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Psychometric properties of the Revised Dental Beliefs Survey

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Abstract – *Objectives:* The objectives of this pair of studies were to examine the internal reliability, test–retest reliability, and construct validity of the Revised Dental Beliefs Survey. *Methods:* A total of 108 college students completed two questionnaires containing the Revised Dental Beliefs Survey, as well as the Revised Iowa Dental Control Index, and Desirability of Control scales. As part of another experiment, 141 study participants with dental injection phobia completed the Revised Dental Beliefs Survey and the Dental Anxiety Scale. *Results:* Both the internal and test–retest reliabilities of the Revised Dental Beliefs Survey were high. The measure demonstrated good convergent and discriminant validities. *Conclusion:* The Revised Dental Beliefs Survey is well-suited for use with clinical and nonclinical populations, in which a stable and valid measure of perceptions of the dental situation is desired.

Key words: dental anxiety; Dental Beliefs Survey; dental fear; dentist–patient relationship; psychometrics

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Dental fears are common, affecting as many as 50% of adults (1). Approximately 5–15% of adults have extreme or phobic levels of dental fear (2, 3). Dental fear is complex, related in most cases to prior painful dental treatment and/or exposure to fearful models. Other etiologic factors include perceptions of insensitive treatment or negative personality (4).

Patient perceptions of behaviors and attitudes of dentists are associated with dental fear. For example, Corah et al. (5) found that dentists' communicative styles ('information–communication' and 'understanding–acceptance'), as well as perceived technical competence, were predictive of levels of dental anxiety during treatment. Rouse and Hamilton (6) found similar factors in a nonclinical sample, and also identified a third factor consisting of interpersonal items (e.g. 'My dentist takes me seriously').

In interviews with phobics, researchers found statements about the 'unsupportive dentist' to be one of three clusters which characterized dental fear experiences (7). This cluster included perceptions that the dentist was unempathic and disrespectful, distrust/doubtfulness about the dentist's skills, and a perceived lack of support from other dental personnel. A second cluster, termed 'vulnerability', included having an anxiety-prone personality, history of receiving negative information about dentistry from others, and prior history of trauma in general. The third cluster, 'existential threat', included fears of violation and loss of autonomy/independence.

Researchers who have not assessed dental fear *per se* have nevertheless identified similar concerns. For example, in a study of patients' perceptions of giving consent for treatment, individuals complained of feeling rushed by the dentist, stated that the dentist did not explain procedures, or that the dentist lied about the treatment (8). Lahti et al. (9, 10) examined patients' views of ideal dentist behaviors and the actual behaviors of the dentist. From the patient's point of view, the most important aspect of the dentist's behavior was the extent to which he/she was 'communicative and informative'. Discrepancies between preferred and actual behaviors of the dentist were the greatest for these items.

Dental Beliefs Survey

The Dental Beliefs Survey (DBS) was developed to assess the patient's views about the dentist and

dental treatment in three areas (subscales): Professionalism, Communication, and Lack of Control (11, 12). Sample items include: 'I feel that dentists do not provide clear explanations' and 'I feel that dentists do not take my worries (fears) seriously.' Patients answer each item on a five-point scale; higher scores are indicative of more negative beliefs about dentistry. A 15-item version has been used most frequently, although some researchers have used a 14-item version, and one study (13) reported a 16-item version. The questionnaire has been translated into a number of languages, including Swedish, German, Norwegian, and Danish (2, 14–16); in addition to research with adults in countries of these languages, it has also been used with English-speaking adolescents in Singapore (17).

Psychometric characteristics: reliability and validity

Scales should have adequate reliability and validity. These terms refer to the stability of the scale, and whether the scale measures what it is supposed to. Reliability may be measured in two ways: examining the internal consistency of the scale, and examining the test–retest stability of the scale over time. Validity may be measured in several ways, the most important of which are criterion validity and construct validity. Criterion validity may be established when the scale is found to be highly correlated with a criterion of interest (e.g. a laboratory test result has good criterion validity if it accurately predicts actual disease status). This kind of validity is, however, often difficult to establish in research involving attitudes and behavior. In this situation, construct validity, including measures of both convergent and discriminant validity, is then used. Construct validity assesses the degree to which a scale measures the underlying construct one is interested in. This is typically done by finding correlations between the scale and other similar scales, resulting in convergent validity. To assess discriminant validity, one finds very low correlations between the scale and other scales which are thought *not* to be related to the underlying construct. Other ways of measuring construct validity include assessing the performance of the scale in theoretically driven research. For example, we can administer a scale measuring anger to two samples which should score very differently, and look to see if, in fact, the two groups do score differently.

Reliability and validity of the DBS

The reliability of the DBS has been measured in two ways. First, the internal consistency of the 15-item version has been found to be good, with alpha coefficients of 0.86–0.93 reported in fearful dental patients, patients requesting emergency dental treatment, and general dental patients (2, 3, 14, 18, 19). Secondly, one researcher examined the stability of the DBS over time, finding the test–retest reliability of the 14-item version to be 0.80 (15).

In terms of construct validity, researchers have found that DBS scores are related to attitudes and behavior consistent with what the scale was to measure. For example, dentally fearful adults have higher scores than dental patients in general (2). Higher scores on DBS have also been found to be predictive of dental fear in adolescents (17). Patients who experience pain at the time of treatment have higher scores than those who are pain-free (15); although individuals might seek out emergency care because of pain, dentally fearful adults have higher scores than patients seeking emergency dental care (19). Dental phobics with an additional psychiatric diagnosis have higher scores compared with those without additional diagnoses (20). Fearful individuals who also meet the Diagnostic and Statistical Manual (DSM) criteria for Social Phobia score higher than those without this diagnosis (21). Following treatment for dental fear, adults show decreases in their DBS scores (12, 14, 22–26).

A pair of studies concerning appointment cancellations provides additional evidence for construct validity. Higher DBS scores at age 20 years are associated with a history of cancellations and missed appointments between ages 12 and 20 years (27). DBS scores were a better predictor of cancellations and missed appointments than were scores on the Dental Fear Survey. Similarly, Skaret et al. (28) found that adolescents with higher DBS scores were more likely to avoid treatment.

With regard to the subscales, only one study has examined these. Dentally fearful adults who showed decreases on items in the Communication subscale early in their dental fear treatment were more likely to be successful (18).

Revised DBS

Getz et al. (29) revised and expanded the DBS to a 28-item version (referred to here as the Revised

DBS, R-DBS), reflecting increased understanding of the concerns of fearful patients. The items are organized into three subscales: Professionalism (e.g. technical competence, whether the dentist appears to make treatment decisions based on his/her best interests rather than those of the patient), Communication (e.g. ease of patient–dentist communication, attitude of the dentist towards the patient), and Lack of Control (e.g. feeling helpless, feeling unable to take a rest during treatment). As with the original DBS, respondents use a five-point scale to describe how they feel about dentistry in general; options range from 'never' (1) to 'nearly always' (5). Higher scores indicate greater negative beliefs. The R-DBS and item assignments to the three subscales appear in the Appendix.

To date, only two studies have examined the psychometric properties of the R-DBS. In an examination of the differences between adults seeking emergency versus nonemergency dental care, higher scores were found for those seeking emergency care (30). An internal reliability of 0.95 was reported in a sample of dentally fearful adults (31). A factor analysis of the R-DBS in this sample generally supported the contents of the subscales, and indicated that 25 of the 28 items provided the best fit, on four factors: Ethics (here called Professionalism, to be consistent with terminology used in the original citation), Communication, Control (here called Lack of Control, again to be consistent with the original terminology), and a new factor called Trust. The Trust factor is primarily composed of a subset of items from the Lack of Control subscale; the most important items are two that refer to the perception that the dentist will not be empathic with the patient's experience of pain. These four factors of the 25-item version of the R-DBS appear in the Appendix.

These initial results are promising. However, to date no test–retest reliability has been calculated for the R-DBS, nor has it been subjected to more rigorous construct validity analysis. As was true for the original DBS, we hypothesized that the R-DBS would show good test–retest reliability and construct validity. We did not know whether the reliability and validity would differ for the full 28-item version and the 25-item best fit version. To test these hypotheses, we conducted two studies with the R-DBS. Our first study, in which college students completed the R-DBS twice, as well as other scales, was designed to assess the internal reliability, test–retest reliability, and aspects of the construct validity of the R-DBS. For our second study, we used data from a larger experiment of treatment for dental injection phobia. Participants completed the R-DBS and a measure of dental fear before treatment; we used these data to provide additional assessments of the construct validity of the R-DBS. Both studies were also designed to explore any differences in reliability or validity between the full 28-item questionnaire and the 25-item best-fitting factor analysis solution.

Study I

Participants

One hundred and eight liberal arts students aged ≥18 years enrolled in two private colleges in Seattle took part in this study. Thirty-four percent were males, and most (75%) were between 18 and 24 years of age.

Questionnaires

Three scales were included on the questionnaires: the R-DBS, the Revised Iowa Dental Control Index (R-IDCI), and the Desirability of Control (DC) scale. The 28-item R-DBS and the nine-item R-IDCI were included on both questionnaires, while the 20-item DC scale was only included on the second questionnaire because of time constraints.

R-DBS: internal and test–retest reliabilities

The R-DBS was included on both questionnaires, administered 2–3 weeks apart, so that test–retest reliability could be computed. The internal reliability of the scale could also be measured on either administration.

R-IDCI: convergent validity

The R-IDCI is a nine-item scale assessing both Desired Control in the dental setting, and Predicted Control in the same setting (32). Scores are interpreted by looking at Desired and Predicted Control simultaneously. Individuals who wish to have greater control (higher scores on Desired Control), but who perceive themselves to have lesser actual control (lower scores on Predicted Control), have been found to have higher levels of distress while with the dentist (32). This measure was chosen to assess the convergent validity of the R-DBS, as both measures appear to be based on similar constructs.

DC: discriminant validity

The DC scale is a 20-item scale measuring one's general desire to have control over life events (33).

Higher scores indicate a preference for greater amounts of control over one's life. As this measure appears to be assessing an overall trait-like preference for control, it may not be able to predict which individuals prefer greater levels of control in specific settings. Therefore, it was included to assess the discriminant validity of the R-DBS.

Procedures

Institutional Review Boards gave approval for the study. Participating faculty members briefly described the study to the students in advance. One researcher came to each participating class, and described the study further. Students were informed that their participation was voluntary. The questionnaires were anonymous; however, in order to pair questionnaires for the test–retest correlations, students were asked to make up a 'code name' for themselves, to be used on both questionnaires. As an incentive, participating students were offered the chance to win a gift certificate for $100 from their campus bookstore by filling out a separate form. The researcher administered the questionnaires twice, 2–3 weeks apart.

Hypotheses

We predicted that the R-DBS would be positively correlated with the Desired Control subscale of the R-IDCI, and negatively correlated with the Predicted Control subscale of the R-IDCI. Of the R-DBS subscales, we also predicted that the correlation between Lack of Control (R-DBS) and Predicted Control (R-IDCI) would be the greatest. We also predicted that the correlation between DC and the R-DBS scales would be low.

Data analyses

The questionnaire responses were checked and then entered into a computer file. If a participant gave two answers to an item, the mean value was substituted. No other changes were made to the answers. The data were analyzed by SPSS Version 11.5 for Windows. Summary scores were computed for all scales and subscales. Cronbach's alpha values were computed for the R-DBS to determine its internal reliabilities, and Pearson's correlations were computed for the R-DBS to assess its test–retest reliabilities. Pearson's correlations were computed to examine convergent and discriminant validities. As a result of the lack of time, several students in one class did not complete the first questionnaire. Therefore, we decided to use data from the second questionnaire where possible. For each analysis, only participants who had completed the relevant scale(s) or subscale(s) were included. Two sets of analyses were performed, one with all 28 items included and the other with the 25 items identified as comprising the best-fit model.

Results

About 97% of the students who were present during the days of the questionnaire administration participated; 78% participated in both administrations. The means and standard deviations for all measures are presented in Table 1.

Reliability

The internal reliabilities of the R-DBS and its subscales were high. Cronbach's alpha values for the 28-item version were 0.95 for the total score, 0.86 for Professionalism, 0.91 for Communication,

Table 1. Study I: college student's scores on measures

Scale	Possible scores	Range	*n*	Mean	SD
Revised Dental Belief Survey					
28-item version					
Total	28–140	28–108	89	51.5	17.6
Professionalism	11–55	11–38	92	20.1	6.3
Communication	9–45	9–36	90	16.7	6.3
Lack of Control	8–40	8–38	92	15.0	6.0
25-item version					
Total	25–125	25–97	90	46.6	15.8
Professionalism	10–50	10–35	92	18.5	6.3
Communication	7–35	7–27	90	12.9	4.9
Lack of Control	4–20	4–20	92	8.1	3.4
Trust	6–30	6–23	92	10.4	4.1
Revised-Iowa Dental Control Index					
Desired Control	5–25	8–24	88	16.5	3.3
Predicted Control	4–20	6–20	88	12.6	3.4
Desirability of Control	20–140	61–121	76	94.8	12.5

Table 2. Study I: Pearson's correlations between Revised Dental Beliefs Survey (28- and 25-item versions) and other measures in college students

Scale	R-IDCI Desired Control	R-IDCI Predicted Control	Desirability of Control
28-item version			
Total	0.35**	−0.52***	−0.15
Professionalism	0.31**	−0.37***	−0.14
Communication	0.23*	−0.53***	−0.13
Lack of Control	0.44***	−0.55***	−0.17
25-item version			
Total	0.35**	−0.53***	−0.16
Professionalism	0.30**	−0.39**	−0.11
Communication	0.24*	−0.50***	−0.12
Lack of Control	0.39***	−0.57***	−0.19
Trust	0.39***	−0.50***	−0.17

*$P < 0.05$; **$P < 0.01$; ***$P < 0.001$.

and 0.87 for Lack of Control. The results for the 25-item version subscale were similar: 0.95 for the total score, and 0.85, 0.88, 0.83, and 0.83 for Professionalism, Communication, Lack of Control, and Trust, respectively.

Test–retest reliabilities were also high. Pearson's correlations for all items, Professionalism, Communication, and Lack of Control subscales on the 28-item version were 0.88, 0.79, 0.76, and 0.80, respectively (all $P < 0.01$). On the 25-item version, the test–retest reliabilities were 0.86, 0.80, 0.76, 0.70, and 0.77 for all items and Professionalism, Communication, Lack of Control, and Trust factors, respectively (all $P < 0.01$).

Convergent and discriminant validity

As predicted, the R-DBS and each of its subscales were positively correlated with the Desired Control scale on the R-IDCI, and negatively correlated with the Predicted Control scale of the R-IDCI. The correlations were very similar for the 28- and 25-item versions of the R-DBS. In general, the values were higher for the Predicted Control scale than the Desired Control scale. The largest correlation of each analysis was found for Lack of Control (R-DBS) and Predicted Control (R-IDCI); these values were −0.55 for the 28-item version, and −0.57 for the 25-item version. Moreover, as predicted, DC did not correlate with the R-DBS scales on either version. The correlation coefficients are presented in Table 2.

Study II

Participants

As part of a larger experimental study investigating treatment of dental injection phobia, 141 adults with a DSM-IV (34) diagnosis of Specific Phobia of dental injections completed a battery of questionnaires including the 28-item R-DBS and the Dental Anxiety Scale [DAS; (35, 36); for details on the larger study, including information about procedures, see Ref. 20]. These adults were aged 18 to 66 years (mean = 36.3; SD = 12.1), and 64% were female.

Questionnaires

R-DBS: internal reliability and validity

As the participants have fear of an aspect of dental treatment, they should score higher on the R-DBS than the college students in study I. Therefore, a comparison of the mean scores provides a method of assessing construct validity. In addition, internal reliability can also be measured.

DAS: convergent validity

The DAS consists of four items about the dental situation, ranging from thinking about a dental appointment 'tomorrow' to waiting in the chair for cleaning or drilling. Each item is scored on a five-point scale, and the total is summed. Higher scores are indicative of greater levels of dental anxiety. It was used here as a further measure of convergent validity.

Hypotheses

We predicted that the R-DBS and DAS would be positively correlated, and that the R-DBS scores would be higher in this sample than in the college students.

Data analyses

Statistical analyses were carried out as described for study I. In addition, independent-sample *t*-tests were computed in order to compare the R-DBS scores of the injection phobic and student samples.

Table 3. Study II: dental injection phobics' scores on Revised Dental Beliefs Survey and Dental Anxiety Scale

Scale	Possible scores	Range	*n*	Mean	SD
Revised Dental Belief Survey					
28-item version					
Total	28–140	28–131	126	78.25	25.61
Professionalism	11–55	11–50	131	28.44	9.46
Communication	9–45	9–44	137	24.98	9.07
Lack of Control	8–40	8–40	135	25.14	8.31
25-item version					
Total	25–125	25–116	127	68.96	23.13
Professionalism	10–50	10–45	135	25.16	8.59
Communication	7–35	7–35	137	19.50	7.23
Lack of Control	4–20	4–20	134	12.62	4.45
Trust	6–30	6–30	138	16.84	6.27
Dental Anxiety Scale	4–20	8–20	141	15.90	2.80

We computed all statistics twice, for the 25- and 28-item versions.

Results

The mean and standard deviation values for the R-DBS and the DAS are presented in Table 3.

Reliability and validity

Internal reliability of the R-DBS was high. The reliability of the 28-item version was 0.96. The reliabilities for the Professionalism, Communication, and Lack of Control subscales were 0.89, 0.91, and 0.90, respectively. For the 25-item version, the reliabilities for the total scale, Professionalism, Communication, Lack of Control, and Trust factors were 0.96, 0.89, 0.88, 0.85, and 0.89, respectively.

As predicted, individuals with dental phobia scored significantly higher on the R-DBS than the college students. This was true for both the 28-item version ($t(213) = 8.54$, $P < 0.0001$) and the 25-item version ($t(215) = 7.96$, $P < 0.0001$). Moreover, as predicted, the R-DBS and the DAS were significantly correlated. The correlations between the 28-item version and the DAS were 0.49 for the full scale, and 0.42, 0.50, and 0.46 for Professionalism, Communication, and Lack of Control, respectively. For the 25-item version, the correlations were 0.48 for the full scale, and 0.41, 0.50, 0.40, and 0.42 for Professionalism, Communication, Lack of Control, and Trust, respectively. All values were significant at the $P < 0.001$ level.

Discussion

Reliability

Our results indicate that the revised DBS is reliable. The internal consistency of the overall R-DBS is similar to that reported by Kvale et al. (31) for dentally fearful patients, and slightly superior to values reported for the shorter version of the DBS for fearful and nonfearful dental patients (2, 3, 18, 19). This is true of both the 25- and 28-item versions, and is evident in both populations. In addition to providing support for the revised scale in general, this also indicates that the scale's internal consistency is evident in a nonclinical population. Similarly, the test–retest reliability of both the 25- and the 28-item versions is somewhat higher than that reported for a shorter version (15), which indicates that the underlying constructs are stable.

Validity

The relationships between the R-DBS and the R-IDCI provide evidence for convergent validity in both the 25- and 28-item versions. Individuals who experience greater perceptions of personal control have fewer negative beliefs. This relationship is strongest for the subscale measuring perceived lack of control, indicating the similarity of the underlying factor measured by these two subscales. However, the relationship is also strong for the Communication subscale, consistent with findings that perceived problems in dentist–patient communication are more common in dentally fearful individuals. For the 25-item version, the relationship is also strong for the Trust factor. The most important items on this factor are related to the perception that the dentist will not take the pain of the patient seriously; this is also consistent with Rouse and Hamilton's (6) description of an interpersonal factor in the prediction of dental fear. While less strong, the relationship between Predicted Control (R-IDCI) and Professionalism (R-DBS) is significant, indicating that concerns over whether

the dentist truly has the patient's best interests in mind are greater in individuals who perceive that they have less control in the dental setting, compared with those who perceive that they have greater control.

The relationships between Desired Control (R-IDCI) and the R-DBS are significant, indicating that individuals who have more negative beliefs also prefer to have greater levels of control at the dentist. Among the subscales, the highest correlation is for Lack of Control in both the 25- and 28-item version subscales, and for both Lack of Control and Trust in the 25-item version; recalling that the Trust items in the 25-item version are found in the Lack of Control subscale of the full version of the R-DBS, these correlations provide additional evidence for the congruence of what the Desired Control and the Lack of Control/Trust subscales are measuring. Professionalism (R-DBS) and Communication (R-DBS) are also significantly correlated with Desired Control (R-IDCI), indicating that these concerns are particularly important for those who prefer to have more control in the dental setting.

The high correlations between the DAS and both versions of the R-DBS in the needle phobic population provide additional evidence for validity. Consistent with previous research on the shorter version of the DBS, dentally fearful individuals have greater concerns about the dentist–patient relationship. This is also supported by the significantly higher scores found in the individuals with needle phobia, compared with the college students.

We also found good evidence for discriminant validity. The relationships with an overall preference for control (DC) were nonsignificant, indicating that the R-DBS is not tapping a pervasive tendency to wish for control.

25- and 28-item versions

Finally, our results indicate that the 25- and 28-item versions of the R-DBS perform nearly identically. While the question of which scale is better cannot be answered without further studies, our findings do suggest that the shorter version could be used, particularly if the concept of trust is theoretically important. To date, only one study has examined the validity of the subscales of the DBS (18). Future research should examine the descriptive and predictive utilities of the subscales and factors of the R-DBS, particularly as this might help determine which version is preferable.

In conclusion, our data provide strong evidence for the reliability and construct validity of the Revised Dental Beliefs Survey. Its good performance in a nonclinical sample is also evidence that its underlying constructs are stable outside of the dental setting, as well as with a sample of individuals who are not selected for high dental fear. Thus, it can be useful in a variety of clinical and nonclinical settings in which measuring perceptions about dentistry is important.

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Appendix

Revised Dental Beliefs Survey

Item	28-Item version subscale	25-Item version factor
1. I am concerned that dentists recommend work that is not really needed	Professionalism	Professionalism
2. I believe dentists say/do things to withhold information from me	Professionalism	Professionalism
3. I worry if the dentist is technically competent and is doing quality work	Professionalism	N/A
4. I have had dentists say one thing and do another	Professionalism	Professionalism, Trust
5. I am concerned that dentists provide all the information I need to make good decisions	Professionalism	Professionalism
6. Dentists don't seem to care that patients sometimes need a rest	Professionalism	Lack of Control
7. I've had dentists seem reluctant to correct work unsatisfactory to me	Professionalism	Professionalism
8. When a dentist seems in a hurry I worry that I'm not getting good care	Professionalism	Professionalism
9. I am concerned that the dentist is not looking out for my best interests	Professionalism	Professionalism
10. Dentists focus too much on getting the job done and not enough on the patient's comfort	Professionalism	Trust
11. I'm concerned that dentists might not be skilled enough to deal with my fears or dental problems	Professionalism	N/A
12. I feel dentists do not provide clear explanations	Communication	Professionalism
13. I am concerned that dentists do not like to take the time to really talk to patients	Communication	Professionalism
14. I feel uncomfortable asking questions	Communication	Communication
15. Dental professionals say things to make me feel guilty about the way I care for my teeth	Communication	Communication
16. I am concerned that dentists will not take my worries (fears) about dentistry seriously	Communication	Communication
17. I am concerned that dentists will put me down (make light of my fears)	Communication	Communication
18. I am concerned that dentists do not like it when a patient makes a request	Communication	Communication
19. I am concerned that dental personnel will embarrass me over the condition of my teeth	Communication	Communication
20. I believe that dentists don't have enough empathy for what it is really like to be a patient	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	Lack of Control	Lack of Control
22. Dentists don't seem to notice that patients sometimes need a rest	Lack of Control	Lack of Control
23. Once I am in the chair I feel helpless (that things are out of my control)	Lack of Control	Lack of 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	Lack of Control	Trust, Professionalism
25. I have had dentists not believe me when I said I felt pain	Lack of Control	Trust
26. Dentists often seem in a hurry, so I feel rushed	Lack of Control	Trust
27. I am concerned that the dentist will do what he wants and not really listen to me while I'm in the chair	Lack of Control	Trust
28. Being overwhelmed by the amount of work needed (all the bad news) could be enough to keep me from beginning or completing treatment	Lack of Control	N/A

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