Translation and validation of the Revised Dental Beliefs Questionnaire (DBS-R) in China

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Abstract

Background Patient perceptions of behaviours and attitudes of dentists are associated with dental fear and poor dental attendance in Western countries. However, there is a paucity of research exploring patients' perceptions of the dentist in China. One reason for this may be the lack of a valid and reliable scale in Chinese (Standard Mandarin) to measure this. This study aimed to translate the Revised Dental Beliefs Survey (DBS-R) into Chinese and then explore the reliability and validity of this measure (both the short and longer versions) in a Chinese population. **Methods:** We translated the DBS-R using the forwards-backwards method and pilot tested it on a small sample of adults in China. Following this, 480 Chinese adults completed the newly translated scale, as well as a standardised dental anxiety questionnaire (the Modified Dental Anxiety Scale Chinese version) to test convergent validity. 109 participants completed the DBS-R again 2 weeks later for test-retest reliability. **Results:** Both versions of the Chinese DBS-R were internally consistent, demonstrated convergent validity and test-retest reliability was good. **Conclusion** Although both versions of the scale performed similarly, it is suggested the 28-item version may be the scale of choice as this version has items relating to the technical competence of the dentist which appear important to Chinese adults. Future research in China should test this measure in the clinical context.

Introduction

Negative perceptions of dentist behaviors and adverse attitudes towards dentists are associated with dental fear¹⁻⁴ and poor dental attendance in Western countries^{5,6}. However, cultural factors can play an important role in shaping and influencing the attitudes, beliefs, values and behaviours of dental patients. As such, there is a paucity of research exploring patients' perceptions and attitudes concerning the dentist in China. According to the latest national oral health epidemiological study⁷ dental caries and periodontal disease are still highly prevalent in China. In addition, regular dental attendance is low and is still primarily symptom-driven. However, China is experiencing rapid economic development and its dental health services are expanding. In 2016 the Central Committee of the Communist Party released the Healthy China 2030 blueprint which highlighted oral health as a priority within the all-round development of a healthy China in the next fifteen years⁸. Within this, there is a commitment to investing in public oral health and moving from a treatment-focused to prevention-centered practices⁹. Yet there is still limited data available on the factors responsible for uptake, of which negative perceptions of the dentist may be a possible explanatory variable. Lack of a valid and reliable scale in Chinese to measure perceptions and attitudes of the dentist may be one reason for the limited research in this area. Translation of an existing instrument (rather than developing a new one) would allow for assessment of dental attitudes and beliefs in a Chinese population and would also be useful for cross-cultural comparative studies for identification of any cultural differences.

The Dental Beliefs Survey (DBS¹⁰) and the more recent Revised Dental Beliefs Survey (DBS-R¹¹) were designed to assess the patient's perceptions and views of the dentist. The 28 item DBS-R was developed

in English and is divided into three subscales. Professionalism/Ethics relates to the technical competency and integrity of the dentist (e.g., 'I am concerned that dentists recommend work that is not really needed'). The Communication sub-scale encompasses items on the ease of dentist-patient communication and the attitude of the dentist (e.g., 'I'm concerned that dentists will embarrass me over the condition of my teeth'). Lastly, the Lack of Control sub-scale relates to how much in control the patient feels in the dental clinic e.g., 'Once I am in the chair, I feel helpless (that things are out of my control)'. Thus, it endeavors to assess the three dimensions of the interpersonal relationship from the perspective of the patient. It has been translated into several different languages including Spanish⁴, Swedish² and Turkish³.

Since the revised version was published, there have been studies which have explored its psychometric properties. These have included evaluating the factor structure of the revised DBS, predominantly in dentally fearful individuals and dental patients but also in student populations. Kvale et al.¹², in a study with fearful dental patients in the USA, found a modified factor solution of the DBS-R that encompassed Trust as a fourth factor. The Trust factor mostly comprised a subset of items from the Control subscale. The authors left out four of the items found not to contribute to the final model, thus the final four factor scale included 24 out of the 28 original DBS-R items. They conclude that this version is an improvement on the original 28 item version and suggest that this should be the instrument of choice when assessing the professional relationship in the eyes of the patient.

Further studies have evaluated both the original and shorter DBS-R, with both measures indicating good validity and reliability across both clinical and non-clinical populations^{1,2}. It has been suggested that the shorter version, with the Trust sub-scale, may be of most use when researchers or clinicians have a specific theoretical interest in evaluating trust of the dental patient in their dentist¹.

In summary, cultural factors can play an important role in shaping and influencing the attitudes, beliefs and values of dental patients. To our knowledge there is no scale that exists in Chinese to measure these views. Previous studies on the DBS-R have been limited to specific groups of dental patients and students. Data on a non-clinical adult sample (not limited to students) may further establish the psychometric properties outside of the dental clinic, in a context that may differ from previously reported data on predominantly European and American populations.

Thus the aims of our study are to (1) translate the DBS-R into standard Mandarin and (2) explore the reliability and validity of this newly-translated measure in a Chinese sample. This will be carried out in two phases; generating a semantically equivalent translation followed by the assessment of the psychometric properties of the translated measure (both the shorter and longer versions). This was part of a larger study translating and validating several dental-related questionnaires into Standard Mandarin including the short form of the Fear of Dental Pain Questionnaire¹³.

Methods

Forward-Backwards Translation of the Revised Dental Beliefs Survey (DBS-R)

A preliminary translated version of the Revised Dental Beliefs Survey (DBS-R) was obtained by following the forward-backward translation method. The first step was to translate the DBS-R (including the instructions and response format) by the first author whose native language is Standard Mandarin (and is also fluent in English) and who has in-depth experience of Chinese culture. To ensure the equivalence between the original and the translated forms, the back-translation method was used. Therefore, another bilingual individual (independent of the study), whose native language was Standard Mandarin, conducted a reverse translation. Both translators worked independently and the translator responsible for the back translation of the questionnaire did not have access to its original version. Once these translations were complete, a comparison between the original English version and the back-translated version was made by a panel comprising the original translator and two experts. Both experts were familiar with the DBS-R. After discussion, some minor modifications were made at this stage. The preliminary Chinese version of the DBS-R was then submitted for pilot-testing on a small convenience sample of Chinese individuals ($n = 35$) living in Tianjin, North China. The inclusion/exclusion criteria were that participants should be aged 18 or above, have basic literacy and reading ability and no diagnosed major psychological disorder. The participants (see Table 1) were asked to complete the scale (following the translated instructions) and express their opinion on how easy/difficult it would be for Chinese people to understand, and feel at ease with the language used across the questionnaire. Some participants (7 out of 35) highlighted that they had never attended the dentist as a patient, and there were some items that pertained to direct experience e.g., 'Once I am in the chair I feel helpless (that things are out of my control)'. Thus, we included an additional instruction at the beginning of the DBS-R for those who had never been a dental patient. We asked participants to score the questionnaire according to their expectations of the dentist/dental visit even if they had no direct experience. Participants agreed that they could easily rate the items based on expectations (including attending the dentist with others; seeing the dentist portrayed in the media and discussing dental treatment with family/friends). This instruction was translated into English and back into Chinese. This was checked again by the panel. No more modifications were made at this stage.

Psychometric properties of the Chinese Revised Dental Beliefs Survey (CDBS-R): Reliability and validity

We posted advertisements in a range of communities and colleges, and all the participants were given a small gift (a pen or a fan) as an incentive to take part. The study was approved by the Ethics Committee of Tianjin Normal University and written informed consent of the participants was obtained.

Procedure

Participants were told that the study was exploring the different beliefs and feelings people have about going to the dentist and the procedures they may encounter. They were assured that their responses to the questionnaire would be anonymous and confidential. If they agreed to take part, they were given a questionnaire booklet (see Materials) to complete and return. Participants were asked to provide an email address if they were willing to complete the Chinese DBS-R again two weeks later (in order to assess test-retest reliability). Participants were assured that their email addresses would not be used for any other reason and that they would be destroyed directly after data entry. One hundred and thirty participants provided their email addresses and of these 109 participants completed the Chinese DBS-R a second time. There were 35 males and 74 females (43 are from Tianjin city, 27 from Wuhan city and 39 are from Dongying city).

Materials

A paper-based questionnaire booklet was devised for the purposes of the study. It started with a request for participant demographics (gender, age, occupation, living in a rural/urban province and income level). Brief questions about their own self-reported dental attendance and treatment history and dental health behaviours (e.g., tooth-brushing) were also requested. Participants were then asked to complete our newly translated Chinese version of the DBS-R (see Appendix 1 for the final version). As with the English language version, each item was rated on a 5-point Likert-type scale, ranging from 1 = not at all to 5 = very much. Possible scores ranged from 28 to 140 for the longer form and 24 to 114 for the shorter form. Higher scores indicate more negative perceptions/beliefs. Table 2 shows all items (in English) for the DBS-R and the items pertaining to each sub-scale for both the 24 and 28 item versions.

One of the aims of our study was to test the validity of our Chinese DBS-R. Validity is the extent to which an instrument measures what it purports to measure; in essence are we measuring what we think we are measuring? The validity of the scale was firstly assessed by evaluating the relationship of the scores on the DBS-R with those on a previously established measure of dental anxiety. Previous authors have correlated the DBS-R (in English and also in translated forms) with established dental anxiety scales in order to examine validity¹⁻⁴. For our present study, we employed the Chinese Modified Dental Anxiety Scale (MDAS¹⁴), which is an adult dental anxiety measure originally developed in English¹⁵. It comprises five items related to dental experiences (e.g., “If you were about to have a tooth drilled, how you would you feel?”) and is rated on a 5-point scale ranging from ‘Not anxious’ to ‘Extremely anxious’. Overall

scores range from 5 to 25 with a cut-off score of 19 to indicate a 'very dentally anxious' individual^{15,16}. We would expect a moderate correlation between dental beliefs and dental anxiety, as they are related but not identical constructs. To provide further evidence of validity, the sample was divided into two groups, one with low and the other with high dental anxiety using the clinical cut-off score of 19 or over. We would expect the high anxiety group to have significantly higher DBS-R total scores than the low anxiety group.

Statistical Analyses

In line with previous research^{1,2} we analysed the data for both the short and longer (original) versions of the DBS-R for comparison purposes. We calculated Cronbach's Alpha to assess the internal consistency of the Chinese DBS-R (CDBS-R). Test-retest reliability was established using the intraclass correlation coefficient (ICC) between Time 1 and Time 2 for the 130 participants who completed the DBS-R two weeks apart. The convergent validity of the scale was assessed by correlating the CDBS-R with the Modified Dental Anxiety Scale (MDAS). We would expect a moderate correlation between dental beliefs and dental anxiety. In addition, employing a t-test we would expect there to be a significant difference in CDBS-R total scores between those scoring 19 or over and those scoring under 19 on the MDAS. Moreover, we performed a t-test to confirm whether there was a difference in total CDBS-R scores between those who had never been to the dentist, and those who had. We would expect higher scores for those who had never attended. To test whether there was a difference in dental beliefs across subscales, we calculated mean item totals and conducted a repeated measures ANOVA for both the three and four sub-scale versions. A significance level of $\alpha = 0.05$ was used.

Results

There were 530 questionnaires distributed and 516 questionnaires returned. Of those returned, 36 had one or more items missing (across any of the questionnaires) so were removed from analysis. This left 480 completed questionnaires (155 males and 325 females). Most participants were between 20-30 years old; 71.9% of participants lived in urban and 28.1% lived in rural areas. For a full breakdown of demographics including gender and age please see Table 3. Table 3 also presents data on the dental history and habits of the participants. Twenty-two percent of the participants had never been to the dentist and tooth extraction was the procedure that most participants (41%) had experienced in the dental clinic. Twice-daily (or more often) tooth-brushing was reported by majority of participants, though a third of participants reported less frequent brushing.

We compared scores on the CDBS-R for gender, age and income level. Females scored significantly higher (mean = 86.50; SD = 16.19) than males (82.41, SD= 18.87). This difference was significant for the 28-item version ($t = 2.39$, $df = 478$, $p < 0.05$) and also the 24-item version (females mean score = 73.80; SD = 14.57 and males mean = 70.38; SD = 16.06). ($t = 2.32$, $df = 478$, $p < 0.05$).

There was no difference in CDBS-R scores in terms of age $F(5, 474) = 1.35$, $p > 0.05$ for the 28-item item and also for the 24-item $F(5, 474) = 1.55$, $p > 0.05$) and also no significant difference in terms of income level for both longer $F(2, 477) = 2.70$, $p > 0.05$ and shorter versions ($F(2, 477) = 2.88$, $p > 0.05$).

Table 2 presents the means and standard deviations for each of the items of the CDBS-R. Higher scores indicate more negative perceptions of the dentist. Table 4 presents the overall mean (standard deviation) for each subscale of the short and long DBS-R versions. The mean score was 85.2 (SD = 17.6) for the overall 28 item scale (range 28 to 134) and 72.7 (SD = 15.1) for the shorter form (range 24 to 114). Table 4 also shows the item mean (SD) scores for the DBS-R subscales. There was a significant difference in item mean scores across sub-scales on the 28-item version $F(2, 474) = 12.44$ $p < 0.001$). *Post hoc* tests showed that participants had significantly higher mean item totals on the Professionalism sub-scale than the Communication sub-scale ($p < 0.005$) and the Control sub-scale ($p < 0.001$). In addition, mean item totals were higher on the Control subscale than the Communication subscale ($p < 0.05$). On the 24-item version there was also a significant difference in item mean scores $F(3, 474) = 6.65$ $p < 0.01$) with participants having higher mean item totals on the Ethics sub-scale compared to the other three sub-scales; Communication ($p < 0.01$); Control ($p < 0.05$) and Trust ($p < 0.001$).

Reliability of the DBS-R

As can be seen from Table 4 Cronbach's Alpha demonstrated a high level of internal reliability for the Chinese DBS-R long form ($\alpha = 0.94$) and short-form ($\alpha = 0.93$). Sub-scales for both versions of the CDBS-R were also internally consistent (0.84-0.90) though slightly lower values were noted on the shorter form (0.73-0.86). Of the 130 participants that completed the CDBS-R again two weeks later, 109 returned questionnaires (28 males and 81 females). Test-retest data from the sub-sample of 130 participants (28 males and 81 females) showed a strong intraclass correlation for both versions (ICC = 0.94 longer and ICC = 0.82 for shorter form).

The 5-item Chinese Modified Dental Anxiety Scale (MDAS) was internally consistent in our sample ($\alpha = 0.85$) and the mean anxiety score was 13.7 (SD = 4.6). In order to assess validity we correlated the CDBS-R with the MDAS which showed a weak/moderate but significant correlation ($r = 0.38$ and $r = 0.39$, $p < 0.001$ for the longer and shorter versions respectively).

As can be seen from Table 5 those who had never attended the dentist scored significantly higher on the CDBS-R overall and for each of the sub-scales across both versions of the scale. There were 75 participants (15.6%) that had a very high anxiety score on the MDAS (score of 19 or above). Those in the highly anxious group, had significantly higher CDBS-R scores overall and for each of the sub-scales (see Table 6).

Discussion

It is important to have a measure that can be used to reliably measure beliefs and attitudes about the dentist. Therefore, the aims of our study were to (1) translate the DBS-R into Standard Mandarin and (2) explore the reliability and validity of this newly-translated measure (both long and short-form) in a Chinese sample.

Across the sample, the psychometric properties for both the short and long version of the CDBS-R were found to be similar. Both versions had good reliability and validity. The internal consistency of the Chinese DBS-R was tested using the Cronbach's alpha coefficient, and it demonstrated a high level of internal consistency in both versions (0.93 – 0.94). These are comparable to alpha levels found in other studies for both clinical and non-clinical samples^{1,2,4,12}. In addition, when we calculated the Cronbach's Alpha for the subscales of the DBS-R they are all internally consistent though slightly lower values were noted on the shorter form (0.73-0.86 short vs 0.84-0.90 long versions). Thus, our findings show that the items on the CDBS-R measure a single underlying construct for both the long and short versions. Test-retest data demonstrated that the CDBS-R is stable over time (in this instance across a two-week period). Thus the reliability of the CDBS-R in our sample is also evidence that its underlying constructs are stable outside of the dental setting. This is particularly pertinent considering the high number of adults in our sample that are never-attenders. It would now also be useful to test the CDBS-R also in a clinical population.

The weak to moderate but significant correlation between the Modified Dental Anxiety Scale (MDAS) and CDBS-R also indicates that the two scales are tapping somewhat similar, but not identical, underlying constructs. For example, it might be possible for individuals to be highly fearful of certain dental procedures, assessed by the MDAS, but not necessarily to have negative beliefs about the dentist, assessed by the CDBS-R. A similar finding was reported in the validation study for the Spanish version of the DBS-R⁴. Moreover, as an additional test of validity, when we divide the participants into high and low anxiety groups based on an established cut-off, as predicted we find that scores on the CDBS-R are significantly different, with the highly anxious group having more negative dental perceptions.

Higher scores on the CDBS-R indicate greater negative perceptions of dentists and the dental visit. The mean overall score for the CDBS-R appears high (85.2 for the long form and 72.7 for the shorter form), especially when compared to studies conducted in Western countries. For example, Coolidge et al¹, in their psychometric evaluation of both forms of the English version of the DBS-R, the mean score in their American student sample was 51.5 and 46.6 for the longer and shorter-form. Moreover, in a non-clinical study using the 28-item Spanish version of the DBS-R with a Spanish-speaking community sample of Hispanics in the USA the mean was 61.2⁴. In addition, perceptions of the dentist in our Chinese participants were consistently negative across all of the sub-scales on the DBS-R (mean item scores were between 2.97 and 3.10). Abrahamsson et al² compared item mean scores between students (1.7- 2.3), general dental patients (1.4 - 1.8), periodontal patients (1.6 - 2) and fearful dental patients (2.7 – 3.6). Thus, in comparison our Chinese sample have beliefs most in line with fearful dental patients. Although a cross-cultural study would be needed in order to explore this fully, this appears to indicate that beliefs about dentists in our Chinese sample may be more negative than found in some Western countries.

In our sample, there were differences across the sub-scales in terms of mean item total scores. For the 28-item version, participants had significantly higher mean item totals on the Professionalism/Ethics sub-scale than the Communication and the Control sub-scales. On the 24-item version there was also a significant difference in item mean scores with participants having higher mean item totals on the Ethics sub-scale compared to the other three sub-scales. This would appear to indicate that Professionalism/Ethics of dentists are viewed most negatively by participants, and this is a finding that is not commonly reported in studies utilising the DBS-R. There are overlapping items in terms of the Professionalism/Ethics and Ethics sub-scales across the two scales in that they both include items pertaining to concerns about the dentist providing the necessary information, having the patient's best interests at heart and carrying out work that is not necessary. Our findings in relation to professionalism and ethics may, in part, be linked with the oral health services in China. Dental care is offered only on a fee-for-service basis and is expensive to access, even though care is primarily provided by the public health service based in hospitals. Although there are private dental practices, insurance does not reimburse for treatment and it is much more expensive than the public health alternative. Thus dental

care is expensive across sectors. It may be that this contributes to a belief that dentists perform treatment that is expensive and not always necessary. However, this is speculative, and does not fully explain negative perceptions across other factors included in this dimension e.g., how dentists handle information (such as, withholding information and not giving clear explanations). There is a need for further work, possibly of a qualitative nature, to fully explore these beliefs in the Chinese culture.

Interestingly, Kvale et al¹² in the 24-item DBS-R, omitted several items from the Professionalism/Ethics sub-scale that relate to the technical competence of the dentist. 'I worry if the dentist is technically competent and is doing quality work' and 'I'm concerned that dentists might not be skilled enough to deal with my fear or dental problems' were removed as these items were not considered directly relevant to the interpersonal relationship. However, in our sample these items scored highly - Item 3 which is related to competency/skilled work was the highest scoring item. This may indicate two things. First, that technical competency and skill are important issues when viewing dentists in China (for those who have and have not been a dental patient), and as such should be explored further. Second, since only the 28-item CDBS-R includes these items, this may be the scale of choice when assessing perceptions of the dentist in a non-clinical Chinese sample.

Mean item totals were higher on the Control subscale than the Communication subscale only on the 28-item scale and this is similar to other studies. For example, in Abrahamsson et al's study² they found that the Control sub-scale had the highest mean item total (across both the 24 and 28 item versions) and in both clinical and non-clinical groups. As Abrahamsson and colleagues highlight, these feelings should be acknowledged and strategies put in place to increase patients feeling more in control.

In our sample, there were low rates of regular dental attendance and twenty-two percent of the participants reported that they had never been to the dentist. Though we should acknowledge that these are based on self-report, these findings concur with previous (though sparse) research exploring dental service utilization in China. It has been noted that the number of dental practitioners is low relative to population and though the numbers of dentists have grown rapidly in recent years, dental service utilization remains low¹⁷. Zhu et al¹⁸ reported on the third oral health national survey including oral health practices, behavior, knowledge and attitudes. Twenty-two percent of the respondents had never visited a dentist. Moreover, dental attendance in the last 12 months from the fourth, and most recent, national survey (2015 – 2016) showed that only twenty percent of adults surveyed reported attending the dentist in the past year¹⁹. Within our pilot study, the high number of 'never attenders' was also acknowledged during the pilot stage of our study (7 out of 35 had never attended). Thus the instructions on the Chinese DBS-R were slightly modified in order to reflect this. It was deemed important to do this, so that items 'made sense' to all participants – not just those who had visited a dentist. We would argue

that it is as important to assess the perceptions of those who have never attended, as it is to assess those who have. Indeed, perceptions of the behaviour and attitude of dentists can affect dental anxiety and could influence the decision to access dental care – this could be irregularly or not at all. When we compared total CDBS-R scores between those who had never attended the dentist and those who had – those who had never attended had more negative perceptions of the dentist and this difference was significant. This provides further evidence of validity but also indicates that there is a need to assess and address (and further explore the possible underlying reasons for) the negative perceptions of these non-attenders to hopefully also help facilitate accessing dental care.

It is important to acknowledge the strengths and limitations of our study. In terms of strengths, we followed a rigorous translation method (forwards-backwards method). We also piloted the measure which was an important step to ensure that the measure was understandable for Chinese individuals. We also tried to ensure that the same meaning was conveyed on the translated measure while at the same time making the Chinese version culturally meaningful. In terms of limitations, although we sampled from three provinces, and aimed to get a varied sample in terms of demographics and experience, we still had a relatively high number of students in our sample, so cannot purport to generalise across the whole of China. In addition, there was an over-representation of females in our sample. However, it should be noted that across countries females do appear to take part in studies on dental-related beliefs and dental-related fear more often than males, and as such there is an over-representation of females in study samples across both clinical and non-clinical samples^{2, 20-22}.

Conclusions

Understanding cultural beliefs and attitudes towards dentists is important. Our findings suggest that the CDBS-R is a reliable and valid measure for assessing Chinese adults' perceptions of behaviours and attitudes towards dentists. Both versions of the scale performed similarly, but for now we would suggest the 28-item version may be the scale of choice as items relating to the technical competence of the dentist appear important to both the Chinese adults that have and have not been dental patients.

The development of China's health care system presents opportunities (and challenges) for more emphasis and resources into prevention services and programs¹⁷. This CDBS-R could be used to assess, and possibly provide a starting point, to help address dental beliefs in the Chinese population. In terms of future research, further elucidation of why Chinese adults have such negative beliefs about the dentist (particularly in terms of professionalism and ethics) is an important endeavour. Finally, future studies should employ the CDBS-R in the clinical setting to assess its utility for use with a clinical population.

Abbreviations

DBS (The Dental Beliefs Scale)

DBS-R (The Dental Beliefs Scale- Revised)

CDBS-R (the Chinese Dental Beliefs Scale - Revised)

MDAS (the Modified Dental Anxiety Scale Chinese version)

ICC (Intraclass correlation coefficient)

ANOVA (analysis of variance)

SD (standard deviation)

Declarations

Ethics approval and consent to participate

The study was reviewed and approved by the Ethics Committee of Tianjin Normal University, China (reference number APB20161205). This study was conducted in accordance with the principles of the Declaration of Helsinki and the participants provided their written informed consent prior to participation.

Consent for publication

Not applicable

Availability of data and materials

The datasets used and/or analysed during this study are available from the corresponding author upon reasonable request.

Competing interests

The authors declare that they have no competing interests.

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This study received no funding.

Authors' contributions

HB conceived the study. LW and HB co-designed the study. LW collected and analysed the data. HB and LW co-wrote the manuscript. Both authors read and approved the final manuscript.

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Tables

Table 1: Demographics and dental health history and habits of participants in the pilot study

Participants ($N = 35$)		Frequency
Gender	Male	14
	Female	21
Age (years)	Below 20	3
	20-30	14
	30-40	8
	40-50	5
	50-60	3
	Above 60	2
Province	Urban	22
	Rural	13
Education level	Below middle school level	8
	High school level	8
	College/university level	13
	Above Master level	6
Occupation	Civil service and public institution employees	5
	Enterprise/company employees	6
	Self-employed	3
	Farmer	6
	College student	11

	Not working	4
Income level	Low	16
	Middle	15
	High	4
How you ever attended a dentist?	Yes	28
	No	7

Table 2 Mean and standard deviation (SD) for each item of the Chinese DBS-R[1]

Item on DBS-R	Mean (SD)	24-item Sub-scale	28-item Subscale
1. I am concerned that dentists recommend work that is not really needed	3.20 (1.04)	Ethics	Professionalism/Ethics
2. I believe dentists say/do things to withhold information from me	2.94 (1.01)	Ethics	Professionalism/Ethics
3. I worry if the dentist is technically competent and is doing quality work	3.33 (1.00)	N/A	Professionalism/Ethics
4. I have had dentists say one thing and do another	3.02 (1.01)	Trust	Professionalism/Ethics
5. I am concerned that dentists do not provide all the information I need to make good decisions	3.10 (1.06)	Ethics	Professionalism/Ethics
6. Dentists don't seem to care that patients sometimes need a rest	3.03 (1.02)	Control	Professionalism/Ethics
7. I've had dentists seem reluctant to correct work unsatisfactory to me	2.91 (1.01)	Ethics	Professionalism/Ethics
8. When a dentist seems in a hurry I worry that I'm not getting good care	3.30 (1.02)	Ethics	Professionalism/Ethics
9. I am concerned that the dentist is not really looking out for my best interests	3.17 (1.05)	Ethics	Professionalism/Ethics
10. Dentists focus too much on getting the job done and not enough on the patient's comfort	3.01 (1.04)	Trust	Professionalism/Ethics
11. I'm concerned that dentists might not be skilled enough to deal with my fear or dental problems	3.10 (1.03)	N/A	Professionalism/Ethics
12. I feel dentists do not provide clear explanations	3.04 (0.96)	Ethics	Communication
13. I am concerned that dentists do not like to take the time to really talk to patients	3.05 (1.03)	Ethics	Communication
14. I feel uncomfortable asking questions	2.80 (1.06)	Communication	Communication
15. Dental professionals say things to make me feel guilty about the way I care for my teeth	3.30 (1.00)	Communication	Communication
16. I am concerned that dentists will not take my worries (fears) about dentistry seriously	3.05 (0.97)	Communication	Communication
17. I am concerned that dentists will put me down (make light of my fears)	3.09 (0.99)	Communication	Communication
18. I am concerned that dentists do not like it when a patient makes a request	3.10 (1.00)	N/A	Communication
19. I am concerned that dental personnel will embarrass me over the condition of my teeth	2.89 (1.01)	Communication	Communication
20. I believe that dentists don't have enough empathy for what it is really like to be a patient	2.97 (0.97)	Communication	Communication
21. When I am in the chair I don't feel like I can stop the appointment for a rest if I feel the need	2.96 (1.01)	Control	Control
22. Dentists don't seem to notice that patients sometimes need a rest	3.05 (0.98)	Control	Control
23. Once I am in the chair I feel helpless (that things are out of my control)	3.02 (1.04)	Control	Control
24. If I were to indicate that it hurts, I think that the dentist would be reluctant to stop and try to correct the problem	2.87 (1.04)	Trust	Control
25. I have had dentists not believe me when I said I felt pain	2.85 (1.03)	Trust	Control
26. Dentists often seem in a hurry, so I feel rushed	3.06 (1.03)	Trust	Control
27. I am concerned that the dentist will do what he wants and not really listen to me while I'm in the chair	3.02 (1.01)	Trust	Control
28. Being overwhelmed by the amount of work needed (all	2.96	N/A	Control

the bad news) could be enough to keep me from beginning or completing treatment	(1.04)		
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[1] In English – see Appendix 1 for Chinese version

Table 3: Demographics and dental health history and habits of the main study participants

Participants (<i>N</i> = 480)		Frequency (%)
Gender	Male	155 (32.29)
	Female	325 (67.71)
Age (years)	Below 20	82 (17.08)
	20-30	210 (43.75)
	30-40	69 (14.37)
	40-50	55 (11.46)
	50-60	44 (9.17)
	Above 60	20 (4.17)
Province	Urban	345 (71.88)
	Rural	135 (28.13)
Education level	Below middle school level	59 (12.29)
	High school level	86 (17.92)
	College/university level	243 (50.63)
	Above Master level	92 (19.17)
Occupation	Civil service and public institution employees	83 (17.29)
	Enterprise/company employees	97 (20.21)
	Self-employed	36 (7.50)
	Farmer	33 (6.88)
	College student	183 (38.13)
	Not working	48 (10)
Income level	Low	266 (55.4)
	Middle	179 (37.3)
	High	35 (7.3)
How often do you brush teeth?	Once a day	142 (29.58)
	Twice a day	289 (60.21)
	More than twice a day	29 (6.04)
	Not regularly	14 (2.92)
	Not at all	6 (1.25)

Have you ever attended a dentist?	Yes	373 (77.7)
	No	107 (22.3)
Frequency of dentist visits	Twice a year	44 (9.17)
	Once a year	80 (16.67)
	Less than once in two years	239 (49.79)
	Other answer	117 (24.38)
What kind of dental procedures have you experienced?	Dental checkup	161/480 (33.54)
	Tooth extraction	196/480 (40.83)
	Scale and polish ('Tooth wash')	128/480 (26.67)
	Orthodontics	56/480 (11.67)
	Tooth filled	168/480 (35.00)
	Local anesthetic injection	78/480 (16.25)
	Root canal therapy	54/480 (11.25)
	Conscious-sedation	10/480 (2.08)
	Other	44/480 (9.17)

Table 4 Mean and standard deviation (SD), Cronbach's Alpha and Item mean score for each subscale on the 28 item and 24 item versions of the Chinese DBS-R

Sub-scale on 28-item DBS-R	Mean (SD)	Cronbach's Alpha	Items on scale	Item mean score
Professionalism/Ethics	34.1 (8.0)	0.90	1-11	3.10 (0.72)
Communication	27.3 (6.0)	0.84	12-20	3.03 (0.66)
Control	23.8 (5.9)	0.87	21-28	2.97 (0.74)
Total score	85.2 (17.6)	0.94		
Sub-scale on 24-item DBS-R				
Ethics	24.7 (5.8)	0.86	1, 2, 5, 7, 8, 9, 12, 13	3.09 (0.72)
Communication	18.1 (4.0)	0.76	14, 15, 16, 17, 19, 20	3.02 (0.67)
Control	12.1 (3.0)	0.73	6, 21, 22, 23	3.01 (0.76)
Trust	17.8 (4.5)	0.82	4, 10, 24, 25, 26, 27	3.00 (0.75)
Total score	72.7 (15.1)	0.93		

Table 5 DBS-R scores across sub-scales for participants who have attended the dentist and never attended the dentist

	Never attended the dentist Mean (SD)	Attended the dentist Mean (SD)	t	df	sig
N	107	373			
DBS-R sub-scale score on 28-item scale					
Professionalism	36.63 (7.48)	33.39 (7.96)	3.76	478	$p < 0.001$
Communication	28.58 (5.50)	26.91 (6.07)	2.56	478	$p < 0.05$
Control	25.03 (4.86)	23.43 (6.10)	2.49	478	$p < 0.05$
Overall total score	90.23 (15.25)	83.73 (18.03)	3.40	478	$p < 0.001$
DBS-R subs-scale score on 24-item scale			3.30	478	$p < 0.001$
Ethics	26.53 (5.29)	24.19 (5.84)	3.73	478	$p < 0.001$
Communication	19.00 (3.90)	17.83 (4.03)	2.66	478	$p < 0.05$
Control	12.68 (2.59)	11.88 (3.12)	2.44	478	$p < 0.05$
Trust	18.70 (3.82)	17.59 (4.63)	2.28	478	$p < 0.05$
Overall total score	26.53 (5.29)	24.19 (5.84)	3.30	478	$p < 0.001$

Table 6 DBS-R scores for participants who are highly anxious (> 19 on the Modified Dental Anxiety Scale; MDAS) and not highly anxious (< 19 on the MDAS)

	19 or above on the MDAS	< 19 on the MDAS	t	df	sig
N	75	405			
Mean (SD) sub-scale on 28-item scale			7.18	478	$p < 0.001$
Professionalism	39.34 (6.56)	33.14 (7.83)	6.44	478	$p < 0.001$
Communication	30.75 (5.44)	26.64 (5.86)	5.64	478	$p < 0.001$
Subscale-Control	27.88 (5.60)	23.03 (5.62)	6.87	478	$p < 0.001$
Mean (SD) Total DBS-R Score	97.97 (14.62)	82.81 (17.15)	7.18	478	$p < 0.001$
Mean (SD) sub-scale score on 24-item scale					
Ethics	28.52(4.58)	24.01(5.73)	6.45	478	$p < 0.001$
Communication	20.40 (3.86)	17.66 (3.91)	5.58	478	$p < 0.001$
Control	4.32 (2.74)	11.64 (2.89)	7.45	478	$p < 0.001$
Trust	20.71 (3.99)	17.30 (4.37)	6.28	478	$p < 0.001$
Mean (SD) Total DBS-R Score	83.95 (12.56)	70.61 (14.66)	7.39	478	$p < 0.001$

Supplementary Files

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