Dentists' training and willingness to treat adolescents with learning disabilities: the mediating role of social and clinical factors

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Aim*:* To test a theoretical model based on Cohen's dental profession factors (training; practitioner attitudes; geography) to investigate practitioners' willingness to treat adolescents with learning disabilities (LD) in primary dental care. ***Participants:*** A sample of all 537 primary care dentists working in a mainly urban area of Northern Ireland and a more rural area of Scotland. ***Main outcome measure:*** Willingness to treat adolescents with LD. ***Method:*** Questionnaire survey of demographic profile, undergraduate education, current knowledge, attitudes towards individuals with LD and willingness to treat this patient group. A path analytical approach (multiple meditational model) was used. ***Results****:* Three hundred dentists participated giving a valid response rate of 61%. Undergraduate education and current knowledge (training) strengthened a social model perspective promoting positive attitudes and willingness to treat adolescents with LD. Undergraduate education and current knowledge about disability did not significantly contribute to dentists whose attitudes were underpinned by the medical model of disability. Therefore geography (rural or urban location) was not an influential factor in willingness to treat adolescents with LD. This does not exclude the possibility that area of work may have an influence as a consequence of undergraduate university attended. ***Conclusion:*** This model identifies the importance of undergraduate and continuing dental education with regard to modifying professional attitudes (social and clinical factors) to assist practitioners treat adolescents with LD and provide them with inclusive dental services in primary dental care.

Key words: *learning disabilities, access, willingness, attitudes, knowledge*

Introduction

Adolescents with learning disabilities (LD) can experience barriers when accessing dental care (Ackerman, 2013; Anders and Davis, 2010). Despite government initiatives (DHSSPS, 2007, 2005; DoH, 1995, 2001, 2007, 2009; Scottish Government, 2012), much remains to be done to increase access to dental care.

Cohen (1987) formulated barriers to dental care as patient, dental profession and government-societal factors. While patient factors were acknowledged as fundamental, dental profession factors, described as '*uneven geographical distribution, training inappropriate to changing needs and demands and insufficient sensitivity to patient's attitudes and needs*' (Cohen 1987) were thought to impact on access particularly for those experiencing disability. If primary dental services are to be inclusive, then appropriate training, sensitivity (practitioner attitudes) to patients' needs together with a willingness to provide care would be essential requirements for inclusive services.

Cohen's formulation reflects the concept of normalisation (Wolfensberger and Tullman, 1982). Normalisation has facilitated access to primary care by shifting services from institution to community, therefore if the goal of inclusion (Culham and Nind 2003) is to provide people with LD mainstream services, there is a need to examine dentists' training, their attitudes and willingness to provide treatment for people with LD and in particular adolescents with LD who may experience high dental treatment needs (Ackerman, 2013; Anders and Davis 2010; Martin *et al.* 2013). Operationalising dental profession factors (Cohen 1987) as a theoretical mediation model would, as a first step, permit an understanding of the predictive factors associated with service inclusion. This theoretical model, based on training (undergraduate and continuing education), practitioner sensitivity (attitudes) and geography (region), was hypothesised to contain the essential constructs to predict practitioners' willingness to treat adolescents with LD in primary dental care, as an indicator of service inclusion. The aim was to test this theoretical model based on Cohen's dental profession factors to investigate GDPs' willingness to treat adolescents with LD in primary dental care.

Method

Two geographically dissimilar health boards were selected to participate. One health board was in Northern Ireland (NIB) and urban with primary dental care provided by NHS general dental practitioners. The other health board was in Scotland (SB), remote and rural with primary dental care was provided by NHS general dental practitioners and salaried dental practitioners. A sample of all practitioners working in primary dental care in the NIB (n=390) and SB (n=147) were invited to participate during a six-month period spanning 2010 and 2011.

The questionnaire was in four parts. The first examined the demographic profile of the dental practitioner, including their age, gender, university attended, higher qualifications, locality (NIB or SB) and type of primary dental care practice (general or salaried). The second part considered the practitioners' undergraduate and continuing training in special care dentistry; with current knowledge acting as an indicator of continuing professional development. Practitioners were asked five questions on different aspects of the undergraduate curriculum on special care dentistry to assess their undergraduate experience. Nine knowledge questions examined the practitioners' current knowledge concerning the prevalence of LD, oral health status and the provision of dental care for individuals with LD. These questions were based on current professional standards (BSDOH, 2002; GDC, 2013; RCS.Eng, 2001). Thirdly, a 20 item inventory developed by Bedi *et al.* (2001) determines practitioners' attitudes to LD patients. All attitudes were based on a 5-point Likert scale (1-5), from strongly disagree to strongly agree with reverse scoring was applied as appropriate. A total attitudinal score was obtained for each participant on a scale ranging from 20 to 100. Higher scores represented a more positive attitude towards individuals with LD. The final part of the questionnaire assessed the behavioural intentions to treat adolescents with mild, moderate or severe LD (3 question-items), practitioner confidence and stress experienced. Intentions and confidence were assessed on a 7-point Likert scale, from 0, not at all, to 7, yes definitely. Stress was measured on a 7-point scale from 0, very stressful, to 7, not at all stressful.

The questionnaire, information sheets, consent form and a stamped address envelope were sent to all dentists on the NIB and SB lists of primary dental care practitioners. Non-responders were sent a second mailing two months later with a third and final follow-up sent six months after the initial distribution. The contacted dentists were asked to read the information sheet, complete the consent form and return it with the completed questionnaire. NHS Research Ethics advised that ethical approval was not required for this study. Clinical governance committees of the Boards were contacted and permission granted to conduct the survey. Analyses were conducted with SPSSv15 and AMOSv17. Chi-squared analysis and correlation analysis were calculated to test associations. Alpha was set to 0.05 (two-sided).

Path analysis was used to test the pre-specified multiple mediational model to predict the dependent variable: willingness to treat. The model was specified as a series of boxes to denote the variables and arrows to indicate the possible direction of influence (Kline 1998). Although the use of arrows is controversial as it implies direction of causality, it is recognised that these are only indicative and that there are many alternative models that could have been fitted. However the clarity of the exposition of the model aids communication of the possible relationships between the variables of interest. To estimate the success of the model to fit the raw data a number of fit indices were adopted. The indices chosen were the Comparative Fit Index (CFI), the Tucker-Lewis Index (TLI), and a test of parsimony – the Root Mean Square Error of Approximation (RMSEA). Values higher than 0.95 (CFI, TLI) and lower than 0.05 (RMSEA) are

regarded as excellent fit (Hu and Bentler 1999). Bootstrapped standard errors were calculated to avoid bias from variables with non-optimal normal distributions.

Results

Three hundred questionnaires were returned, 204 from NIB and 96 from SB. Of the 537 dentists listed, 42 were excluded as five had retired, four were on maternity leave, 3 on sick leave and 30 had left the UK leaving 495 potential respondents. The valid overall response rate was 61% (300/495). Dropout analysis revealed no significant difference by gender ($\chi^2[1]=0.77$, p=0.38) or by type of primary dental care practice: general dental service or salaried dental service ($\chi^2[1]=0.11$, p=0.74) between those practitioners who had, or had not, participated. Of the sample 36% (107) were aged between 25-35 years while 53% (159) were male. Belfast, Glasgow and Dundee dental schools accounted for 48%, 14%, and 9% of respondents' training respectively with the remaining 29% qualifying elsewhere. Three-quarters (76%, 229) worked in the General Dental Service (GDS) and 24% (71) in the Salaried Dental Service (SDS). A significantly greater proportion of dentists working in SB worked in the SDS compared with the NIB (61% vs 49%, $\chi^2[2]=34.87$, p<0.001). More NIB respondents, 72%, stated they provided NHS treatment than the 58% from SB, ($\chi^2[1]=4.59$, p=0.03).

Seventy-seven percent stated that as undergraduates they had no formal programme in special care dentistry. Of those who had undergraduate training this included, LD awareness training (18%), behavioural management (14%), didactic teaching (11%), clinical treatment (11%) and communication skills training (5%). Each time a respondent indicated that they had experienced any of the 5 items, they were awarded a score of 1. The scores were summed together to calculate a total undergraduate training score, range 0 to 5. The internal reliability of the scale was adequate (KR20=0.65). The mean score for undergraduate training in special care dentistry was 1.37 (95%CI: 1.27, 1.47).

Almost all practitioners knew the prevalence of LD (98%), the GDC requirements (96%) and consent regulations (96%). Smaller proportions correctly identified that people aged 16-19 with LD had the poorest periodontal health (41%), and that deinstitutionalisation had reduced LD people's contact with dental services (43%). A total special care dentistry knowledge score was devised with 1 being awarded for a correct answer and 0 awarded for an incorrect answer, range 0 to 9. The internal reliability for the knowledge scale was as found to be adequate (KR20=0.65). The mean score was 6.70 (95%CI: 6.57, 6.84).

The 20 attitudinal items were subjected to an oblique-rotation principal components analysis. Two factors were identified (using the eigenvalue convention of greater than unity to retain a factor) which explained 36% of the total variance. Scale 1 was composed of items 3, 4, 5, 8, 10, 13, 14, 17, 18, 19, was conceptualised as a 'clinical factor'. It explained 26% of the variance and had an eigenvalue of 5.25. Scale 2 was composed of items 1, 2, 6, 7, 9, 11, 12, 15, 16, 20, and was conceived as a 'social factor'. The social factor explained 9% of the

variance, with an eigenvalue of 1.85. Internal reliability (Cronbach's alpha) of the clinical factor and social factor scales was α=0.81 and α=0.72 respectively and suitable for group comparisons (Table 1). The total mean score for clinical factor scale was 25.4 (95%CI: 24.7, 26.0) and for the social factor scale 31.1 (95%CI: 18.0, 50.0).

The mean scores for intention to treat adolescents with varying degrees of disability, showed that there were significant differences in mean scores for the intention to treat adolescents with mild (5.51, 95%CI: 5.31, 5.71), moderate (4.83, 95%CI: 4.61, 5.04) or severe LD (2.73, 95%CI: 2.50, 2.97) (F[1,278]=516.24: p<0.001). The mean scores were: 3.70 (95%CI: 3.53, 3.86) for confidence, 3.57 (95%CI: 3.38, 3.77) for motivation and 3.21 (95%CI: 3.03, 3.39) for stress experienced.

All of the above items were subjected to a principal components analysis. One factor emerged as 'willingness to treat' with an eigenvalue of 3.48. Willingness to treat explained 58% of the variance and had Cronbach's alpha of 0.85. The mean score was 23.58 (95%CI: 22.67, 24.50). Scores of this combined scale ranged from 0-42, with higher scores indicating a greater willingness to treat.

To predict the willingness to treat, the samples from NIB and SB were pooled together. The independent variables including: undergraduate education, knowledge of special care dentistry as well as the attitudinal scores for social factor and clinical factor scales. The independent variables were organised into two stages, proximal and distal. The model prepared was constructed from Cohen's formulation together with the theoretical principle that undergraduate education and knowledge would inform dentists' attitudes and predict the outcome – their willingness to treat adolescent patients with LD.

The assigned proximal variables were the attitudinal scales for social factor and clinical factor: that is, these two variables were considered to be more closely associated with the dependent variable of willingness to treat. The two assigned distal variables were undergraduate education and current knowledge of special care dentistry. All variables were entered as raw variables. Inspection of the distribution of the scales confirmed that all measures included in the model were normally distributed with the single exception of undergraduate education which was positively skewed. Estimates of association from this measure were treated with caution, although all other measures were normally distributed ensuring that any potential biases were not magnified (Table 2).

The path model was tested using Amos v17 (Figure 1). All indirect and direct paths were included. Error terms were entered into the model for those variables that acted as non-independent predictors. Likewise the dependent variable required an error (disturbance) term.

Table 1. Attitudinal scale (means, 95%CI and reliabilities) and items (means, 95%CI and factor loadings)

| Attitudinal items	Cronbach's alpha	Factor loading	Mean (95%CI)
Clinical Factor Scale	0.81		25.38 (24.74, 26.03)
3. It is impossible to keep the teeth dry when working on people with a LD		0.60	2.20 (2.10, 2.30)
4. Patients with a LD are too disruptive in the dentists' chair to allow proper treatment		0.66	2.23 (2.13, 2.33)
5. Oral hygiene instruction for people with a LD has little or no effect		0.53	2.18 (2.08, 2.28)
8. Dentists should reserve the right not to treat people with a LD		0.54	2.69 (2.55, 2.84)
10. Dentists should be paid a lot more for treating people with a LD than for treating other people		0.54	3.75 (3.62, 3.87)
13. Patients with a LD upset other patients in the waiting room		0.35	2.31 (2.21, 2.41)
14. Dentists should refuse to treat people with a LD unless they are accompanied by a responsible person		0.57	2.94 (2.82, 3.05)
17. There is no point in discussing a treatment plan with people with a LD, as they will not understand it		0.67	2.02 (1.93, 2.12)
18. Treating patients with LD causes too much stress for the dental team		076	2.34 (2.23, 2.45)
19. It is better for all concerned if people with LD attend specialist clinics rather than general dental practices		0.65	2.67 (2.55, 2.79)
Social Factor Scale	0.72		37.09 (36.53, 37.66)
1. People with LD can be expected to reach the same standard of OHI as other people		0.62	3.11 (2.98, 3.25)
2. People with LD are able to make decisions about their own health care		0.64	3.52 (3.41, 3.62)
6. Aesthetic dental treatment is as important for people with LD as it is for other people		0.62	3.75 (3.63, 3.87)
7. People with LD are able to successfully adjust to life outside an institutional setting		0.68	3.61 (3.52, 3.71)
9. Patients with LD pose no special health risks to other patients and dental personnel		0.27	3.67 (3.54, 3.79)
11. Patients with LD can be trusted to keep their dental appointments as much as anyone else		0.47	3.31 (3.19, 3.42)
12. Treating patients with LD is highly rewarding		0.42	3.75 (3.64, 3.86)
15. Each dental care should be assessed individually irrespective of whether the patient has an LD		0.53	4.51 (4.42, 4.59)
16. Laws should be enforced to prevent dentists from discriminating against people with an LD		0.30	3.35 (3.21, 3.49)
20. People with LD should receive the same quality of care as others		0.59	4.48 (4.41, 4.55)

Table 2. Pearson product–moment correlation coefficients of variable used in the path analysis

	Willingness to treat	Social factor	Clinical factor	Current knowledge	Undergraduate education (training)
Willingness to treat	1	**0.45 ****	**-0.54 ****	**0.17 ***	**0.15 ***
Social factor	**0.45 ****	1	-0.49 **	**0.17 ****	**0.13 ***
Clinical factor	**-0.54 ****	**-0.49 ****	1	**-0.13 ***	**-0.17 ****
Current knowledge	**0.17 ***	**0.17 ****	**-0.13 ***	1	0.05
Undergraduate education (training)	**0.15 ***	**0.13 ***	**-0.17 ****	0.05	1

** $p<0.01$, * $p<0.05$; n=277
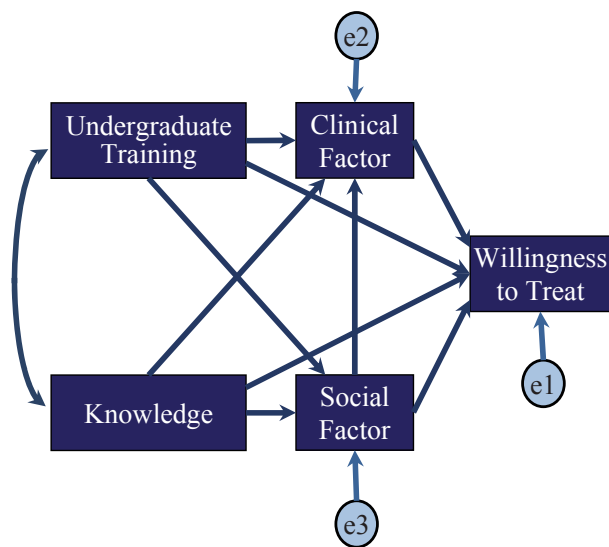
Figure 1. *Initial model proposed with all paths included*
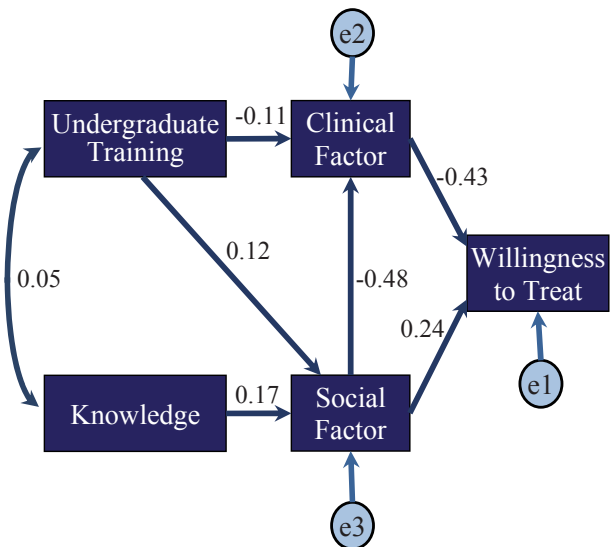
Figure 2. *Results of final path analysis model for the whole study sample (n=277)*

All error terms had their regression weights set to unity to enable convergence of the estimation procedures (for model identification). Maximum likelihood estimation was employed as the most efficient method to derive model parameters. By convention the correlation between the knowledge and treatment at undergraduate level was specified. Hence the effects of each of these two distal variables will be independent of the effect of the other when interpreting their separate paths in the overall model. Initial results showed that three paths were redundant ($p>0.05$) and these were removed for the sake of parsimony and ease of interpretation. These were the two direct effects of undergraduate education and current knowledge on willingness to treat. This demonstrated that the position of these two variables as 'distal' rather than 'proximal' to willingness to treat was consistent with the initial proposed model. The third path of knowledge to clinical factors was also dropped from the model (z=1.48, p=0.138).

The resulting model, with the redundant paths removed, was run using the complete data set with no missing values. No alerts were raised by the estimation procedure and all coefficients were within conventional limits. A maximum of eight iterations was required to achieve convergence. The standardised model is presented in Figure 2 showing all paths which were statistically significant. The correlation between the two distal variables (undergraduate education and current knowledge)

was non-significant but retained in the model for the sake of completeness and enable clear interpretation of these variables on the social and clinical factors. The overall fit of the data to the specified model was excellent as shown by the low chi square value (χ^2=4.18,=3, p=0.243) and the χ^2/df ratio was less than two (namely 1.4). The three common fit indices confirmed close correspondence of the data to the model: *CFI*=0.994; *TLI*=0.981; *RMSEA*=0.038.

A further check was made to ascertain the similarity of these results across the NIB and SB. This was achieved by running a simultaneous fitting procedure on the data sets from both health boards. The paths were constrained to be equal across the two boards and then fitted freely. The omnibus test to compare these two constrained and unconstrained models demonstrated that there were no significant differences in associations between the two boards (χ^2=3.954, df=6, p=0.683).

Discussion

The aim was to test a theoretical model based on Cohen's (1987) dental profession factors (training, practitioner sensitivity, geography) to investigate the GDPs' willingness to treat dental care for adolescents with LD in primary dental care, as an indicator of service inclusivity. A model was devised based on Cohen's formulation, together with the theoretical position that

undergraduate education and current knowledge would moderate dentists' attitudes, which in turn would mediate and predict willingness to treat adolescent patients with LD. Willingness to treat was conceptualised as a multi-faceted construct being composed of the behavioural intention, confidence, motivation and the stress associated with treating adolescents with LD. The multiple mediation path model appeared to fit the raw data very well as shown by the following indicators: low number of iterations for convergence, all parameters estimates within range (i.e. no negative variances), the χ^2/df ratio below 2, and all fit indices either higher than 0.95 (CFI and TLI) or lower than 0.05 (RMSEA).

Few practitioners reported that they had experienced undergraduate education in LD. Although, well informed about some aspects of special care dentistry, there was some inconsistency in current knowledge. Limited undergraduate education and inconsistent knowledge can reduce practitioner confidence and increase insensitivity which may act as barriers to the provision of primary care services for patients with LD (Kroll *et al.,* 2006). It was postulated that inadequate undergraduate and continuing education could act, to moderate practitioners' willingness to treat adolescents with LD.

Two groups of attitudes emerged from the factor analysis reflecting the medical model (clinical factor) and the social model of disability (social factor) (Barnes *et al.,* 1999; Culham and Nind, 2003; Oliver, 1990, 1996). This suggested that practitioner adherence to the social model, as reflected in high social factor scores, would attenuate the impact of meagre undergraduate and continuing education upon willingness to treat: whereas adherence to the medical model would enhance the effect of meagre undergraduate and continuing postgraduate training and reduce willingness to treat. The findings from the path analysis would support these suppositions. The attitudinal component, clinical factor, was strongly related to being unwilling to provide treatment whereas the attitudinal component, social factor, was related to a willingness to treat adolescents with LD in primary dental care, with the direction of influence supporting the hypothesis that those with higher social factor scores would adopt a societal-model orientation and provide treatment. These findings reflect Ackerman's (2013) supposition that '*the lack of adequately trained and willing providers is the single greatest barrier to care for people with intellectual disability*'.Undergraduate training was marginally and negatively related to the clinical factor but positively associated with the social factor. Current knowledge had no reliable effect on the clinical factor, whereas current knowledge had a moderate positive effect upon the social factor and willingness to treat. Therefore, undergraduate training experiences, and consistent knowledge of LD through the adoption of a 'social factor' pathway, resulted in practitioners having a greater propensity to treat adolescents with LD in primary dental care and hence provide inclusive services.

The comparison across areas (NIB and SB) did not reveal differences in the overall set of associations as indicated by the non-significant χ^2 value raised when testing for a difference between simultaneously constrained and unconstrained models. It is recognised that the confidence in this comparison was modest as the sample size in Scotland was relatively small, however the strength of this approach was that a single omnibus test was employed therefore reducing the chance of Type I errors.

As with all studies that propose temporal relations between variables some caution is advised with meditational models using cross-sectional data. It is possible that the relationship between adoption of a particular model and attitude/beliefs is a two way process. Therefore, on the one hand, the adoption of a social model may lead to more positive attitudes/beliefs while on the other hand the provision of positive experiences may enable the adoption of a social model through disconfirmation of previous views. The advantages of testing our original conceptual model in this efficient way and proposing what we consider a defensible theoretical approach to understanding willingness to treat an often-neglected group of young patients, outweigh the possible disadvantages. Since these findings have implications for the educational process, we encourage further research to confirm and extend this formulation. This is of central importance, since these findings will be instructive to policy makers, teachers of dental education and to the profession (Owens *et al*., 2010). This model identifies the importance of undergraduate (GDC, 2011) and continuing dental education (GDC, 2013) with regard to changing professional attitudes as encompassed in Cohen's (1987) dental profession factor.

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