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Are oral health-related self-efficacy, knowledge and fatalism indicators for non-toothbrush ownership in a homeless population?

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Aim: To determine if the social cognitive theory (SCT)-constructs of oral health-related efficacy, knowledge and fatalism were indicators of non-toothbrush ownership in a metropolitan-based homeless population in Australia. ***Methods:*** Self-report data were collected from a convenience sample of 248 homeless participants located in Adelaide, Australia. Log binomial regression was used to estimate the strength of the association of the SCT constructs efficacy, knowledge and fatalism with the frequency of non-ownership of a toothbrush before and after adjusting for selected characteristics and associated factors. ***Results:*** Of the study population (aged 17–78 years, 79% male) just over one-fifth (21%) did not own a toothbrush. In an unadjusted model, low self-efficacy (PR=1.18) and low knowledge (1.27) were indicators for non-toothbrush ownership. These relationships were attenuated by 5.2% and 3.2% respectively after adjusting for social determinants, health factors, substance use and dental service utilisation-related factors, but remained statistically significant in the final model. ***Conclusions:*** Poor oral health-related self-efficacy and knowledge were both indicators for non-ownership of a toothbrush among a homeless population. This relationship held even after adjustment for relevant social and behavioural factors. Fatalism was not an indicator for non-toothbrush ownership in this population.

Key words: *self-efficacy, toothbrushing, homeless, knowledge, fatalism, oral health, Australia*

Background

Social Cognitive Theory (SCT) is a comprehensive approach to understanding human behaviour, motivation, affect and thought processes (Bandura, 1988). It is widely used in health behaviour research, with key constructs including self-efficacy, fatalism, knowledge, beliefs and observational learning (Bandura, 2004). SCT posits that self-efficacy, defined as one's perceived capacity for success in organising and implementing a new pattern of behaviour based on experience with similar actions or circumstances, is a critical determinant of behaviour (Bandura, 1988; 2004). In the oral health context, the dominant paradigm for health promotion in the 1970s and '80s focused on attempts to improve oral health by improving knowledge and, in turn, individual oral-health behaviours (Cardinal *et al.*, 2009). Contemporary health promotion efforts have shifted away from this paradigm, recognising that education is a necessary but insufficient component of any oral health behaviour change intervention (Chung *et al.*, 2004). The literature suggests that broader psychosocial factors can influence engaging with, and maintenance of, health-promoting factors, and that SCT has a key role to play in this (Cardinal *et al.*, 2009).

Risk indicators that adversely affect adults' ability to engage in preventive health practices include poverty, chronic stress and depression (Chung *et al.,* 2004; McLennan *et al.,* 2001; Ruiz 1990). Homeless people are an unusual population who exhibit many of these risk indicators, often due to substance abuse or other addictions (Kelly and Caputo, 2007). Homelessness can be classified as: Primary, lacking conventional accommodation such as rough sleepers or squatters; Secondary, frequently moving between temporary accommodations and emergency shelters; or Tertiary having insecure tenure and may be staying long term in boarding houses without private bathroom or kitchen facilities (Chamberlain and MacKenzie, 2009). In 2011, almost 105,000 Australians were considered homeless. South Australia recorded 8,000 homeless people, with just under 40% aged 12–24 years (ABS, 2011). In the city of Adelaide, over 760 people were reported homeless: 17% staying in boarding houses, 26% in financially supported accommodation, 46% with friends or relatives and 11% in improvised dwellings or 'sleeping rough' (Chamberlain and MacKenzie, 2009). Although difficulties with access to services among socially disadvantaged groups are recognised, the homeless populations are especially disadvantaged in this respect.

Oral health is recognised as being poor among homeless populations throughout the world (Okunseri *et al.,* 2010). For example, a 1984 survey of two adult shelters in the United States found that virtually all homeless persons lacked dental care, with several experiencing acute pain requiring immediate attention (Allukian, 1995). Diseases of the oral cavity may lead to pain, tooth loss, difficulties with eating, problems with speech, infections that spread to other areas of the body and lowered self-esteem due to poor aesthetics (Daly *et al.,* 2010). In Australia's National Oral Health Plan, the oral health of homeless people, under the banner of socially disadvantaged groups in general, is considered one of seven national priorities (OHMG, 2014). The health, including oral health, of homeless groups has also been recognised at a national level as requiring urgent attention.

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In the context of oral health in the homeless population, toothbrush ownership is specific to social cognitive theory (SCT), and is thus an appropriate outcome measure that might be changed by a suitable SCT-based oral health promotion intervention. The aim of this study was to determine if the SCT-constructs of oral health-related efficacy, knowledge and fatalism were indicators of non-ownership of a toothbrush in a metropolitan-based homeless population in Australia.

Methods

This was a cross-sectional study of a convenience sample of people utilising services for homeless adults in the Adelaide inner metropolitan area. Participants were recruited from three drop-in centres and two accommodation facilities assisting homeless individuals with accommodation, support services and meal provision. Participants completed a questionnaire which was either self-administered or completed via administered interview. Interview sessions were advertised at each centre through the use of flyers, posters and attending staff. Each centre was allocated two or three supervised questionnaire sessions over a three week period in 2009.

Participants needed to be aged 17+ years, residing in an accommodation facility or attending a 'drop in centre' for homeless people, and able to understand and communicate coherently to consent to participate (i.e. not psychotic, under the influence of alcohol/narcotics, or taking medication which made them mumble or difficult to understand).

Ethics approval was received from Human Research Ethics Committee of the University of Adelaide (H-009-2009) and the Aboriginal Health Council of South Australia. Each participant received a $20 supermarket voucher, oral self-care items and a dental information pamphlet as reimbursement for their time in taking part in the study.

The questionnaire was designed specifically for this at-risk group and was developed in consultation with experts in the field of disadvantage and oral health. For purposes of this analysis, the outcome variable was non-ownership of a toothbrush. The question asked was 'Do you have a toothbrush?' with response options of 'Yes' or 'No'.

The SCT explanatory variables included three previously-validated scales representing oral health-related self-efficacy, knowledge and fatalism constructs (Finlayson *et al.,* 2005). The self-efficacy scale comprises six items for the stem question 'How confident do you feel about your ability to brush teeth at night when you are' and items 'under a lot of stress', 'depressed', 'anxious', 'feeling like you do not have the time', 'tired' or 'worried about other things in your life'. Responses were a five-point scale dichotomised into low ('not at all confident' and 'hardly ever confident) and high self-efficacy ('occasionally confident', 'fairly confident' or 'very confident').

Similarly, the six item oral-health related knowledge scale had the stem 'How important do you rate the following in relation to prevention of tooth decay and gum disease?', with items 'avoiding a lot of sweet foods', 'using fluoride toothpaste', 'visiting the dentist regularly', 'keeping teeth and gums clean', 'drinking fluoridated water' and 'using dental floss and other cleaning aids'. Responses on a five-point scale were split into low (responses 'not at all important', 'not very important' and 'doesn't matter much') and high knowledge ('fairly important' or 'extremely important').

The two item oral health-related fatalism scale asked 'how much do you agree' with the statements 'most people usually develop problems with their teeth' and 'most people will eventually need to have their teeth pulled out'. Responses on a five-point scale were dichotomised into low fatalism (responses of 'strongly disagree', 'moderately disagree' or 'neither agree nor disagree') and high fatalism ('moderately agree' and 'strongly agree').

Reliability of the instruments was assessed for internal consistency using Cronbach α for the self-efficacy and knowledge scales, while Spearman-Brown coefficients were used for fatalism.

Confounding variables included demographics (age, gender, indigenous status), socio-economic factors (current residence, education, income), general health status (mental illness, diabetes, co-morbidities), substance use (tobacco, non-prescription drugs, alcohol), dental visiting behaviour (when last saw dentist) and dental fear. Age was dichotomised into '17 to 40 years' and '40+ years'. Current residence was dichotomised into 'None or emergency accommodation' and 'Supported residence facility or other'. Education was dichotomised into 'Primary or high school' and 'Trade, TAFE or University'. Income was dichotomised into 'waged or 'state supported'. Mental illness was categorised into 'Yes' or 'No' in response to the question 'Have you ever been told by a doctor that you have a mental illness?' The question 'Have you ever been told by a doctor that you have diabetes?' offered responses 'Yes' or 'No'. Co-morbidities was categorised into 'Yes' when two or more health issues were reported, otherwise 'No'. The following question was asked regarding tobacco use: 'Which of the following best describes your tobacco smoking status' with responses dichotomised into 'Currently or used to smoke tobacco' or 'Have never smoked tobacco'. Responses to the question 'Which of the following best describes your non-prescription drug use?' were dichotomised into 'Currently or used to" and 'Have never used non-prescription drugs'. Dental visiting was assessed by asking 'When did you last see a dentist' with responses dichotomised into 'Less than one year ago' or 'One or more years ago'. Dental fear was assessed by the question 'Would you feel scared about going to the dentist', with response options 'Yes' and 'No'.

Descriptive statistics for sample characteristics and frequency of non-ownership of a toothbrush were calculated. Chi-square tests compared groups. Log binomial regression estimated the strength of the association of the SCT constructs efficacy, knowledge and fatalism with the frequency of non-ownership of a toothbrush before and after adjusting for selected characteristics and risk factors. To meet the eligibility criteria for inclusion in multivariable analyses, these characteristics and factors needed to be significant at a $P<0.05$ level in bivariate analysis. Specifically, six sets of analyses were performed: Model 1, prevalence ratios (PR) adjusted for age, gender and indigenous status; Model 2, PRs adjusted for age, gender, indigenous status and social determinants (current residence, qualification, income); Model 3, PRs adjusted for age, gender, indigenous status and health factors (mental health, diabetes, co-morbidities); Model 4, PRs adjusted for age, gender, indigenous status and substance use (tobacco use, non-tobacco use, non-prescription drug use, alcohol use); Model 5, PRs adjusted for age, gender, indigenous status and dental service utilisation (dental fear); and Model 6, PRs adjusted for all factors.

The degree of attenuation was calculated as:

$$1 - (\ln(PR_{adjusted}) / \ln(PR_{unadjusted}))$$

after Brotman (2006). Calculating attenuation is helpful for determining any reduction in the strength of association observed in the first model upon addition of more variables. The data were analysed using SPSS v.20.

Results

Completed questionnaires were received from 248 participants. Cronbach's alphas of 0.95 (self-efficacy), 0.85 (knowledge) and Spearman's-Brown coefficient 0.69 (fatalism) were calculated for the three SCT scales respectively, indicating good internal consistency and reliability. Just over one-fifth of participants did not own a toothbrush (Table 1).The prevalence of respondents reporting high self-efficacy was around 68% and 94% reported high knowledge. Almost four-fifths of participants reported high fatalism. Nearly 80% of participants were male and the highest education attainment for around three-quarters was primary or high school. Non-ownership of a toothbrush was significantly associated with low self-efficacy, low knowledge, being indigenous and having primary or high school as the highest educational attainment.

Table 1. Socio-demographic variables with toothbrush non-ownership

	Participants		*Not owning a toothbrush*	
	n	*(%)*	n	*(%)*
Overall	248	(100)	52	(21.0)
Self-efficacy				
High	169	(68.1)	24	(14.2)*
Low	79	(31.9)	28	(35.4)
Knowledge				
High	233	(94.0)	44	(18.9)*
Low	15	(6.0)	8	(53.3)
Fatalism				
High	196	(79.0)	37	(18.9)
Low	52	(21.0)	15	(28.8)
Age				
17 to 40 years	126	(50.8)	30	(23.8)
41 or more years	122	(49.2)	22	(18.0)
Gender				
Male	196	(79.0)	41	(20.9)
Female	52	(21.0)	11	(21.2)
Indigenous				
Yes	69	(27.8)	21	(30.4)*
No	179	(72.2)	31	(17.3)
Current residence				
None or emergency accommodation	93	(37.5)	36	(39.6)*
Supported residence facility or other	155	(62.5)	16	(10.3)
Highest qualification				
Primary or high school	185	(74.6)	43	(23.5)*
Trade, TAFE or university	63	(25.4)	8	(12.7)
Income				
Waged	12	(4.8)	1	(8.3)
State supported	236	(95.2)	51	(21.6)

*$P<0.05$

Just over three-quarters of participants reported no co-morbidities (Table 2) and almost 90% smoked tobacco. Around 92% consumed alcohol. Factors significantly associated with non-toothbrush ownership were tobacco usage and dental fear, while factors significantly associated with low self-efficacy included mental illness, diabetes, co-morbidity, non-prescription drug use and dental fear. Factors significantly associated with low knowledge included alcohol use and no dental fear, while factors significantly associated with high fatalism included tobacco use, non-prescription drug use, alcohol consumption and dental fear.

Table 3 presents estimates from multivariate models examining indicators for non-toothbrush ownership. After adjusting for age, gender and indigenous status, low self-efficacy and low knowledge were significantly associated with non-ownership of a toothbrush (Model 1) and this persisted without attenuation after further adjustment for social determinants (Model 2). Attenuation of 3.3% low knowledge resulted from subsequent adjustment for health factors (Model 3). Both associations held without attenuation after adjusting for substance use (Model 4). After adjustment for dental service utilisation (Model 5) the associations remained though with the prevalence ratio for low self-efficacy being attenuated by 5.1%. In the final model (Model 6), which adjusted for all covariates, low self-efficacy and low knowledge remained significantly associated with non-ownership of a toothbrush with prevalence ratios attenuated by 5.2% and 3.3% respectively. Fatalism was not associated with non-toothbrush ownership in any of the models.

Discussion

In our study, poor oral health-related self-efficacy and knowledge were both indicators for non-ownership of a toothbrush among a homeless population in Adelaide, Australia. This relationship held even after adjustment for different social and behavioural factors. Fatalism was not an indicator for non-toothbrush ownership in this population. The findings suggest that social cognitive theory-related variables, particularly self-efficacy and knowledge, do have a role to play in important oral health behaviours such as toothbrush ownership among vulnerable populations. The findings are encouraging in that self-efficacy and knowledge are both constructs amenable to change if interventions are implemented in safe and appropriate environments.

Throughout the world, oral health among the homeless is recognised as playing an important role in general health and well-being, and of being difficult to improve due to access issues with dental services (DiMarco *et al.,* 2010). Although oral health is noted as being poor among homeless groups, the evidence in Australia is scarce. Minimal data on homeless adults have been collected from national oral health surveys with no information presented on the perceptions homeless people have of oral health and access to dental services, and no examination of the role of social cognitive theory in relation to oral health-related self-efficacy, knowledge and fatalism; domains that may be of critical importance in the development of relevant and respectful oral health promotion initiatives among this group. Our findings go some way to adding to the knowledge base of SCT-based factors associated with poor oral health among the homeless in an urban setting in Australia.

Table 2. General health, substance use and dental behaviours with toothbrush non-ownership and social cognitive theory factors

	Participants n (%)	*No. not owning toothbrush (%)*	*Self-efficacy 'low'* n (%)	*Knowledge 'low'* n (%)	*Fatalism 'high'* n (%)
Overall	248 (100.0)	52 (21.0)	79 (31.9)	15 (6.0)	196 (79.0)
Mental illness					
Yes	100 (40.3)	22 (22.0)	40 (40.0)*	7 (7.0)	228 (80.0)
No	148 (59.7)	30 (20.3)	39 (26.4)	8 (5.4)	216 (78.4)
Diabetes					
Yes	20 (8.1)	4 (20.0)	11 (55.0)*	2 (10.0)	201 (79.4)
No	228 (91.9)	48 (21.1)	68 (29.8)	13 (5.7)	243 (75.0)
Co-morbidities					
Yes	57 (23.0)	10 (17.5)	28 (49.1)*	3 (5.3)	210 (80.1)
No	191 (77.0)	42 (22.0)	51 (26.7)	12 (6.3)	234 (75.4)
Tobacco use					
Yes	220 (88.7)	49 (22.3)*	70 (31.8)	14 (6.4)	244 (85.7)*
No	28 (11.3)	3 (10.7)	9 (32.1)	1 (3.6)	200 (78.2)
Non-prescription drugs					
Yes	155 (62.5)	35 (22.6)	54 (34.8)*	11 (7.1)	234 (84.9)*
No	93 (37.5)	17 (18.3)	25 (26.9)	4 (4.3)	210 (75.5)
Alcohol					
Yes	227 (91.5)	48 (21.1)	73 (32.2)	3 (14.3)*	204 (80.6)*
No	21 (8.5)	4 (19.0)	6 (28.6)	12 (5.3)	240 (61.9)
Dentist last seen					
Less than a year ago	66 (26.6)	13 (19.7)	24 (36.4)	14 (7.7)	209 (78.6)
One or more years ago	182 (73.4)	39 (21.4)	55 (30.2)	1 (1.5)	235 (80.3)
Dental fear					
Yes	107 (43.1)	27 (25.2)*	43 (40.2)*	10 (9.3)*	234 (86.9)*
No	141 (56.9)	25 (17.7)	36 (25.5)	5 (3.5)	210 (73.0)

*P<0.05

Table 3. Six models of indicators for non-ownership of a toothbrush

	Low self-efficacy PR (95%CI)	*Low knowledge PR (95%CI)*	*High fatalism PR (95%CI)*	*Variables included*
Model 1	1.18 (1.11-1.43)	1.27 (1.11-1.67)	1.04 (1.00-1.25)	Age, gender, indigenous status
Model 2	1.18 (1.11-1.43)	1.27 (1.11-1.67)	1.04 (1.00-1.25)	Model 1 with the addition of social determinants [a]
Model 3	1.18 (1.11-1.43)	1.25 (1.11-1.67)	1.04 (1.00-1.25)	Model 1 with the addition of health factors [b]
Model 4	1.18 (1.11-1.43)	1.27 (1.11-1.67)	1.03 (1.00-1.25)	Model 1 with the addition of substance use [c]
Model 5	1.16 (1.11-1.43)	1.25 (1.11-1.43)	1.05 (1.00-1.25)	Model 1 with the addition of dental service utilization [d]
Model 6	1.15 (1.11-1.25)	1.23 (1.11-1.43)	1.03 (1.00-1.25)	All models

CI Confidence Interval; [a] Social determinants were current residence, qualification, income; [b] Health factors were mental health, diabetes, co-morbidities; [c] Substance use were tobacco, non-tobacco, non-prescription drugs, alcohol; [d] Dental service utilisation was dental fear

Of course, self-efficacy in a homeless context is not only relevant to toothbrush ownership. Sumerlin (1996) deduced from unsheltered homeless men that efficacy and 'trust in self' were critical components of survival. Among the homeless with substance use disorders, self-efficacy was found to be critical for integration into natural community supports, which in turn enhanced the likelihood of this population obtaining and maintaining abstinence, gainful employment and permanent housing (Fisk *et al.,* 2007). Vandemark (2007) explains the relevance of displacement in eroding a sense of self-identity and belonging, and that displacement is an important component of homelessness as it influences social and functional abilities that are crucial for re-entry into homes and society. In the homeless context, the role of place is fundamental in determining identity and self-efficacy.

Knowledge in a broader sense is also recognised as an attribute among homeless populations that enables greater 'street smarts' and hence survival. However, knowledge uptake may be impaired by mental health and/or addiction issues. In their review of health interventions for the homeless, Hwang and Burns (2014) concluded that the central elements of interventions that are most effective include the provision of housing and an emphasis on client choice in treatment decisions, both of which increase the person's level of knowledge and, in turn, autonomy. Saperstein and colleagues (2014) reported that comprehensive intervention for homeless groups with a strong focus on knowledge attainment has the potential to facilitate skill acquisition required for academic, vocational and independent living success in adulthood.

It is perhaps unsurprising that fatalism was not an indicator for non-ownership of a toothbrush in our study, given that potential role models for study participants are likely to be people who "usually develop problems with their teeth."

There is evidence of SCT being used in other areas of dental research. For example, in a prospective cohort study, Woelber and colleagues (2015), reported that oral hygiene-related self-efficacy was positively associated with optimal oral hygiene behaviour. In a study involved diabetic patients, Syrjälä and colleagues (1999), reported that dental self-efficacy was associated with both oral heath behaviour/oral hygiene and HbA1c levels. Stewart and colleagues (1997) developed an oral hygiene self-efficacy instrument, which included items pertaining to self-efficacy but not to knowledge or fatalism. Some previous work used a broad definition of SCT as it pertains to oral health, while others have used more specific indicators such as toothbrushing.

There was limited attenuation observed when additional variables were added to the first model in multivariable analysis indicating that the relationship between self-efficacy and knowledge with non-toothbrush ownership was not largely influenced by other variables that were also significantly associated with non-toothbrush ownership in bivariate analysis.

There are notable study limitations. The convenience nature of the study design means the findings are not generalizable to the wider homeless population within Adelaide, or indeed elsewhere. All responses were self-report, with some response bias likely for certain outcomes of interest. The cross-sectional nature of data collection means causality cannot be ascertained; our findings are associations only. It was also not possible to calculate Cohen's kappa for inter-rater agreement because there was no repeat administration of questionnaires. Shortcomings aside, the findings reveal important information for health service providers to the homeless with respect to factors that influence toothbrush ownership. That the social cognitive theory-related constructs of self-efficacy and knowledge were positively associated with toothbrush ownership speaks to both the utility and potential success of interventions that aim to focus on these factors in a bid to improve one of the most critical oral health behaviours. We acknowledge that toothbrush ownership would need to be backed up by regular brushing behaviour with fluoride toothpaste to be effective. But ownership of a toothbrush is the first link in that chain. It would be helpful if future studies used clinical oral health parameters to provide objective measures of oral health to avoid issues inherent with self-report data (social desirability bias, for example).

In conclusion, oral health is recognised as an important component of health and wellbeing among homeless populations, with toothbrush ownership being a critical factor in this respect. Often, oral health care providers working with the homeless tend to identify individual vulnerabilities such as mental illness or substance misuse. However, it is important to recognise that homelessness is equally the result of structural factors within a society, such as systematic inequities in educational and employment opportunities, a shortage of affordable housing, and social policies that are targeted against marginalised populations. As well as appreciating the role that social cognitive theory-based constructs might play in oral health behaviours, oral health care providers and policy makers also need to be cognisant that effective strategies to reduce homelessness need to embrace both interventions to improve the health of homeless individuals together with larger-scale policy changes and interventions directed at structural factors.

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