Eye (2002) 16, 150–155

www.nature.com/eye

CLINICAL STUDY

Psychosocial and clinical determinants of compliance with occlusion therapy for amblyopic children

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Abstract

Aims **The objective of this study was to determine the extent that psychosocial and clinical variables influence parental compliance with occlusion therapy (eye patching) in children with amblyopia.**
Methods **Children (n = 151) receiving occlusion therapy (eye patching) for the treatment of amblyopia were recruited from five orthoptic clinics in Bristol, UK. Parents completed a questionnaire based on Rogers' (1983) Protection Motivation Theory (PMT). The parents (n = 105) were also followed up 2 months later. Clinical data, including measures of visual acuity, were also recorded. Compliance with eye patching was assessed through self-report accounts of parents. Stepwise regression analyses were used to determine the factors predictive of compliance with eye patching.**
Results **Self-reported compliance with eye patching at study entry revealed that only 54% of parents were achieving orthoptists' recommendations to patch their child. Perceived self-efficacy was positively associated with compliance and perceived prohibition of the child's activities were negatively associated with compliance. At follow-up, past behaviour accounted for the largest proportion of explained variance in patching behaviour followed by response efficacy, and prohibition of the child's activities.**
Conclusion **The present findings may serve to inform interventions aimed at enhancing current orthoptic practice to improve compliance in amblyopic children. The importance of 'self-efficacy' and past behaviour suggests that consultations with parents exhibiting higher levels of success with patching may elicit strategies that could be shared with parents experiencing difficulties with patching their children. In addition, it is possible that the perceived efficacy of the treatment could be enhanced if orthoptists emphasised evidence of improvements in visual acuity which may, in turn, foster the maintenance of eye patching.**

Eye (2002) **16,** 150–155. DOI: 10.1038/sj/EYE/6700086

Keywords: compliance; eye patching; self-efficacy; response efficacy; prohibition; past behaviour

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Introduction

Amblyopia is the most common visual defect of childhood with a prevalence of 3%.[1] It can impair the ability to carry out visually demanding tasks and it is associated with poor stereo acuity; thus it may interfere with a child's educational progress and sporting ability. It may also affect a child's self-image, interpersonal relationships and influence later career choices.[2,3] In addition, it significantly increases the risk of blindness in the event of vision being affected in the non-amblyopic eye.[4,5] It is widely recognised that there is a critical period in early childhood during which amblyopia must be identified if treatment with occlusion therapy (ie, patching of the non-affected eye) is to be successful.[6] This has led to the introduction of pre-school vision screening in the UK. However, a systematic review of pre-school vision screening and the efficacy of occlusion therapy reported that evidence to support the view that children with amblyopia improve during treatment was lacking.[7] Consequently, the authors concluded that there was limited evidence to support the continued screening and treatment of amblyopia in the UK.

We suggest that this conclusion is

premature in the light of a confounding issue that was not examined in the report, namely compliance. Studies have demonstrated that treatment compliance is the most critical factor for predicting a successful outcome in amblyopic children.[8–14] This suggests that evidence of limited improvement following treatment may reflect poor compliance with occlusion therapy, rather than ineffective treatment. This hypothesis is partly supported by investigations that have explored compliance with children receiving orthoptic treatment. These have revealed high levels of non-compliance ranging from 11.7% to 54%.[15–18] In addition, previous qualitative work has highlighted that despite a belief in the efficacy of the treatment, difficulties in patching children are not uncommon and may be a consequence of adverse psychosocial effects such as perceived emotional distress and prohibition of the child's activities.[19]

The present study was designed to extend previous qualitative work by exploring the psychological and social factors that influence compliance with eye patching using a questionnaire specific to visual impairment and eye patching in children. The conceptual framework was afforded by Rogers' (1983) Protection Motivation Theory[20] which posits that intentions (protection motivation) to adopt a health protective behaviour mediate beliefs regarding severity, vulnerability, response efficacy (treatment beliefs) and self-efficacy (ability to perform recommended behaviour), and response costs or barriers.

The focus of the present study was to examine the extent that psychosocial and clinical variables influence parental compliance with occlusion therapy (eye patching) in children with amblyopia. In particular, we aimed to determine the extent to which psychosocial variables predict compliance with eye patching after the influence of clinical variables has been taken into account.

Methods

Participants

After obtaining ethical approval from the United Bristol Healthcare Trust and North Bristol NHS Trust research ethics committees, a total of 238 amblyopic children were identified through records at five orthoptic clinics. The inclusion criteria were children who had unilateral amblyopia due to strabismus, anisometropia or both, were under 8 years of age and who had been prescribed occlusion for a minimum of 2 months. Children with other visual or developmental disorders were excluded. Most participants (81.5%) had been occluding for a period for at least 2 months, but for 28 parents participation in the study coincided with their child's first appointment since starting occlusion therapy. Of 238 eligible parents, 41 (17%) called the clinic to cancel their appointment and a further 36 (15%) failed to attend without notifying the clinic. In total, 161 attended their clinic appointment and only 10 refused to participate, typically due to time limitations. The final number of parents giving consent at study entry was 151 (63.5%).

Children

The parents of 72 female and 79 male children were recruited. The mean age of the children was 4.5 years (range = 1–8 years). Of these, 99 were attending school, 42 were attending nursery and 10 were not attending these facilities. The majority (88%) also had siblings living at home.

Parents

The mean age of the parents was 33 years (range = 19–59 years) and were predominantly Caucasian (94%). Typically the child's mother completed the questionnaire (85%). Seventy-three described themselves as a 'housewife', 41 were in unskilled jobs, 20 were in semi-skilled jobs and 11 were in professional occupations, there was one student. Of the children's fathers, 47 were in unskilled labour, 43 were semi-skilled, 38 were professionals, eight were unemployed and there were three students.

Procedure

The parents of eligible children were sent an information sheet outlining the nature of the study and participation requirements. All parents were met by the first author on arrival at the clinic for their child's appointment and were requested to give consent to take part in the study. The consenting parents then completed an issue-specific questionnaire in a private room in the presence of AS. The questionnaire items were based on the main components of PMT[20] (ie, severity (how severe is the visual impairment), vulnerability (future implications of amblyopia), response costs (barriers to treatment of eye patching), response efficacy (perceived effectiveness of eye patching), self-efficacy (parents belief in ability to patch child) and protection motivation (intention to patch child). Responses to individual items were measured on five point scales such that high scores indicated high levels of the variable of interest. A short demographic survey was also completed by the parents.

Table 1 Clinical data for participating children and non-attenders

Data collected	*Participants (n = 151)*	*Non-attenders (n = 36)*
Gender	72 (48%) F, 79 (52%) M	19 (56%) F, 15 (44%) M
Mean age of child	4.5 years	4.7 years
Type of amblyopia	57% Strabismic	59% Strabismic
	23% Anisometropic	23.5% Anisometropic
	20% Strab/Aniso	17.5% Strab/Aniso
Age when first patched	3.3 (1.6) years	3.3 (1.5) years
Mean duration of treatment	14 (13.4) months	18.5 (13.6) months
Mean VA at first assessment	6/24	6/24
Mean VA at study entry (Time 1)	6/12	6/18
Mean VA at follow-up (Time 2)	6/12	
Family history of amblyopia	73%	56%
Spectacles	91%	100%
Mean % past non-attendance	4.8% (11.3)	12% (12.7)

VA = visual acuity.

Parents were also requested to provide details on orthoptist's recommendations for patching their child and how many hours, on average, they were presently achieving. After the orthoptic consultation, clinical data were collected for each child (including non-attenders) by the orthoptists and are presented in Table 1.

Follow-up

Parents were followed up at approximately 2 months to coincide with their child's next orthoptic appointment. The parents were asked again, this time via letter or telephone, how many hours they were recommended to patch their child and how many hours they actually achieved. In order to test for potential attrition biases, the responses of parents who only completed the Time 1 questionnaire and responded again at Time 2 (n = 105) were compared with those who only completed the Time 1 questionnaire (n = 46). No significant differences were found for any of the measures in the Time 1 questionnaire.

Visual acuity

The earliest recorded visual acuity score (VA)* was taken as a measure of VA (Time 0). Visual acuity was also recorded at study entry (Time 1) and at follow-up (Time 2) in order to assess change in VA over the study period and the influence of improved VA in parental compliance with patching their child's eye. All VA scores were converted to LogMar equivalents for the purpose of data inputting and analysis (eg, the equivalent LogMar score of 6/12 would be 0.3 and 6/18 would be 0.48, therefore higher LogMar scores represent a higher degree of visual impairment). The difference in VA score in the children's amblyopic eye between Time 0 and Time 2 was used as a marker of improvement in VA.

Results

Clinical data

The recommended patching regimen per day at Time 1 ranged from 30 min to 12 h (mean = 3.4 h; SD = 2.6), self-reported patching hours achieved at Time 1 ranged from 0 to 12 h (mean = 2.4 h; SD = 2.1). Recommended patching at Time 2 (follow-up) ranged from 30 min to 12 h (mean = 2.9 h; SD = 2.4), actual patching at Time 2 ranged from 0–12 h (mean = 2 h, SD = 1.9). At study entry, 54% of parents reported that they were achieving orthoptists' recommendations and 53% were achieving orthoptists' recommendations at Time 2. Mean visual acuity score in the amblyopic eye at Time 0 was equivalent to 6/24 which improved to 6/12 at Time 1 (study entry) but remained at this level at Time 2 (n = 105). Actual compliance with patching was measured as a ratio of actual patching hours divided by recommended patching hours; such that the higher the ratio, the more compliant with patching. The mean ratios for patching at Time 1 and Time 2 were 0.73 (SD = 0.73) and 0.75 (SD = 0.55) respectively.

* The measurement of visual acuity in this study was dependent on the age and developmental level of the child thus a range of tests were administered accordingly and these tests differ within and between children. The scores presented are approximate and are based on converted LogMar equivalents of scores on the various tests. Therefore the improvements in visual acuity scores from Time 0 to Time 1 and Time 2 can only be regarded as an indicator of visual acuity rather than a definitive measure.

Protection motivation theory

In order to construct multi-item, reliable measures of the PMT components, responses to individual items of the questionnaire were factor analysed using principal components analysis (varimax rotation). This procedure confirmed the internal reliability of the main PMT components. It also permitted perceived costs or barriers to treatment to be divided into three separate scales; beliefs regarding the prohibition of activities, perceived emotional distress and stigma. The strong Cronbach's alpha coefficients support the robustness of the internal consistency of these measures which range from 0.72 (stigma) to 0.91 (protection motivation).

Predictors of compliance

Time 1 To explore which variables predicted compliance with eye patching at Time 1, a stepwise regression analysis was conducted (Table 2). The compliance ratio score at study entry was used as the dependent variable. Treatment duration, characteristics of the child (age and gender), visual acuity in the amblyopic eye (at Time 0 and at Time 1) and percentage of missed appointments were entered along with the components of PMT as independent variables.

Two variables emerged as significant predictors of compliance with eye patching. First, 'self-efficacy' was positively associated with compliance and explained 25% of the variance and 'prohibit' was negatively associated with compliance explaining a further 3% of the variance. Thus, belief in the ability to patch a child (ie, self-efficacy) increased the likelihood of patching and a belief that patching prohibits the child's activities such as play and reading (ie, prohibit) reduced the likelihood of patching. The remaining clinical variables and features of the child did not emerge as significant predictors of compliance.

Time 2 A further regression analysis was conducted to examine predictors of compliance with patching at Time 2 (2-month follow-up; $n = 105$). The ratio for patching compliance at Time 2 was used as the dependent variable. Improvement in VA score since Time 0 and Time 2 was entered with the other clinical variables (including past patching compliance), treatment duration and the components of PMT. At Time 2, past patching behaviour was the primary predictor of compliance accounting for 23% of the variance. This was followed by 'response efficacy' (treatment effectiveness) explaining a further 8% of the variance and 'prohibit' which was negatively associated with compliance explaining a further 3% of the variance. None of the clinical variables or features of the child were associated with eye patching at Time 2. Thus, those who were successful in patching their children at study entry were more likely to continue to do so and this was reinforced by the perceived efficacy of the treatment. However, a belief that patching would prohibit the child's activities, again, reduced the likelihood of patching as it did at Time 1.

Discussion

The objective of this study was to determine the extent that psychosocial and clinical variables influence compliance with occlusion therapy in children with amblyopia. Regression analysis demonstrated that the Protection Motivation Theory (PMT)[20] variables 'self-efficacy' and 'prohibition' of the child's activities were predictors of compliance with patching at Time 1. Thus, parents reporting high levels of compliance were more likely to hold strong self-efficacy beliefs with regard to patching while parents reporting low levels of compliance were more likely to perceive that patching prohibited their child from engaging in activities such as playing, socialising and reading. At follow-up (Time 2), however, past behaviour (self-reported patching at Time 1) was the primary predictor of future patching behaviour followed by the influence of a strong belief in the effectiveness of the treatment. Again, prohibition of the child's activities was associated with compliance and is also consistent with earlier qualitative work.[19]

Table 2 Stepwise regression analysis to predict compliance with patching at Time 1 ($n = 151$) and Time 2 ($n = 105$)

	β	R^2	*Adj* R^2	*CI*	*P-value*
Time 1					
Self-efficacy	0.212	0.255	0.250	0.149–0.275	0.000
Prohibition of activities	–0.187	0.290	0.279	–0.164––0.020	0.013
Time 2					
Past patching compliance	0.488	0.238	0.229	0.299–0.677	0.000
Response efficacy	0.208	0.327	0.311	0.083–0.333	0.001
Prohibition of activities	–0.101	0.363	0.339	–0.196––0.077	0.035

β = Beta weight; R^2 = explained variance; Adj R^2 = adjusted variance; CI = 95% confidence interval.

The magnitude of the association between the PMT variables and compliance suggests there is scope to improve compliance with eye patching. Specifically, there is a need to address issues surrounding: (1) the prohibition of the child's activities; (2) self-efficacy; (3) past behaviour; and (4) the perceived effectiveness of the treatment with regard to enhancing the delivery of orthoptic care in the UK.

With regard to the first of these issues, it is believed, by patching during activities requiring sustained attention and co-ordination such as playing, reading and socialising, that maximal gains in VA are to be made. Therefore, periods of patching should be encouraged by parents in which children play, read and interact with others. Secondly, 'self-efficacy' (parental belief in the ability to patch) was a significant predictor of patching; thus parents exhibiting success with patching may have strategies that could inform parents experiencing difficulties with patching their children. For example, successful parents could be invited to conduct peer-led consultations with those experiencing difficulties to foster perseverance with patching. Thirdly, at follow-up past patching behaviour was the strongest predictor of future patching suggesting that past behaviour is a behavioural marker for 'self-efficacy' and may explain why 'self-efficacy' did not emerge as a significant predictor of compliance at follow-up. It may, therefore, be advantageous to identify parents having the most difficulty at the outset of treatment as such parents may continue to be poor compliers. Therefore, future interventions to enhance parental compliance should be initiated in the early stages of treatment.

Parental perceptions of the effectiveness of treatment are reflected in the positive association of 'response efficacy' beliefs with compliance. Thus, it is suggested that belief in the effectiveness of treatment could be enhanced if, for example, orthoptists emphasised evidence of improvements in visual acuity which may foster maintenance of eye patching. Furthermore, increased awareness of the critical period for the treatment of amblyopia may improve compliance. Evidence to support this view comes from a recent investigation which suggests that parents have poor knowledge or understanding regarding the reduced effectiveness of the treatment with advancing age.[17] It is current health authority practice to issue leaflets regarding amblyopia and eye patching which emphasise the need for early treatment if improvement in VA is to be made. However, it is possible that such leaflets are inadequate and fail to impart an understanding of this aspect of the treatment. Furthermore, a study examining the effects of intensified education of parents with amblyopic children demonstrated that parents receiving the intervention had changed attitudes towards amblyopia that would favour compliance.[21]

There are, however, some limitations to the present study that should be noted. The first concerns the extent of visual impairment experienced by the children in this study. The mean depth of visual loss at the first orthoptic assessment was severe at 6/24, but by study entry VA had improved to 6/12. However, results of an ongoing population-based research study[22] show that at 7 years of age, mean monocular VA was 6/6 (using Early Treatment of Diabetic Retinopathy Study format of LogMar charts). Therefore, our amblyopic children were experiencing a substantial degree of visual loss in comparison with the normal population at study entry. It is possible that the degree of improvement in the children's eyesight prior to completing the questionnaires may have influenced parental perceptions of the severity of amblyopia for the better. This is supported by the fact that the 'severity' component of PMT did not emerge as a predictor of compliance. In addition, the regression analysis did not reveal a relationship between VA and compliance. One explanation for this is that some children's VA scores may have reached a level acceptable to orthoptists or further improvement may have been considered unlikely in older children as they will have passed the critical period for the treatment of the condition. Thus it is suggested that orthoptists may explicitly or implicitly communicate beliefs that patching will not yield further benefits which results in a decline in parents' motivation to patch.

Finally, we also cannot be certain of the extent to which parental self-report of compliance is accurate.[23] Indeed, parents may overestimate levels of patching (even though assured of anonymity) and reports are also subject to accurate recall. A more reliable and objective method of collecting these data may be achieved with 'occlusion dose monitors' (a modified occlusion patch attached to a data logger). Recent trials with occlusion dose monitors by Fielder *et al*[24] and Simonsz *et al*[25] have demonstrated the feasibility of employing this technology. The monitors could be utilised to examine whether and how compliance with patching adversely affects the efficacy of occlusion therapy.

In summary, past behaviour and the PMT variables 'self-efficacy' and 'response efficacy' were positive predictors of patching suggesting that parents who can patch their children with relative ease continue to do so and this is enhanced by the perceived benefits of the treatment. However, prohibition of the child's activities is a consistent barrier to treatment

compliance. The present results may serve to inform interventions aimed at enhancing current orthoptic practice and in so doing improve compliance with occlusion therapy.

Acknowledgements

We thank Andy Frost, Liz Newcomb, Ann Starbuck, Julie Parker, Angela Hay, Liz Fisher, Rosemary Foley and the administration staff of the Orthoptic Department, Bristol Eye Hospital, United Bristol Healthcare Trust. We also thank all the families who kindly participated in this study.

This study was funded by the National Eye Research Centre and the Medical Research Council Health Services Research Collaboration, University of Bristol.

Bristol is the lead centre of the MRC Health Services Research Collaboration.

This work was presented as a poster at the annual meeting of ARVO, Fort Lauderdale, Florida, 29.4.2001–4.5.2001.

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