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The concept of validity in sociodental indicators and oral health-related quality-of-life measures

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Abstract – *Background:* Most of the psychometric instruments used to measure quality of life associated with oral impairment and disability from the perspectives of older adults focus on negative experiences, and pay little attention to the possibility of positive reactions to disablement. This oversight challenges the validity of the instruments in current use, and raises questions about the process used to validate them. *Objectives:* In this study, we consider the general attributes of psychometric validity, and how they have been applied to oral health-related instruments. *Conclusions and recommendations:* The psychometric characteristics and predictive validity of existing dental instruments are still weak, probably because the instruments fail to address the broad range of personal variables that influence oral health, disability and quality of life. We recommend, therefore, that a continuous process of validation be adopted to include: (1) assessments of the theoretical framework supporting the instruments; (2) evaluations of the focus and structure of the questions used; and (3) enhancements of the prediction value of instruments applicable to oral health-related beliefs and behaviours.

Key words: psychometrics; quality of life; sociodental indicators; subjective oral health; validity

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There is a need for broadly based biopsychosocial measures of the impact from oral impairment and disability, that Cohen and Jago (1) identified in 1976 when they introduced the term sociodental indicator (SDI*) to dentistry. Since then, at least 17 SDIs have emerged, portraying disability mostly as a dysfunctional burden on patients and society, with the patient passively accepting and reporting the consequences of illness, and the physician interpreting and treating the sickness (2). However, the appropriateness of this psychosocial portrayal of impairment and disability seems to have been overlooked (3, 4).

*SDIs are known also as 'subjective oral health measures', 'dental psychometric measures', 'oral health-related quality-of-life measures', and 'patient-based subjective oral health measures'.

A psychometric instrument is valid if it measures what it intends to measure in a meaningful and useful way (5). Optimally, the development and validation process involves a complex interplay of: (1) selecting a reasonable theoretical framework; (2) forming questions that are relevant to the disorder under investigation and meaningful to the respondents; and (3) predicting behaviour and belief from the psychometric scores produced by the instrument (6). The complexity of this process can be confusing and controversial. In this paper, we consider the typical attributes of validity in psychometrics, along with the methods used to validate the SDIs currently used in dental research. We will address traditional perspectives on construct, content and criterion validity; and we will consider various sociocultural values and adaptive strategies that can influence responses to the instruments.

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Table 1. Conceptual and structural basis of psychometric instruments used in dentistry

Instruments	Acronym	Structural origins	Empirically based[a]	Connotation of questions	Number of questions[b]
Social Impacts of Dental Disease (19)	SIDD	SIP	Yes	N	14
Oral Health Impact Profile (19)	OHIP	ICIDH	Yes	N	49
Geriatric (Generic) Oral Health Assessment Index (19)	GOHAI	ICIDH & SIP	Yes	N & P	12
Oral Health-Related QoL-Instrument (21)	OHRQL	Multiple[c]	No	N	36
Oral Impact on Daily Performances (19)	OIDP	ICIDH	No	N	8
Dental Impact on Daily Living (19)	DIDL	SIP	Yes	N & Nt & P	36
Dental Impact Profile (19)	DIP	SIP	Yes	N & Nt & P	25
Oral health-related Quality of Life measure (19)	OHQoL	Multiple[d]	No	N	3
Oral Health Quality of Life Inventory (19)	OH-Qol	SIP	Unclear	P	15
Rand Dental Questionnaire (19)	Unspecified	SIP	No	N	3
Oral Health Questionnaire (58)	Unspecified	ICIDH	Unclear	N & Nt & P	70
Oral Health Quality of life UK (14)	OHQoL-UK	ICIDH2	Yes	N & P	16
Subjective Oral Health Status Indicators (19)	SOHSI	Multiple	No	N & Nt	34
Liverpool Oral Rehabilitation Questionnaire (23)	LORQ	Unclear	No	N	40
Self-rated Oral health (59)	SROH	ICIDH	No	N & P	3
DENTAL (60)	DENTAL	Unclear	No	N	15
Dental Health Status Quality of Life Questionnaire (61)	DS-QoL	Generic QoL instrument	No	N & P	Unclear

N = negative, Nt = neutral, P = positive, SIP = Sickness Impact Profile, ICIDH = International Classification of Impairments, Disabilities and Handicaps.
[a]Information derived from open-ended interviews.
[b]Some indicators present shorter or extended forms other than the original version.
[c]Heath-related models: Natural History of Disease Model and SIP.
[d]Developed from existing measures (RAND, oral facial pain index, etc.).

Traditional attributes

Construct validity

Construct validity reflects how well the instrument projects the theory on which its questions are based (7). Most if not all SDIs are based on Parsons' sick-role theory (8). This very influential social theory supports also the glossary of negative terms relating to disablement that was adopted in 1980 by the WHO (9) for the International Classification of Impairments, Disabilities and Handicaps (ICIDH). It portrays the consequences of disease and disability as socially destructive to the functional and work-related role of individuals in society (10, 11). The Sickness Impact Profile (SIP), which evolved also from Parsons' theory as a generic psychometric instrument for measuring behavioural dysfunction relating the ill-health (12), has had a profound influence on the structural design of SDIs (Table 1).[†]

Consequently, most SDIs take an overwhelmingly negative approach to oral impairment and disability, and they overlook the positive behaviours and beliefs along with the coping and adaptive strategies of many disabled people. They fail also to acknowledge the socio-cultural environment as a mitigating influence on how disability is perceived and accommodated in different societies (10, 13). Alternatively, construct validity can be gauged by comparing the overall score from an instrument with the response to a single question addressing a global assessment of oral health. For example, construct validity is claimed when there is a close association between a low score on several of the more popular SDIs and a positive response to a global question about poor oral health (14).

Convergent validity, which is an expression of construct validity, refers to a convergent or similar response to like-questions, either within the same instrument or between instruments with the same theoretical base. Therefore, most SDIs with similar questions should display strong convergent validity because they are rooted deeply in sick-role theory. *Discriminant validity*, which is another expression of construct validity, addresses the

[†]In the interest of space, we refer to the text by Slade (19) in which the development and structure of most of the SDIs in current use are described. Instruments that are not described there are referenced individually in the text, and all acronyms are identified fully in Table 1.

ability of an instrument to discriminate between respondents who experience the same phenomenon in different ways, or between similar questions in instruments with different theoretical foundations (15). Quite simply, people indeed respond to the same phenomena in different ways if the context in which they experienced it changes or if they modify their understandings of the phenomena (16). Lastly, indicators with similar questions will provoke different responses if they are based on different theories of ill health.

Content validity

Content validity reflects usually the clarity, comprehensiveness and relevance of the questions in the instrument (17, 18). In almost all of the SDIs, experts have been used to judge the validity of the content, although there are a few notable exceptions (e.g. DIDL and DIP) where lay folk or nonexperts were also asked for advice (19). Content validity can refer also to *logical validity* when experts deem the questions to be logically sound; or to *face validity* when questions reflect appropriately the supporting theory (20). More broadly, content validity can denote the scope or range of the instrument's questions. However, most of the existing SDIs serve only to qualify, report the presence, and quantify the negative or bothersome impacts of oral impairment, which befits their theoretical foundation in sick-role theory (Table 1).

Some SDIs use questions derived solely from theory or from other instruments (e.g. OIDP and OHRQL), whereas others (e.g. GOHAI and OHIP) use questions based on theory but modified by input from nonexperts (19, 21). However, the nonexperts who are interviewed are usually patients rather than healthy people, so the bias of patients who are in treatment for some disorder or other probably limits the focus of the instruments towards the impact of disability and dysfunction (22). Moreover, when information in the form of a series of statements is gathered from nonexperts, it is usually distilled by experts into a small number of questions, which may further limit the focus of the inquiries if relevant information is left behind and if the question is phrased in a different nuance than the original statement. Similar difficulties can occur when experts take statements or questions from one 'validated' instrument to develop another (23) or to translate a validated instrument to another language (24, 25). Finally, some instruments cover a variety of clinical problems and their consequences, whereas others are more restricted (26). The OHIP (19) and the LORQ (23), for instance, both use about 40 questions to cover various oral health-related concerns so that they have some relevance at the level of the individual patient, whilst the RAND dental questionnaire and the OHQoL (19) present three questions to get a global or population-based impression of the social and psychological consequences of oral disorder.

Criterion validity

Developers can test the validity of their instruments against specific criteria, such as current (i.e. concurrent validity) or future (i.e. predictive validity) beliefs and behaviours (27). The instrument is valid when the response elicited (e.g. complaint of chewing problems) is associated with *concurrent* conditions (e.g. fractured tooth) or even more convincingly when the response can *predict* beliefs or behaviours. Unfortunately, the SDIs that are currently available do not predict oral health-related beliefs and behaviours very well (28, 29), possibly because respondents adapt to their impairments and limitations as time passes (30). More often than not, patients and respondents to SDIs when compared with clinicians and researchers see the need for health care and treatment quite differently (31), which confirms yet again the need for input from nonexperts when developing psychometric instruments. Criterion validity can be tested also against the known properties of an existing instrument, particularly if the existing instrument embodies a gold standard. Unfortunately again, gold standards relating to oral health are hard to find (32).

Limitations of the current validation testing

Relevance of the theoretical framework

Validity is closely linked to relevance. As we explained above, most of the existing SDIs dwell heavily on the negative impact of oral disorder, and they ignore the positive contributions of teeth to various aspects of life, such as eating and self-confidence. There have been some attempts to reconcile dental psychometrics with broader interpretations of health and disability (33); however, most SDIs overlook the adaptive and coping strategies, or the ethno-cultural factors that influence overall well-being (29, 34). The International Classification of Functioning, Disability and Health – ICF (35) promoted by the WHO recently

dismisses the predominantly negative view of disability in favour of a more existential or self-directed interpretation of health. The ICF also attempts to accommodate strategies for promoting health and preventing or minimizing the negative consequences of impairment and disability. It portrays disability and physical impairment as an integral part of the social, cultural and psychological context of people's lives subject to an ever-changing fabric of positive and negative values. Consequently, we feel that the ICF provides a more encompassing conceptual framework for a psychometric instrument to measure health-related beliefs and behaviours (4). For example, participants who answer 'yes' to the question 'did you experience difficulty opening your mouth wide?' on the SIDD (19) might indeed be bothered by the difficulty, or conversely they might have accepted the restriction without concern. Additional questions, such as 'is the ability to open your mouth widely important for you when eating or, talking?' or 'are you concerned that you cannot open your mouth widely?' might identify respondents who are not bothered by the impairment despite their affirmative answer to the question that simply identified the difficulty.

Confusing attributes

Construct, content and criterion validity are not the only terms used to identify specific attributes of validity (36, 37). Factorial, translation, intrinsic and practical validity all appear almost interchangeably (6), while criterion validity alone has been identified as convergent, discriminant, concurrent and predictive (19, 38). Apparently, validity is a broad and confusing concept that requires clarification and continuous evaluation. Moreover, we recommend that the evaluation process should test the predictive potential of an instrument within a theoretical framework that accommodates the full range of social and cultural characteristics of the population under investigation (5, 6).

Misinterpretations

Individuals respond to psychometric instruments within the context of a particular ethno-cultural environment, and not as 'naked individuals stripped of all historical, social, institutional and convictional connections' (39). Some ethno-cultural groups, for example, respond to pain very overtly (40), whilst others respond with more subtle and less obvious expressions of emotion (41). Similarly, total tooth loss is a handicap to some but a blessing or at least an expected part of life for others (42, 43). The limited interpretation that respondents give to questions adds further to the likelihood of misunderstandings. An affirmative response to the OHIP question: 'have you had difficulty chewing any foods because of problems with your teeth, mouth or denture?', or to the GOHAI question: 'how often did you limit the kinds or amounts of food you eat because of problems with your teeth, mouth or denture?' reveals simply that that the respondent had difficulty or problems; however, it reveals nothing about the concerns they caused. Some foods are naturally difficult to chew, so acknowledging this reality does not necessarily imply concern or a negative impact on quality of life (44). Likewise, an affirmative response to the DIDL question 'have you tried to avoid showing your teeth when smiling or laughing?' (19) could reflect normal behaviour in some Asian societies where it is boorish to display teeth, but anxiety in Caucasian societies where there is a disturbing preoccupation with dental appearance (45).

Translations

Questions posed within a particular ethno-cultural context (46) can miss the nuances of natural conversation and disturb original meanings when translated from one language to another (47), especially where words have no relevant or direct translation (48). Awareness of this potential for irrelevance and misunderstanding led to the elimination of seven questions in the Malay version of OHIP (49). The OHIP question 'have you had to interrupt meals because of problems with your teeth…?' translated to Portuguese as 'have you had to stop your meals…?', which holds quite another meaning (50). Other examples of potential misunderstandings are seen with the French translation of 'comfortably swallowing' for the GOHAI (48), and with the Italian version of the OHIP question 'have you been self-conscious because of problems with your teeth…?' (24). Apparently 'self-conscious' has no meaning in the Italian context! On the other hand, questions have been added to the Greek version of the OIDP to enhance its relevance to the experiences of Greek respondents (51). In all, despite reasonable attempts to provide sensitivity to linguistic translation, the impact on the validity of the psychometric instrument is unknown.

Significance and utility of scores

It is difficult to interpret the significance of a psychometric measurement when it is reported

simply as a numerical score, and especially if it represents only negative impacts. All too frequently, scores are interpreted misleadingly as indicators of concern and offer little insight to the utility or significance of a psychosocial impact (52). This dilemma is evident when interpreting the implications of similar scores derived under different circumstances. If, for example, a respondent answers 'very often' to the first 18 questions of the OHIP, and answers 'never' to the remaining 31 questions, the final composite score of 72 reflects disturbances to quality of life caused mostly by pain and physical limitations. However, the same score of 72 is achieved by answering 'never' to the first 31 OHIP questions, and 'very often' to the remaining 18 questions, but here the disturbances relate to disability and handicap. Evidently, a score of 72 can denote very different conclusions about the significance of oral impairment. Clearly, inferences made from a given score also need confirmation as part of the overall validation of the instrument (6). Juniper et al. (53) suggest that the score is useful only if it associates with an important change in impact, while Locker et al. (54) recommend scoring each domain of disturbance, if indeed this is possible given that people do not readily segregate life into stable, well-defined and measurable domains.

Unstable scores

Dental psychometric instruments have been used to measure the quality and impact of treatments and the effectiveness of oral health services. There is an assumption that a change in scores over time indicates improvement or deterioration in oral health (55). Yet, there is little evidence that psychometric scores reflect changes of clinical relevance (56). We do not know, for instance, whether an increase in a GOHAI score from 10 to 20 over a given period of time indicates that conditions have improved twofold or that the respondents simply had a change of mind during the same period (57). Perceptions of health and disability are influenced by the social, cultural and political context in which they are assessed; therefore, despite their popularity, psychometric instruments relating to oral health provide little help in explaining why respondents with severe dental impairments can rate their oral health as good and satisfying, whilst others complain in bitter distress (3, 32).

Conclusions

- Sick-role theory, which forms the conceptual basis for most psychometric instruments for dentistry has been challenged by theories offering a more positive and realistic interpretation of impairment and disability.
- The content of the questions used by many SDIs are ambiguous, vague, or limited in scope, which detracts from their ability to address the complexities of health measurements.
- Questions in SDIs about mouth concerns are reasonably dependable if they related to existing conditions; however, in general they provide a weak basis for predicting health-related beliefs and behaviours, probably because they do not accommodate the ever-changing sociocultural environment in which people live.
- The process of assessing the validity of SDIs should evaluate continuously the theoretical framework, the content of the questions, and the predictive potential of the scores, within the natural environment of the population in question.

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