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Depression, drugs and dental anxiety in prisons: A mediation model explaining dental decay experience

Garima Arora[1], Gerry Humphris[2], Satu Lahti[3], Derek Richards[1,4], Ruth Freeman[1,5]

1. Dental Health Services Research Unit, University of Dundee, Dundee DD1 4HN, UK
2. School of Medicine, University of St Andrews, St Andrews, UK
3. Department of Community Dentistry, University of Turku, Turku, Finland
4. Dental Public Health South East Scotland, NHS Forth Valley, Stirling FK9 4SW
5. Public Health, NHS Tayside, Dundee, DD2 1UB, UK

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Abstract

Objective To test a theoretical mediation model and investigate whether drug use and/or dental anxiety act as mediating factors between depression and dental decay experience among prisoners.

Method A cross sectional survey was conducted on a convenience sample of 300 prisoners across three prison establishments in Scotland. Depression and dental anxiety were measured using the Centre for Epidemiological Studies Depression Scale and the Modified Dental Anxiety Scale, respectively. Drug use was assessed using three yes (scoring 1)/ no (scoring 0) questions: 'ever taken (illegal) drugs', 'injecting drugs' and 'ever participated in a rehabilitation programme'. Participants had an oral examination to determine dental caries experience (missing [MT] and untreated decay [$D_{3cv}T$]) in all four quadrants. Latent variable path analysis was conducted to test the mediation model.

Results A total of 342 prisoners participated, of which 298 yielded a complete data set. Depression was associated with missing teeth and untreated decay (D_3T) through an indirect pathway (Total standardized indirect effects = 0.11, $p<0.01$) via drug use and dental anxiety (X^2 [71] = 89.8, $p=0.07$; Root Mean Square Error of Approximation: 0.03; Comparative Fit Index: 0.994 and Tucker-Lewis index: 0.992). Twenty-two percent of the variance in untreated decay and missing teeth was explained by both drug use and dental anxiety, however, the strongest predictor was drug use (total standardized direct effects = 0.45, $p<0.001$).

Conclusion A relatively simple model to assist understanding dental decay experience of people in prison has been proposed. The data collected were consistent with our specified model. Drug use acted as the primary mediator and dental anxiety as a secondary mediator between depression and dental decay experience. Given the co-morbidity between mental health and drug use and dental decay experience, an integrated or shared approach is proposed. We recommend that future research should concentrate on building a firmer picture by replicating and extending the framework presented.

Introduction

The importance of preventing dental caries for people in prison was highlighted in the 2005 Scottish oral health strategy.[1] Changes followed, with the responsibility of oral health care shifting from the Scottish Prison Service to the National Health Service. Oral health was now recognised as a key area for prisoner health improvement.[2] While the Scottish Government advocated a 'whole prison' approach to oral health, and its policies recognised the value and difficulties of preventing dental caries in prison, psychosocial influences such as depression, dental anxiety and drug use were not fully appreciated.[3] This was considered of some importance, since 70-78% of the people entering Scottish prisons tested positive for drug use;[4] those with 'severe or enduring' mental health problems report a history of substance use[5] and the increased prevalence of dental decay experience.[6] Moreover, prisoners report greater levels of dental anxiety[6,7], frequent use of emergency dental services[6,7] which contributed to greater untreated dental decay.[8-10]

From Coles et al., an investigation with people experiencing homelessness, an excluded group, demonstrated that nearly 20% of the variance of depression and decay was overlapping.[11] The simple bivariate model may be applied to the prison population although we believe is incomplete. Additional constructs are required to expand our ability to explain dental decay experience. Two crucial variables are missing. The first is drug use which is often linked within the prison context, to depression as a form of self-medication.[12,13] Likewise, the link between drug use and dental decay has been reported.[14] An argument can therefore be reasonably made that depression may be associated with decay via the mediation of drug use. An alternative path to link depression to decay may also be specified independent of drug use. This consists of the chain of association via dental anxiety as a mediator. People who experience mental health problems such as depression are more likely to report high levels of dental anxiety.[15] In addition, those frightened to receive dental care are likely to show greater dental decay.[16] Hence a relatively parsimonious parallel mediational model can be compiled that might apply efficiently to a prison population that would explain proportionately greater variance than a simple bivariate relationship of depression and decay (Figure 1). A more revealing explanatory approach to understanding the role of psychosocial influences on dental decay therefore warrants testing. Accordingly, the aim of the study was to test this theoretical mediation model and investigate whether drug use and/or dental

anxiety acted as mediating factors between depression and decayed and missing teeth among prisoners.

Materials and methods

A convenience sample of 300 people in custody from three prisons was gathered with 100 participants from adult male, adult female and young offenders' prisons. The survey excluded participants who did not understand English or those who posed a risk to the survey team.

The sample size was estimated and derived from the average daily prison population during the survey period.[17] The number of parameters to be estimated by the structural equation model was 36. The minimum ratio recommended by one source, of total sample to parameters requiring estimation was 10:1.[18] With a sample of approximately 300, the ratio is moderately underpowered however Bentler and Chou[19] stress that the ratio of 10 participants per variable/free parameter may not be so strict if there are more than 2 variables per latent factor/variable. As this is the case in our model, that is each of our latent variables have 3 or more indicator variables, then the strict criteria of 10 per parameter can be relaxed somewhat. Therefore suitable conditions would exist for a stable solution.

The research team attended the SPS-approved breakaway training session. A training day was organised to ensure that: (1) both examiners and researchers understood the operational procedure and questionnaire administration, and (2) the standardization of the dental examination. The two examiners had experience of working in prisons and epidemiological fieldwork, having recently been calibrated for a national dental survey. The International Caries Detection and Assessment System (ICDAS) training was delivered by an ICDAS co-ordinator.[20]. The ICDAS is a visual scoring system to assess caries, restoration or missing tooth surfaces, with D_1MFT including all ICDAS codes (1-6), D_2MFT including codes 3-6 in enamel and dentine, and D_3MFT including codes 3-6 in dentine. The examiners were selected, because they had worked in the prison environment and recently been calibrated for a national oral health survey. They had obtained percentage agreements in the range of 91–100% and a Kappa of >0.8.

The questionnaire sought information on age, gender, employment status prior to imprisonment, living and prison experiences. Dental anxiety was assessed using the Modified Dental Anxiety Scale (MDAS).[21] The MDAS rates dental anxiety on a 5-point Likert scale ranging from not

anxious (1) to extremely anxious (5). Five questions rate dental anxiety when going for dental treatment, waiting for dental treatment, drilling, scale and polish and local anaesthesia. Scores range from 5 to 25, with scores above 19 indicating extreme dental fear. The MDAS has high internal consistency (Cronbach alpha =0.93) and shows good reliability over time (intra-class correlation coefficient = 0.93). [22] The internal consistency of the total MDAS for this sample was 0.94.

Depression was measured using the Centre for Epidemiological Studies Depression Scale (CES-D).[23] The CES-D is a self-reported scale consisting of 20 items reflecting dimensions of depression, measured on a 4-point Likert scale. The respondents are asked to rate their experiences of each item in the last week, with response categories ranging from 0 (rarely or none of time) to 3 (most or all of the time). Total scores can range from 0 to 60, with scores of 16 or above indicating depression. The CES-D has high internal consistency, ranging from 0.85 to 0.90.[23] The internal consistency of the total CES-D for this sample was 0.90.

Drug use was assessed by three yes (scoring 1) /no (scoring 0) questions: 'ever taken (illegal) drugs', 'injecting drugs' and 'ever participated in a rehabilitation programme'. Score range was from 0 (no drug use) to 3 (drug use). The internal consistency of drug use scale was 0.60.

Information posters were displayed, one week before the survey, in the prisons. Participant information sheets and data collection forms were distributed prior to the survey. On the day of the survey, consent was obtained, followed by questionnaire completion and dental examination.

Data analyses

The survey data were entered onto a database and analysed using SPSS v25 and STATA v16. Analyses were conducted including: frequency distributions, Cronbach's alpha, chi-square analysis, t-tests, ANOVA with Scheffe, correlation analysis, exploratory and confirmatory factor analysis and structural equation modelling (SEM). SEM was used to test simultaneously the measurement model and the complex inter-relationships between variables.[18,24] This technique was adopted to enable the assessment and possible modification of the hypothetical path model. A latent variable model was applied to explain the relation between observed and unobservable latent variables.

In the initial model, four variables were defined as hypothetical latent constructs, represented by oval diagrammatic elements in the model (Figure 1). First, the latent variable depression (CES-D) consisting of a 20-item scale, was subjected to principal components analysis using the oblimin method. To determine the number of factors for retention Horn's Parallel analysis[25] was conducted and revealed a clear three-factor solution (Figure 1: Supplementary file). The 3 factors were Subscale 1 composed of CED-S items 6, 7, 9, 10,13,14,15,17,18,19 and 20 with an eigenvalue of 8.0; Subscale 2 composed of CED-S items 1, 2, 3, 5, 11 and had an eigenvalue of 2.5 and Subscale 3 items 4,8,12, and 16 and had an eigenvalue of 1.4. Each of the subscales explained different aspects of depression therefore Subscale 1 was named 'negative affect'; Subscale 2 'psychophysiological' and Subscale 3, 'positive affect' (Table 1: Supplementary file).

The second latent variable (history of drug use) was specified by the three raw variables of [i] ever taken (illegal) drugs, [ii] injecting drugs and [iii] rehabilitation and were checked for strength of association. The third latent variable (dental anxiety) was specified by the five items comprising the MDAS scale. Cumulative caries experience was specified by a total score of two variables: number of decayed ($D_{3CV}T$) and missing teeth (MT) in each quadrant. Third molars were excluded (decayed and missing) to minimize the effect of variability in their presence/absence.[26] This was a dichotomous variable, scored as 0 for 'No' and 1 for 'Yes' respectively.

To analyse the model a two-step approach was adopted.[27] In the first step, confirmatory factor analysis was performed on the hypothesised original measurement model and re-specified using modification indices to test its adequacy. In the second step, full structural equational modelling (SEM) was conducted based on a satisfactory measurement model, (i.e. a minimum of good fit). Standardized parameter estimates with their confidence intervals were calculated. This gave estimates of the direct, indirect and total effects of the associations between proximal and dependent variables. By convention, the first observed variable used to scale the latent variable was used as the reference indicator and was therefore fixed at 1 for the unstandardized solution. Model fit was evaluated (maximum likelihood estimator) using a range of conventional indices: Comparative Fit Index (CFI), Root Mean Square Error of Approximation (RMSEA) and Tucker-Lewis Index (TLI). All analyses were also run with the Satorra-Bentler[28] option as a sensitivity test for possible violations of distributional non-normality. Modification indices (>4, i.e. conservative approach) were requested on running STATA routine for inspection to determine

whether considered adjustments could be made to the model to improve its fit. Alpha level was 0.05 (2 sided).

Ethical considerations

Ethical approval was obtained from The National Research Ethics Service (Reference Number NRES 10/S0501/10) and the Scottish Prison Service Ethics Committee. All data files were held securely on encrypted university computers in a secure location.

Results

Three hundred and forty-two prisoners from three prisons participated. Forty-four of the 342 did not have a dental examination. Reasons included refusal (25%), court attendance (25%), at work/education (14%), discharged from prison (11%), moved to another prison (9%), agency visit (5%) or unknown reason (11%). This gave a working dataset of 298 participants (Table 1).

Age ranged from 17 to 67 years with a mean age of 29.1 years (SD: 11.2). Seventy percent (n=208) were male: 95% (n=277) Caucasian. Sixty-eight percent (n=198) were unemployed prior to imprisonment and 35% (n=95) had lived in residential care as children. The majority of those surveyed had been living with family (37%), rented accommodation (32%) or had ever been homeless (41%). They had spent an average of 2.5 years in prison (SD: 4.8). Forty-nine percent (n=136) were long-term prisoners (>4 years). Thirteen percent reported being prescribed anti-depressants. Thirty percent (n=89) had visited a dentist (inside/outside prison) in the last 6 months. Half the sample (50%) reported visiting the prison dentist.

The study sample total mean CES-D score was 17.7 (SD: 11.7; range 0-55). One hundred and five respondents (35.2%) scored 16 or above, suggesting depression. Female prisoners had a significantly higher mean CES-D score (mean=22.3) than male prisoners (mean=14.5) and young offenders (mean=17.3) ($p<0.001$). Short-term prisoners had significantly higher mean scores for total CES-D score (19.8; SD: 11.8) than long-term prisoners (15.2; SD: 11.0), (t= 2.96; $p=0.003$).

The dental anxiety mean score was 10.1 (SD: 5.6; range: 5-25). Eleven percent (n=33) scored 19 or over and were categorised as extremely anxious. The prison establishment significantly explained differences in total mean dental anxiety scores (F [2,281] = 6.21, $p<0.002$). Female

prisoners had significantly higher mean total MDAS score (11.8) than young offenders (9.6) and adult male prisoners (9.1). Relatively high proportions reported that they were extremely anxious about having a local anaesthetic agent (13.7%) and having their teeth drilled (12.4%).

The mean number of $D_{3CV}T$ was 1.4 (SD: 2.1; range: 0-12) and the mean number of MT was 5.9 (SD: 7.4; range: 0-28). The mean number of $D_{3CV}MT$ was 7.3 (SD: 7.5; range 0-28). Adult male prisoners had significantly higher mean numbers of MT than young offenders and female prisoners ($p<0.001$). Young offenders had higher dental decay experience and greater mean numbers of $D_{3CV}T$ ($p<0.001$) than adult male and female prisoners (Table 2).

Seventy-nine percent (n=230) of respondents stated they had used (illegal) drugs and 18% (n=50) reported intravenous drug use. Significantly larger proportions of young offenders (91.8%) stated they had used drugs than did adult male (78.1%) and women prisoners (67%) [X^2 [2] =17.31, $p<0.001$]. Significantly higher proportions of female prisoners than others [X^2 [2] =25.85, $p<0.001$] and a significantly higher proportion of prisoners who had experienced homelessness [X^2 [1] =43.62, $p<0.001$] injected drugs. Fifty-seven (19%) prisoners reported that they had participated in drug rehabilitation. Significantly lower proportions of young male offenders (7.1%) than adult male (22%) and female prisoners (28.9%) had participated in drug rehabilitation [X^2 [2] =15.43, $p<0.001$].

Using the complete dataset, four latent variables –were used in a structural equation model depression (CES-D: three subscales), dental anxiety (MDAS: five items), drug use (three items) and $D_{3CV}MT$ (four items). The STATA command language '*sem*' was used. The initial model was first analysed using the confirmatory factor analysis (CFA) to test for the adequacy of measurement model. The measurement model achieved convergence within 7 iterations with all paths statistically significant $p<0.05$, the fit indices revealed the need to modify the model in order to fit the data more adequately. The initial model's $X^2[84]= 293.5$, $p<0.001$, meant that the model failed to fully account for the covariances existent in the raw data. The RMSEA of 0.09 was well above the goal of 0.05, CFI of 0.93 and TLI of 0.91 were well below the target of 0.95 for a good fit. To improve the model, modification indices for the error term covariances were examined. Two covariances between the error terms of these raw variables were added (i.e. allowed to correlate) to the measurement model: e.mdas3 x e.mdas5 and e.D_{3cv}MT_LowerLeftQuadrant x e.D_{3cv}MT_LowerRightQuadrant. Theoretically, these systematic errors independent of the *a priori*

model were considered appropriate. The resulting model, with correlated error terms added, revealed an excellent fit to the sample data (X^2 [82] =101.4, p=0.07; RMSEA: 0.03; CFI: 0.993 and TLI: 0.992). The standardised measurement model showing all path coefficients is depicted in Figure 2. The SEM included all variables with the exception of 'positive affect' which showed a low loading on the Depression latent variable. The detailed CFA output presented in Table 2: Supplementary file. No Pearson's correlation coefficient of the raw variables across latent variables (as opposed to within latent variable clusters) were of magnitude at or above >0.85, demonstrating discriminant validity of the individual indicators. The Pearson's correlation matrix as posted in Table 3: Supplementary file. The fit indices for each individual latent variable are available in Table 6: Supplementary file.

The re-specified measurement model was tested further in a full structural regression model. The resulting model (Figure 3), revealed an excellent fit to the sample data (X^2 [71] = 89.8, p=0.07; RMSEA: 0.03; CFI: 0.994 and TLI: 0.992). A sensitivity analysis was performed to reassure that the model components and overall fit statistics were not influenced by variation of raw data from normal distribution. The Satorra-Bentler[28] option was performed on the final model. Parameters showed minor variation, if any, with all retaining the original statistical significance. The non-adjusted solution is presented to enable comparison with future reports, without access to this option. The final model found that depression predicted decayed and missing teeth through an indirect pathway (total standardised indirect effect 0.11, p=0.004), via drug use and dental anxiety (Figure 2). Therefore, 22% of the variance in decayed and missing teeth was explained by both drug use and dental anxiety. All path coefficients were positive and statistically significant; however, the strongest predictor was drug use (total standardised direct effect=0.45, p<0.001). Endogenous variables with their associated standardized beta coefficients, error terms and R-squared values are provided in Tables 4 and 5: Supplementary file.

Discussion

This study revealed important findings for those within the criminal justice system in Scotland. These findings appeared to support the theoretical model and pointed to the complexity of the relationship between depression and caries experience and the place of drug use and dental anxiety as potential mediators in the association. This study suggests that the prediction of dental decay

experience by depression was mediated separately, by two parallel and independent paths, namely: drug use and dental anxiety. The path which features most strongly was the association of depression with dental decay experience via drug use. Examination of the standardised coefficients (equivalent to correlations) supports the positive link between depression, drug use and dental decay experience. In the second parallel path the association of depression with dental decay experience via dental anxiety was only weakly positive. Overall the specification of this model explained 22% of the variance in the relationship between depression and decayed and missing teeth. The level of explanation, admittedly relatively small, however, does reflect an interesting summary; that is, the model consisted of just two psychological constructs (depression and dental anxiety) and a single health compromising behaviour (drug use).

Over a third of the sample scored greater than 16 on the CES-D suggesting they were depressed. This represented a much higher proportion (virtually double) than the general Scottish population prevalence of depression (17%).[29] In Scotland, women in prison are known to be more vulnerable to mental ill-health[30] and the women in this sample had higher scores for depression than younger and older men. Seventy-nine percent of the participants reported drug use. Mental ill-health and drug abuse are known to co-vary. It is of interest, therefore, that the young offenders, in this sample, were more likely than others to report drug use while scoring lower for depression, illustrating the complex nature of the interaction of depression with drug use.

The clinical data revealed that the mean number of decayed teeth into dentine and missing teeth was 1.4 and 5.9 respectively for the total sample. Relative to adult women and men, young offenders, in this sample, had higher experience of decayed and lower numbers of missing teeth reflecting a similar pattern of dental disease in young offenders in America.[31] Their pattern of dental disease suggested that their drug use was in some way associated with their dental decay experience.

The proportion and mean scores for dental anxiety in this sample of prisoners were similar to that of the general UK population.[32] The characteristics of dental anxiety such as the highest scores are for local anaesthetic injection and the drill and that females are more fearful than men, were also

found here, suggested that in terms of dental anxiety this prison sample was broadly equivalent to the UK population.

There were some limitations that warrant attention. The proposed parallel mediational model was hypothesised closely based on the relevant literature. The development and testing of the model, as well as suggesting a causal set of ordered pathways from cross-sectional data, however, should be treated with caution. While this model exhibited an adequate fit, the possibility of other equally valid models that would is acknowledged. Possible alternatives should be cross-validated with additional samples of participants in prisons. We acknowledge that we were unable to separate 2 key variables: age and gender, because they are confounded in the prison establishments e.g. women's prison and a young offenders' institution. Subtle changes in sampling can interfere with the eventual solution and resultant magnitude of the pathways presented. Hence, we acknowledge that the convenience sampling method may have introduced bias in the magnitude of the parameter estimates, however the sample population was equivalent in terms of prevalence of dental anxiety and in this respect could be considered as representative. Although caution should be taken while generalising the findings to other prison populations, or indeed to the general population where the prevalence of drug use and dental decay experience is likely to vary with different levels of the key variables, these results, nevertheless, highlight the importance of psycho-social factors such as depression and drug use in gaining a better understanding of oral health, possessed by people living in a challenging social environment. Finally, we are aware of recent graphical causal model developments, especially directed acyclic graphs (DAGs), that highlight some important issues in locating possible bias in parameter estimation e.g. confounding and 'collider' effects. A recent accessible article alerts researchers to reflect on their models to ensure plausibility.[33] Future work should include an exploration of the associations in a general population when the overall prevalence of, for example, drug use is lower and a focus on a more varied socioeconomic profile.

In conclusion, we have put forward a relatively simple model to assist our understanding of dental decay experience of people in prison. The data collected were consistent with our specified model. We recommend that future research should concentrate on building a firmer picture by replicating and extending the framework presented.

Given the co-morbidity between mental health and drug use and dental decay experience, an integrated or shared approach for dental health care is advocated. The implications of these

findings are crucial for dental public health specialists in two ways. First this work reinforces oral health as an important factor for mental health, an integral part of prison public health and central to rehabilitation. Secondly, it encourages multidisciplinary working between healthcare providers, the prison estate and social care. This is of some importance with regard to the promotion of inclusion oral health and the incorporation of oral health into health and social care policy to ensure that the oral health and psychosocial needs of prison populations are more adequately met. [34]

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Figure 1 Theoretical mediation model (dotted line represents hypothetical total indirect effect)

Figure 2 Path diagrams of confirmatory factor analysis (CFA) results showing latent variables, items, factor loadings, and correlations (standardised solutions using robust maximum likelihood estimator)

Figure 3 Path diagram showing latent (bold outline eclipses) and indicator (oblong boxes) variables and standardised parameter estimates for *p<0.05; **p<0.01; ***p<0.001. Dotted line with arrow indicates total indirect effects. Solid lines with arrow indicates direct effects and double arrow headed lines denote inclusion of specific correlated residual errors

Table 1: Distribution of sample in the survey and oral examination by prison establishment

Prison	Survey & Oral Examination	Survey only	Total
Women Prison	90 (97.4%)	9 (2.6%)	99 (28.9%)
Adult Male Prison	109 (99.7%)	1 (0.3%)	110 (32.2%)
Young Offenders Institution	99 (90.1%)	34 (9.9%)	133 (38.9%)
	298 (87.1%)	44 (12.9%)	342

Table 2: Oral health comparison by prison establishments

	Prison	Mean number of teeth	Std. Deviation	Min	Max	p	n (%)
Decayed Teeth ($D_{3cv}T$)	Adult Women prison	1.1[1*]	1.7	0	8	p<0.001	90 (30.2%)
	Adult Male Prison	1.0[1]	1.7	0	9		109 (36.6%)
	Young Offenders Institution	2.3[2]	2.6	0	12		99 (33.2%)
Missing teeth due to caries (MT)	Adult Women prison	7.5[2]	8.1	0	28	p<0.001	90 (30.2%)
	Adult Male Prison	8.2[2]	8.2	0	28		109 (36.6%)
	Young Offenders Institution	2.0[1]	3.1	0	20		99 (33.2%)
Decayed and Missing teeth ($D_{3cv}MT$)	Adult Women prison	8.6[2]	8.4	0	28	p<0.001	90 (30.2%)
	Adult Male Prison	9.2[2]	8.4	0	28		109 (36.6%)
	Young Offenders Institution	4.2[1]	4.0	0	20		99 (33.2%)

*Suffixes show the significant differences in means between groups

Figure 1 Theoretical mediation model (dotted line represents hypothetical total indirect effect)

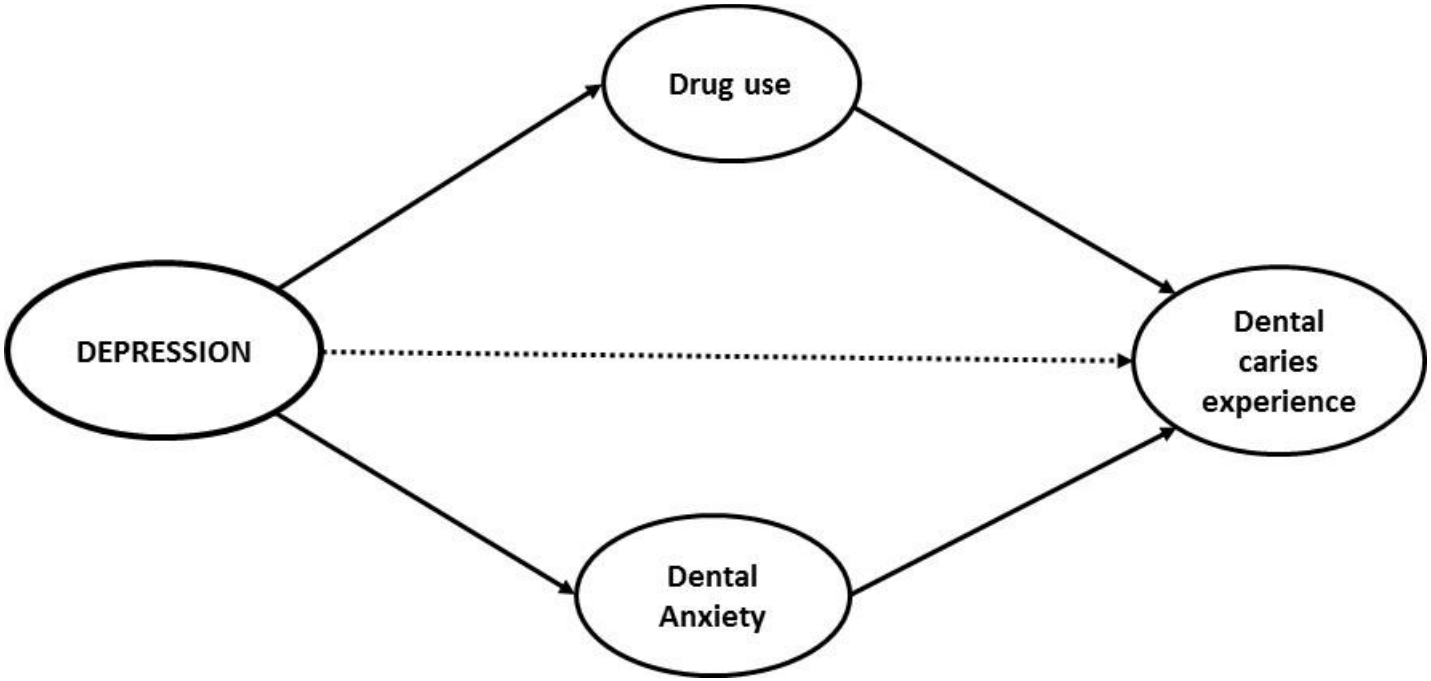
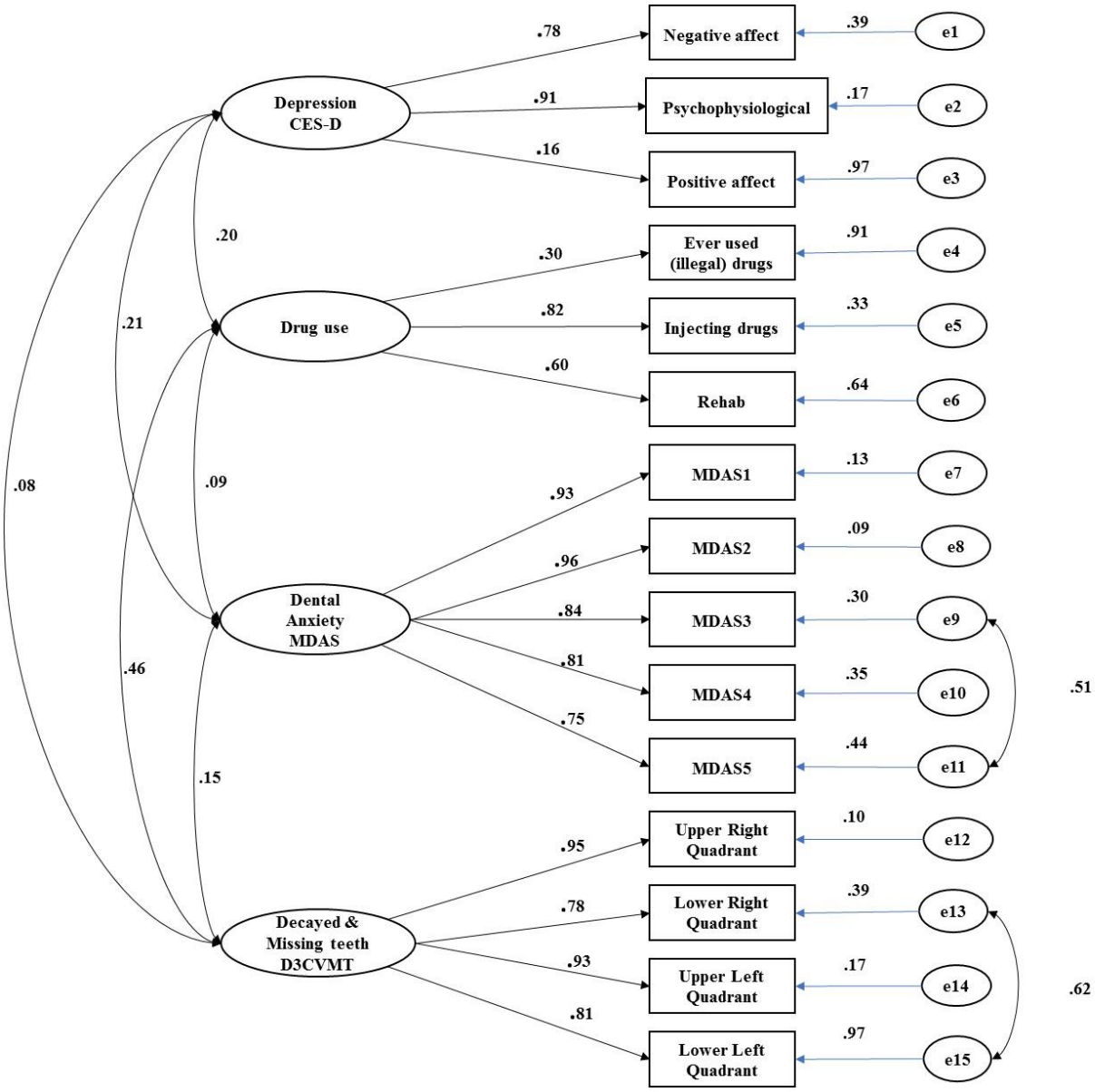
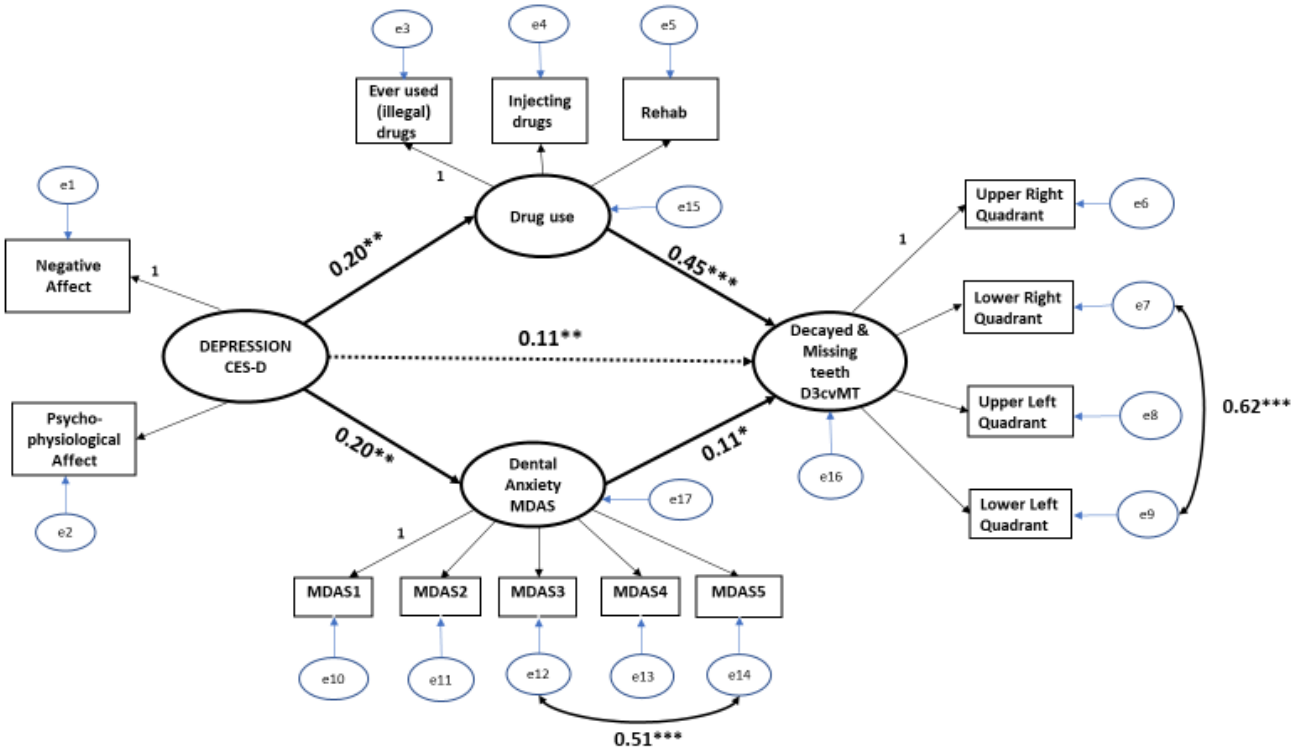


Figure 2 Path diagrams of confirmatory factor analysis (CFA) results showing latent variables, items, factor loadings, and correlations (standardised solutions using robust maximum likelihood estimator)



X^2 [82] = 101.41, p= 0.07, RMSEA = 0.03, CFI = 0.993, TLI = 0.992, N = 298

Figure 3 Path diagram showing latent (bold outline eclipses) and indicator (oblong boxes) variables and standardised parameter estimates for *p<0.05; **p<0.01; ***p<0.001.
Dotted line with arrow indicates total indirect effects. Solid lines with arrow indicates direct effects and double arrow headed lines denote inclusion of specific correlated residual errors



Supplementary files

[1] Table 1: CES_D exploratory factor analysis: subscales, reliabilities and factor loadings (rotated)

[2] Figure 1: Scree plot: parallel factor analysis of the data to show 3 definitive factors

[3] Table 2: Measurement Model- Confirmatory Factor Analysis output

[4] Table 3: Pearson's Correlation matrix: all indicator variables output

[5] Table 4: Structural Equation Modelling output

[6] Table 5: R-squared for SEM model

[7] Table 6: Fit indices

Table 1 CES_D exploratory factor analysis: subscales, reliabilities and factor loadings (rotated)

	Cronbach alpha	Factor loadings	Mean (SD) Range
Subscale Factor 1: negative affect	0.91		7.1 (7.5) 0-31
Felt depressed		0.51	0.8 (1.0)
Felt everything an effort		0.50	0.7 (0.9)
Life has been a failure		0.63	0.9 (1.0)
Felt fearful		0.60	0.5 (0.9)
Talk less than usual		0.50	0.9 (0.9)
Felt lonely		0.86	0.7 (1.0)
People unfriendly		0.75	0.4 (0.7)
Crying spells		0.73	0.5 (0.9)
Felt sad		0.82	0.9 (1.0)
Felt people disliked me		0.76	0.5 (0.8)
Couldn't get going		0.67	0.7(0.9)
Subscale Factor 2: psychophysiological	0.82		3.9 (3.7) 0-15
Bothered by things that don't usually bother me		0.75	0.6 (0.9)
Appetite poor		0.83	0.6 (0.9)
Couldn't shake off the blues even with help from my family		0.73	0.6 (0.9)
Trouble keeping my mind on what I was doing		0.72	0.8 (1.0)
My sleep was restless		0.48	1.2 (1.1)
Subscale Factor 3: positive affect	0.78		6.5 (3.7) 0-12
I felt I was as good as others		0.78	1.7 (1.2)
Felt hopeful about the future		0.79	1.8 (1.2)
I was happy		0.76	1.7 (1.1)
I enjoyed life		0.76	1.6 (1.2)

Figure 1: Scree plot: parallel factor analysis of the data to show 3 definitive factors

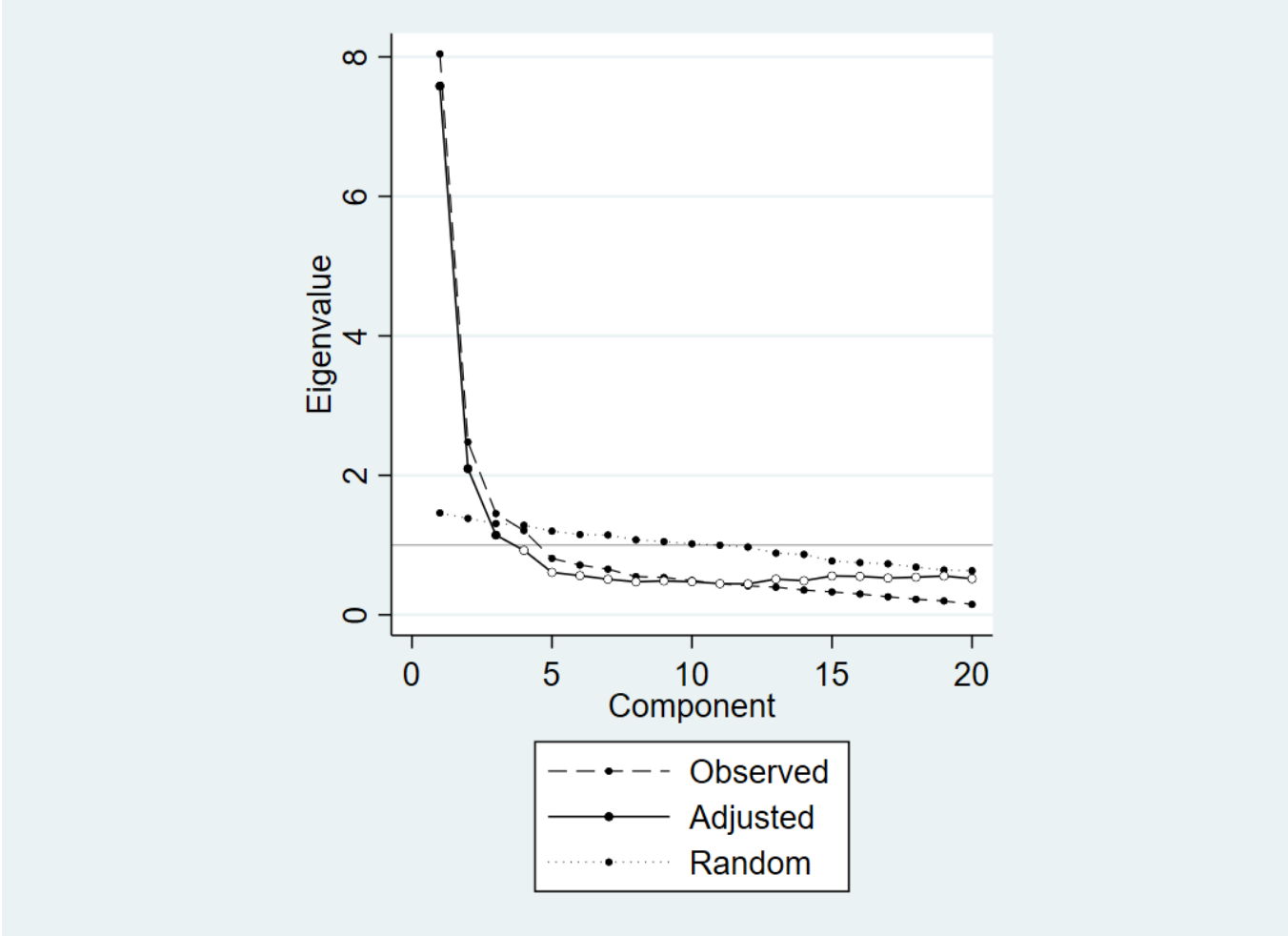


Table 2: Measurement Model- Confirmatory Factor Analysis output

Measurement	**Standardized**
Depression -> Negative Affect (Factor 1)	.78***
Depression -> Psychophysiological Affect (Factor 2)	.91***
Depression -> Positive Affect (Factor 3)	.16*
Drug use -> Ever taken (illegal) drugs	.30***
Drug use -> Injecting drugs	.82***
Drug use -> Rehab	.60***
Dental anxiety -> MDAS1	.93***
Dental anxiety -> MDAS2	.96***
Dental anxiety -> MDAS3	.84***
Dental anxiety -> MDAS4	.81***
Dental anxiety -> MDAS5	.75***
$D_{3cv}MT$ -> Decayed and Missing Upper Right Quadrant	.95***
$D_{3cv}MT$ -> Decayed and Missing Lower Right Quadrant	.78***
$D_{3cv}MT$ -> Decayed and Missing Upper Left Quadrant	.93***
$D_{3cv}MT$ -> Decayed and Missing Lower Left Quadrant	.81***
Variances	**Standardized**
error. Negative Affect (Factor 1)	.39
error. Psychophysiological Affect (Factor 2)	.17
error. Positive Affect (Factor 3)	.97
error. Ever taken (illegal) drugs	.91
error. Injecting drugs	.33
error. Rehab	.64
error. MDAS1	.13
error. MDAS2	.09
error. MDAS3	.30
error. MDAS4	.44
error. MDAS5	.10
error. Decayed and Missing Upper Right Quadrant	.10
error. Decayed and Missing Lower Right Quadrant	.39
error. Decayed and Missing Upper Left Quadrant	.17
error. Decayed and Missing Lower Left Quadrant	.97
Drug use	1
Dental anxiety	1
Decayed and missing teeth	1
Depression	1
Covariance	**Standardized**
error. MDAS3 *with* error. MDAS5	.51***
error. Decayed and Missing Lower Right Quadrant *with*	.62***
Drugs *with* Anxiety	.09
Drugs *with* Decay	.46***
Drugs *with* Depression	.20**
Anxiety *with* Decay	.15*
**Anxiety *with* Depression	.21**
Decay *with* Depression	.08

***p<0.001; **p<0.01; *p<0.05

Table 3: Pearson's Correlation matrix: all indicator variables output

	d~1_sc~e	d~2_sc~e	depres..	ever_d~1	inject~1	rehab_y1	mdas1
depr~1_score	1.0000 298						
depr~2_score	0.7098* 298	1.0000 298					
depr~3_score	0.1589* 298	0.1341* 298	1.0000 298				
ever_drugs~1	0.0378 290	0.1614* 290	-0.0862 290	1.0000 290			
injecting_~1	0.1192* 279	0.1389* 279	-0.0300 279	0.2448* 274	1.0000 279		
rehab_y1	0.0066 298	0.1112 298	-0.0692 298	0.2526* 290	0.4884* 279	1.0000 298	
mdas1	0.1349* 297	0.1620* 297	0.0685 297	0.0482 289	0.0543 278	0.0798 297	1.0000 297
mdas2	0.1595* 292	0.1927* 292	0.0752 292	0.0636 284	0.0511 273	0.0771 292	0.8972* 291
mdas3	0.1032 291	0.1479* 291	0.0554 291	0.0104 284	0.0411 273	0.0268 291	0.7740* 291
mdas4	0.1560* 296	0.1726* 296	0.0786 296	-0.0083 288	0.0028 277	0.0471 296	0.7513* 296
mdas5	0.0966 293	0.1259* 293	0.0101 293	0.0283 286	0.0268 275	0.0993 293	0.6910* 292
dm_urq	0.0233 298	0.0977 298	0.0602 298	0.0125 290	0.3666* 279	0.2654* 298	0.1634* 297
dm_ulq	0.0061 298	0.0484 298	0.0283 298	-0.0242 290	0.3715* 279	0.2627* 298	0.1315* 297
dm_llq	0.0025 298	0.0764 298	-0.0167 298	0.0123 290	0.3500* 279	0.2581* 298	0.0457 297
dm_lrq	0.0155 298	0.1035 298	0.0148 298	0.0204 290	0.3639* 279	0.2159* 298	0.1127 297

	mdas2	mdas3	mdas4	mdas5	dm_urq	dm_ulq	dm_llq
mdas2	1.0000 292						
mdas3	0.8025* 287	1.0000 291					
mdas4	0.7716* 291	0.7088* 291	1.0000 296				
mdas5	0.7271* 289	0.8128* 287	0.6520* 292	1.0000 293			
dm_urq	0.1505* 292	0.1246* 291	0.1230* 296	0.1030 293	1.0000 298		
dm_ulq	0.1071 292	0.1159* 291	0.1221* 296	0.0941 293	0.8824* 298	1.0000 298	
dm_llq	0.0429 292	0.0158 291	0.0641 296	0.0324 293	0.7726* 298	0.7483* 298	1.0000 298
dm_lrq	0.1241* 292	0.1029 291	0.1108 296	0.0883 293	0.7317* 298	0.7384* 298	0.8612* 298

	dm_lrq
dm_lrq	1.0000 298

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Table 4 Structural Equation Modelling output:

Structural	**Standardized**
Depression -> Drug use	.20**
Depression -> Dental anxiety	.20**
Drug use -> Decayed and missing teeth score	.45***
Dental anxiety -> Decayed and missing teeth	.11*
Depression score -> Decayed and missing teeth (total	.11**
Measurement	**Standardized**
Depression -> negative affect (Factor 1)	.72***
Depression -> psychophysiological (Factor 2)	.98***
Drug use -> Ever taken (illegal) drugs	.31***
Drug use -> Injecting drugs	.81***
Drug use -> Rehab	.60***
Dental anxiety -> MDAS1	.93***
Dental anxiety -> MDAS2	.96***
Dental anxiety -> MDAS3	.84***
Dental anxiety -> MDAS4	.81***
Dental anxiety -> MDAS5	.75***
D_{3cv}MT -> Decayed and Missing Upper Right Quadrant	.95***
D_{3cv}MT -> Decayed and Missing Lower Right Quadrant	.78***
D_{3cv}MT -> Decayed and Missing Upper Left Quadrant	.93***
D_{3cv}MT -> Decayed and Missing Lower Left Quadrant	.81***
Variances	**Standardized**
error. Negative Affect (Factor 1)	.48
error. Psycho-physiological Affect (Factor 2)	.03
error. Ever taken (illegal) drugs	.91
error. Injecting drugs	.34
error. Rehab	.64
error. MDAS1	.13
error. MDAS2	.09
error. MDAS3	.30
error. MDAS4	.35
error. MDAS5	.44
error. Decayed and Missing Upper Right Quadrant	.10
error. Decayed and Missing Lower Right Quadrant	.3
error. Decayed and Missing Upper Left Quadrant	.13
error. Decayed and Missing Lower Left Quadrant	.34
error. Drug use	.96
error. Dental anxiety	.96
error. Decayed and missing teeth	.79
Depression	1
Covariance	**Standardized**
error. MDAS3 *with* error. MDAS5	.51***
error. Decayed and Missing Lower Right Quadrant *with*	.62***

***p<0.001; **p<0.01; *p<0.05

Table 5 R-squared for SEM model

Observed Variables	**R-squared**
Negative affect (Factor 1)	.52
Psychophysiological (Factor 2)	.97
Ever taken (illegal) drugs	.09
Injecting drugs	.66
Rehab	.36
MDAS1	.87
MDAS2	.91
MDAS3	.70
MDAS4	.65
MDAS5	.56
Decayed and Missing Upper Right Quadrant	.90
Decayed and Missing Lower Right Quadrant	.61
Decayed and Missing Upper Left Quadrant	.87
Decayed and Missing Lower Left Quadrant	.66
Latent Variables	
Drug use	.04
Dental anxiety	.04
Decayed and missing teeth	.22
Overall	.97

Table 6: Fit Indices

	Method	**Chi2_ms**	**RMSEA**	**CFI**	**TLI**
Full SEM model (Figure 3)	MLMV	Chi2_ms(71)= 89.8; p = 0.07	0.03	0.994	0.992
CFA model (Figure 2)	MLMV	Chi2_ms(82) = 102.3; p= 0.07	0.03	0.993	0.992
Depression (CES-D)	MLMV	Chi2_ms(.) = .; p= .	.	1	.
Drug use	MLMV	Chi2_ms(0) = 0; p= .	0	1	1
Dental Anxiety (MDAS)	MLMV	Chi2_ms(4) = 7.5; p= 0.11	0.05	0.997	0.994