randomized trial of treatment of amblyopia in children aged 7 to 17 years. *Arch Ophthalmol* 2005;**123:**437-447.
5. Archer SM, Musch DC, Wren PA, Guire KE, Del Monte MA. Social and Emotional Impact of Strabismus Surgery on Quality of Life in Children. *J AAPOS* 2005;**9**(2)**:**148-151.
6. Burke JP, Leach CM, Davis H. Psychosocial implications of strabismus surgery in adults. *J Ped Ophthalmol Strabismus* 1997;**34:**159-164.
7. Choong YF, Lukman H, Martin S, Laws DE. Childhood amblyopia treatment: psychosocial implications for patients and primary carers. *Eye* 2004;**18**(4)**:**369-375.
8. Koklanis K, Abel L, Aroni R. Psychosocial impact of amblyopia and its treatment: a multidisciplinary study. *Clinical Exp Ophthalmol* 2006;**34:**743-750.
9. Alberman ED, Butler NR, Gardiner PA. Children with squints: A handicapped group? *Practitioner* 1971;**206**(April)**:**501-506.
10. Tolchin JG, Lederman ME. Congenital (infantile) esotropia: psychiatric aspects. *J Ped Ophthalmol Strabismus* 1977;**15**(3)**:**160-163.
11. Olitsky SE, Sudesh S, Graziano A, Hamblen J, Brooks SE, Shaha SH. The negative psychosocial impact of strabismus in adults. *J AAPOS* 1999;**3**(4)**:**209-211.
12. Coats DK, Paysse EA, Towler AJ, Dipboye RL. Impact of large angle horizontal strabismus on ability to obtain employment. *Ophthalmology* 2000;**107**(2)**:**402-405.
13. Williams C, Harrad RA. Amblyopia: Contemporary Clinical Issues. *Strabismus* 2006;**14:**43-50.

14. Uretmen O, Egrilmez S, Kose S, Pamukcu K, Akkin C, Palamar M. Negative social bias against children with strabismus. *Acta Ophthalmologica Scandinavica* 2003;**81**(2)**:**138-142.
15. Terry R, Brady C. Effects of framed spectacles and contact lenses on self-rating of facial attractiveness. *Percept Mot Skills* 1976;**42**(789-90).
16. Harter S. The construction of the self. New York, New York: The Guilford Press, 1999.
17. Pesudovs K, Garamendi E, Elliott DB. A Quality of Life comparison of people wearing spectacles or contact lenses or having undergone refractive surgery. *J Refract Surg* 2006;**22**(1)**:**19-27.
18. Dias L, Hyman L, Manny RE, Fern K. Evaluating the self-esteem of myopic children over a three-year period: the COMET experience. *Optom Vis Sci* 2005;**82**(4)**:**338-47.
19. Dias L, Manny RE, Hyman L, Fern K, Correction of Myopia Evaluation Trial G. The relationship between self-esteem of myopic children and ocular and demographic characteristics. *Optom Vis Sci* 2002;**79**(11)**:**688-696.
20. Lyon DW, Rainey BB, Bullock CN. The effects of glasses on the self-concept of school-aged children. *Journal of Optometric Vision Development* 2002;**33**(1)**:**29-32.
21. Terry R, Soni P, Horner D. Spectacles, contact lenses and children's self-concepts: a longitudinal study. *Optom Vis Sci* 1997;**74**(12)**:**1044-8.
22. The Pediatric Eye Disease Investigator Group. Impact of patching and atropine treatment on the child and family in the amblyopia treatment study. *Arch Ophthalmol* 2003;**121**(Nov)**:**1625-1632.
23. Hrisos S, Clarke M, Anderson JD, Wright C. Emotional Impact of amblyopia treatment on preschool children. *Ophthalmology* 2004;**111:**1550-1556.
24. Horwood J, Waylen A, Herrick D, Williams C, Wolke D, Team AS. Common visual defects and peer victimization in children. *Invest Ophthalmol Vis Sci* 2005;**46**(4)**:**1177-1181.
25. Harter S. Developmental processes in the construction of the self. In: Yawkey T, Johnson J, eds. Integrative Processes and Socialization: Early to Middle Childhood. Hillsdale, NJ: L Erlbaum Associates, 1988: 45-78.
26. Donahue S. Pediatric Strabismus. *New Eng J Med* 2007;**356**(10)**:**1040-1047.
27. The Pediatric Eye Disease Investigator Group. Treatment of anisometropic amblyopia in children with refractive correction. *Ophthalmology* 2006;**113**(6)**:**895-903.
28. Birch EE, Williams C, Hunter J, Lapa MC, ALSPAC. Random Dot Stereoacuity of Preschool Children. *J Ped Ophthalmol Strab* 1997;**34**(217-222).
29. Siderov J. Suppression: clinical characteristics, assessment and treatment. Oxford: Butterworth Heinemann, 2001.
30. Granleese J, Joseph S. Reliability of the Harter Self-Perception Prolfile for Children and Predictors of Global Self-Worth. *The Journal of Genetic Psychology* 1994;**155**(4)**:**487-492.
31. Harter S, Pike R. The pictorial scale of perceived competence and social acceptance for young children. *Child Dev* 1984;**55**(6)**:**1969-1982.
32. Harter S. Manual for the self-perception profile for children: Revision of the perceived competence scale for children. University of Denver, 1985.
33. Marsh H, Holmes I. Multidimensional self-concepts: construct validation of responses by children. *Am Educ Research J* 1990;**27:**89-117.
34. Bruininks RH. Bruininks-Oseretsky Test of Motor Proficiency, Examiner's Manual. Minnesota: American Guidance Service,, 1978.

35. Garzia RP. A new visual-verbal saccade test: the developmental eye movement test (DEM). *Journal of the American Optometric Association* 1990;**61:**124-135.
36. Webber AL, Wood JM, Gole GA, Brown B. The effect of amblyopia on fine motor skills in children. *Invest Ophthalmol Vis Sci* In Press;**In Press**.
37. Fielder AR, Moseley MJ. Does stereopsis matter in humans? *Eye* 1996;**10:**233-238.
38. Webber AL, Wood JM, Gole GA, Brown B. The effect of amblyopia on fine motor skills in children. *Invest Ophthalmol Vis Sci* 2008;**49**(2)**:**594-603.
39. Grant S, Melmoth D, Morgan M, Finlay A. Prehension deficits in amblyopia. *Invest. Ophthalmol. Vis. Sci.* 2007;**48**(3)**:**1139-1148.
40. Stewart CE, Moseley MJ, Fielder AR, Stephens DA, MOTAS C. Refractive adaptation in amblyopia: quantification of effect and implications for practice. *Br J Ophthalmol* 2004;**88**(12)**:**1552-1556.
41. Cotter S, Edwards A, Arnold R, et al. Treatment of strabismic amblyopia with refractive correction. *Am J Ophthalmol* 2007;**143:**1060-1063.
42. Stewart CE, Stephens DA, Fielder AR, Moseley MJ, ROTAS Cooperative. Objectively monitored patching regimens for treatment of amblyopia: randomised trial. *BMJ* 2007;**335**(7622)**:**707-.
43. The Pediatric Eye Disease Investigator Group. A randomized trial of prescribed patching regimens for treatment of severe amblyopia in children. *Ophthalmology* 2003;**110:**2075-2087.
44. The Pediatric Eye Disease Investigator Group, Repka MX, Beck RW, Holmes JM, Birch EE. A randomized trial of patching regimens for treatment of moderate amblyopia in children. *Arch Ophthalmol* 2003;**121**(5)**:**603-612.
45. Stewart CE, Moseley MJ, Stephens DA, Fielder AR. Treatment Dose-Response in Amblyopia Therapy: The Monitored Occlusion Treatment of Amblyopia Study (MOTAS). *Invest Ophthalmol Vis Sci* 2004;**45**(9)**:**3048-3054.