

## Assessing the Content Validity of the EQ-5D Questionnaire Among Asians in Singapore: A Qualitative Study

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### Abstract

**Introduction:** Although the EQ-5D questionnaire is widely used to measure health status internationally, there is little evidence of its content validity in Asian populations. This qualitative study aimed to explore the content validity of the EQ-5D in Singapore. **Materials and Methods:** Sixty Singaporeans (Chinese: 20; Malay: 20; Indian: 20) completed semi-structured interviews in which they were asked about health concepts which were important to them and the relevance and comprehensiveness of the EQ-5D descriptive system (DS). Thematic analysis employing open, focused and axial coding was used to identify the themes and subthemes from the interviews. **Results:** A total of 70 health concepts were identified which fall into the broad categories of 'physical health', 'mental well-being', 'social relationships', 'medical conditions and treatment', and 'health promotion knowledge and behaviours'. The 5 dimensions in the EQ-5D DS were among the health concepts nominated by participants. Some participants suggested that content validity could be improved by adding social relationships, medical conditions and treatment, and health promotion knowledge and behaviours to the EQ-5D DS. **Conclusions:** This study confirmed that EQ-5D dimensions are important and relevant aspects of health to Asians in Singapore, although some dimensions that could be important to Singaporeans are absent.

**Keywords:** Content validity, EQ-5D, Qualitative research, Singapore

### Introduction

EQ-5D is a tool to measure and value health status.<sup>1</sup> It is a standardised questionnaire that comprises 2 components: a Descriptive System (DS) on the first page and a hash-marked visual analogue scale (EQ-VAS) on the second page. Importantly, responses to the DS can be converted into a utility score to indicate the value of the described health state according to the health preferences of the general

public in a given country or region. This utility score is widely used to estimate quality-adjusted life years (QALYs) in the economic evaluation of health interventions or programs.<sup>1</sup>

The EQ-5D has been used worldwide in many different populations, and the construct validity of its DS has been demonstrated in numerous studies.<sup>2-6</sup> However, only a handful of studies have investigated the content validity of the EQ-5D DS, and none was

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carried out in Asian populations.<sup>7–11</sup> Content validity is defined as the extent to which an instrument measures the important aspects of concepts that it is supposed to assess, and its importance has been stressed for development of patient-reported outcomes (PRO) instruments.<sup>12</sup> It should be noted that construct validity does not necessarily ensure content validity. Take EQ-5D, for example, although construct validity is confirmed to some degree for patients with asthma,<sup>13–15</sup> content validity is found to be poor for this patient group.<sup>11</sup> Therefore, it is imperative to formally assess both. Content validity is usually established before construct validity during the process of developing a new psychometric measure.

Cultural factors are one potential threat to the content validity of patient reported outcome (PRO) measures because culture influences people's ways of living, thinking, and expressing themselves, and therefore inevitably their ways of conceptualising and evaluating psychological concepts such as health.<sup>16,17</sup> As is the case for many PRO measures, EQ-5D was originally designed within a specific cultural context, by researchers from several European countries. However, driven by user demand, it was subsequently applied to populations from other cultures. Theoretically, EQ-5D may include dimensions that are less important to some cultures (i.e. the issue of relevance), and vice versa, health dimensions important to a culture may not be present in EQ-5D (i.e. the issue of adequacy).

While EQ-5D has been widely used and its construct validity extensively tested and demonstrated in Asian populations, its relevance and adequacy has not been investigated in that context. In order to address that gap in the literature, we explored the content validity of the EQ-5D DS among Chinese, Malays, and Indians living in Singapore. The research questions we intended to answer were: How do Singaporeans define health? What are the most undesirable health problems to Singaporeans? Are the EQ-5D dimensions relevant and collectively comprehensive?

## Materials and Methods

### *Participants*

Participants were recruited from the general public using convenience sampling methods. Recruitment began from conveniently selected residential areas by trained interviewers through personal contacts. A snowballing method was then used to recruit new participants who were not family members of existing

participants. Quotas were set to ensure a varied sample in terms of ethnicity, gender, age, educational level, and experience with illness. The inclusion criteria were as follows: (1) native Singaporeans living in Singapore for the past 5 years, (2) aged 40 years or above, (3) ethnic Chinese, Malay or Indian, (4) conversant in English or Chinese, and (5) willing to have the interview audio recorded. Written informed consent was obtained from each participant before interview. Ethical approval for the study was obtained from the National University of Singapore's Institutional Review Board (Ref No.: S-19-129E).

### *Data Collection*

Consenting participants were interviewed face-to-face and one-on-one using a standard semi-structured interview guide either at their homes, workplaces or other quiet public venues. All interviews were recorded with a digital voice recorder. Participants' demographic characteristics were collected using a questionnaire after the interview was completed. Up to 20 participants were recruited from each ethnic group, with the aim of achieving information saturation.

A standard semi-structured interview guide was designed by the investigators to elicit participants' understanding and conceptualisation of health in general before exploring their perceptions of the EQ-5D questionnaire. The semi-structured interview consisted of 2 main sections. The first section consisted of broad, open-ended questions to elicit the health concepts that are most important to the participants (e.g. Could you describe what is good health and poor health to you? What are the health problems that do or could affect your quality of life the most? What are the most undesirable health problems?). In the second section, participants were asked to use the EQ-5D DS to describe their health, following which they were asked for their opinions about the adequacy of the DS (e.g. Were any health aspects that are important to you but not included in the questionnaire?) and suggestions for how it might be improved to make it more relevant and adequate for them. The EQ-5D DS assesses the following five dimensions of health: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. In this study, we used the 5-level version of EQ-5D (EQ-5D-5L) in which each dimension has 5 levels of severity—no problems, slight problems, moderate problems, severe problems, and extreme problems.

Three interviewers were trained for this study using the interviewer guide designed by the study team. All

interviewers were bilingual (English and Chinese). Chinese participants were interviewed in their preferred language. Malay and Indian participants were interviewed only in English.

#### *Data Analysis*

All the recorded interviews were transcribed verbatim, with those conducted in Chinese translated into English after transcription, before they were coded by the interviewers. All the scripts were analysed by sections in accordance with the research questions: the dimensions used to define health and the most undesirable health problems in the first section; important health dimensions that are not included from the EQ-5D DS in the second section.

Thematic analysis was used to analyse the data. No pre-existing framework was used during analysis. The exception was when we coded the section for the most undesirable health problems, we used the WHO definition of health as the framework to identify themes under the three broad categories of physical, mental and social well-being.<sup>18</sup> The coders first familiarised themselves with a transcript before coding it line by line, following closely to the data. This was followed by focused coding, which involved grouping the common and important initial codes into themes and sub-themes. Axial coding was used to organise the themes into domains to give coherence to the analysis at the conceptual level.<sup>19</sup>

Each script was coded line by line by 2 independent coders. To establish consistency in coding, the 2 coders coded 5 common scripts independently and then reviewed their codes together to reconcile any differences. The principal investigator was consulted whenever the two coders could not reach consensus on any discrepancy. The initial codebook developed comprised 5 fields (code title, definition, example, inclusion/exclusion rules, and relationship to other codes). The definitions of the labels used in the codebooks were based on participants' interpretations. This codebook was created to ensure consistency in coding. An inductive process was also adopted to expand and refine the codebook so that new themes identified were reflected. Both coders followed the reconciled codes when they were coding independently. The coded transcripts were then independently reviewed for an assessment of the coding quality.

Excerpts were used to support the analysis; prefixes C, M, and S were used to indicate participant's ethnicity (Chinese, Malay and Indian), followed by a number. Where necessary, minor modifications were made to

the excerpts for easy understanding, such as when colloquial language was used or when a sentence was incomplete.

## **Results**

Sixty native Singaporeans, comprising 20 Chinese, 20 Malays, and 20 Indians, were interviewed from December 2016 to December 2017. Of the 60 participants, 28 were male and 32 were female, and the mean age was 58.9 years (range, 40–88 years old). Most of the participants had either received long-term patient care or had cared for family members or other patients with diseases that they perceived as serious (74.2%). They represented a range of socio-demographic characteristics (see Table 1). A total of 6 interviews were conducted in Chinese while the remaining were conducted in English. Findings were reported following the pre-defined research questions.

### *Health Concepts*

A total of 70 health concepts were identified from the first section of the interviews which focused on what constituted good, poor or excellent health. These health concepts were organised into 17 themes and 53 subthemes before being assigned to 1 of 5 broad domains: *physical health*, *mental well-being*, *social relationships*, *medical conditions and treatment*, and *health promotion knowledge and behaviours*. Figure 1 shows the hierarchical structure of the health concepts and Tables 2 and 3 presents the definitions and exemplar quotes for the health concepts. Below is a brief summary of the health concepts by domain and theme.

**Physical health:** This domain is interpreted as self-perception of the physical aspects of health. It contains 24 health concepts which are grouped under five themes.

**Mental well-being:** This domain comprises status and abilities related to mental activities. It contains 3 themes.

**Social relationships:** This domain includes 4 themes related to quality of interpersonal relationship and its consequences.

**Medical conditions and treatment:** This domain surrounds medical conditions.

**Health promotion knowledge and behaviours:** As suggested by its name, this domain refers to the knowledge and behaviours that promote good health.

Participants from all 3 ethnicities nominated health concepts that fell under the 5 domains. Interestingly, the concept of 'pain' appears in 2 identified domains, namely physical health and mental

Table 1. Participants' characteristics

	Chinese (N=20)	Malay (N=20)	Indian (N=20)	Total (N=20)
<b>Age (year)</b>				
Mean (SD)	65.4 (12.78)	57.1 (8.62)	54.3 (9.92)	58.9 (10.44)
40–59 (n,%)	8 (40%)	13 (65%)	10 (50%)	31 (51.7%)
≥60 (n,%)	12 (60%)	7 (35%)	10 (50%)	29 (48.3%)
<b>Gender (n,%)</b>				
Male	9 (45%)	8 (40%)	11 (55%)	28 (46.7%)
Female	11 (55%)	12 (60%)	9 (45%)	32 (53.3%)
<b>Care-taking experience (n,%)*</b>				
Directly received care	6 (30%)	4 (20%)	3 (15%)	13 (21.0%)
Directly provided care	7 (35%)	13 (65%)	13 (65%)	33 (53.2%)
No experience	8 (40%)	3 (15%)	5 (25%)	16 (25.8%)
<b>Highest Education (n,%)</b>				
Primary education or below	4 (20%)	1 (5%)	2 (10%)	7 (11.6%)
Secondary level (including 'A' level, other diploma and professional qualification)	14 (70%)	17 (85%)	12 (60%)	43 (71.7%)
University & above	2 (10%)	2 (10%)	6 (30%)	10 (16.7%)
<b>Marital Status (n,%)</b>				
Never married	3 (15%)	0 (0%)	1 (5%)	4 (6.7%)
Currently married	12 (60%)	18 (90%)	17 (85%)	47 (78.3%)
Separated/Divorced/Widowed	5 (25%)	2 (10%)	2 (10%)	9 (15%)
<b>Occupation (n,%)</b>				
Working	10 (50%)	14 (70%)	19 (95%)	43 (71.7%)
Homemaker/housewife	2 (10%)	3 (15%)	0 (0%)	5 (8.3%)
Retired	7 (35%)	2 (10%)	1 (5%)	10 (16.7%)
Unemployed	1 (5%)	1 (5%)	0 (0%)	2 (3.3%)
<b>Religion (n,%)</b>				
Buddhism/Taoism	8 (40%)	0 (0%)	0 (0%)	8 (13.3%)
Christianity	10 (50%)	0 (0%)	3 (15%)	13 (21.7%)
Hinduism	0 (0%)	0 (0%)	16 (80%)	16 (26.7%)
Islam	0 (0%)	20 (100%)	1 (5%)	21 (35%)
Other	2 (10%)	0 (0%)	0 (0%)	2 (3.3%)
<b>Average Earnings of Household per month (n,%)</b>				
< \$2,000	7 (35%)	5 (25%)	4 (20%)	16 (26.7%)
\$2000 - \$5999	5 (25%)	8 (40%)	6 (30%)	19 (31.7%)
> \$6000.00	5 (25%)	6 (30%)	8 (40%)	19 (31.7%)
Refused/ Don't know	3 (15%)	1 (5%)	2 (10%)	6 (10%)

\*One Indian and one Chinese participant remarked that they both received care and gave direct care.

Table 2. Domain, theme and definition

Domain	Theme	Operational Definition
Physical Health	Activities	Ability to carry out physical activities
	Appearance	Outward physical traits of a person
	Basic Functions	Persons' basic bodily functions
	Physiological Fitness	Physiological aspects of the body that makes a person physically fit
	Undesirable Body Sensations	Experience or lack of negative sensations
Mental Well-Being	Cognitive Function	Basic functions relating to mental processes involved in knowing, learning, and understanding things.
	Emotions	Feelings of emotional distress or positive emotional experiences
	Mind-set	Persons' general attitudes or way of thinking
Social Relationship	Available Support	Presence or absence of care, support and understanding from other individuals/institutions
	Burden to others	Self-perception of putting mental, financial or physical pressure on others due to own health state
	Quality of Relationships	Degree of harmony between family and non-family members and the ability to partake in social activities
Medical Conditions and Treatment	Family Medical History	Health status and history of the person's close relatives
	Financial Burden	Feelings of financial burden due to own health status
	Medical Diagnosis	Presence /Absence of Illness confirmed by medical test(s) or the doctor
	Medical Treatment	Need for medical resources including medicine prescription, medical aids, examinations or tests as well as the other medical advice
Health Promotion Knowledge and Behaviours	Behaviours	Behaviors associated with improving /damaging health
	Knowledge	Extent of knowledge pertaining to health promotion

well-being. Physical pain was reported as bodily pain due to painful illnesses.

*“Normally, there is ankle pain. This one you call it. [points to knee] and your spine.” (M008)*

Emotional pain was reported when the participants recounted being diagnosed with a serious illness or when other family members or loved ones were involved.

*“I think it [illness] puts a lot of pain, both to the patients and the family members” (S020)*

#### *The Most Undesirable Health Problems*

The health concepts that were identified as being most undesirable by participants were grouped according to the following domains: physical health, mental well-being and social well-being.

Physical health: Almost all the participants reported physical health problems as one key aspect that would affect their quality of life (QoL) most. These included problems in basic functioning such as mobility and vision, the ability to perform activities such as exercises and hobbies, and the ability to perform self-care activities and work-related activities.

*“A lot of things that they [stroke patients] cannot do already, such as putting their shirt. Eating [is also] difficult for them to do.” (M004)*

The concepts of pain and not being able to enjoy food were also highlighted by participants as some of their most undesirable health problems.

*“Heart attack, stroke all these will cause you a lot of pain and physical suffering.” (M010)*

Table 3 Exemplars of identified health concepts

Domain	Theme	Subtheme	Example of quote	
Physical Health	Activities	Daily activities	“Good health means no illness, can perform the daily routine work; healthy and you are able to do everything on your own.” (S006)	
		Recreational activities	“A person with excellent health, I think, would have no issues picking up a game, not having issues picking up a sports and being ready for any activities.” (S009)	
	Self-care (basic)		“That means the activity is restricted... bathe yourself, cannot move around yourself, cannot feed yourself, cannot dress yourself... and all these daily activities cannot be done by yourself.” (C011)	
		Work	“you can't go back to work and your productivity dips.” (C006)	
	Appearance	Hair loss	“There is the physical. Basically they lose hair.” (S017)	
		Weight/Shape	“Good health will be a healthy BMI.” (S009)	
	Basic functions	Breathing	“Let's say a weak heart... you might start panting and getting breathless ... inconvenienced by this shortness of breath.” (C013)	
		Bowel/Urine movement	“At night I give her pampers because her urine control is not very good.” (S001)	
	Physiological fitness	Upper limb control	Chew	“...teeth drop, loose. Some people at 60 years old, their teeth are still all very strong.” (S003)
			Hearing	“Hearing aid you can [hear]. But some people with the hearing [aids] also can't hear.” (M008)
Vision		Heart beat	“They helped me to put a battery inside (points to the pacemaker in his chest).” (C001)	
		Immunity	“I mean if you are bedridden, you know.. There's basically no quality of life.” (C013)	
Physical vitality/ energy		Sleep	“Cannot sleep well at night.” (M007)	
		Speech	“...your slurred speech.” (S014)	
Undesirable bodily sensations		Stamina	“...now my hand here... I still can squeeze but it's not so strong. It's a mild stroke.” (M012)	
		Giddiness/Dizziness	“...one eye, when I see things, it looks big. The other eye, when I see things, it looks small. That's why [when] I look at the ground, it is not flat. I will fall down.” (C005)	
Lack of appetite		Lack of appetite	“Sometimes like, people get the cough and flu very often. They have very weak immune system.” (S015)	
			“Excellent is, I mean you are proactive, energetic, everyday can do extra things. Always move around, very active person...” (S006)	
		“You cannot push yourself, you probably get tired easily; you probably have to rest more.” (S009)		
		“I feel quite giddy.” (C005)		
			“You feel like eating but then [when] you look at the food that you like, and then [you] just don't have appetite.” (C015)	

Table 3 Exemplars of identified health concepts (Cont'd)

Domain	Theme	Subtheme	Example of quote
Mental well-being	Cognitive function	Nausea/Vomit	“sometimes like you want to vomit or something like (because of dialysis).” (M010)
		Numbness	“...nerve problems; the numbness.” (M004)
Mental well-being	Cognitive function	Pain/Headache	“[Poor health] will cause you a lot of pain and physical suffering.” (M001)
		Concentration	“I think it is poor health when you want to study or you work, you can't concentrate.” (C017)
		Mental vitality/energy	“Mentally you are very tired, you can't perform.” (C006)
Mental well-being	Mental awareness/ orientation	Mental awareness/ orientation	“[Sugar level] can drop, and then the person can get very disoriented. The person can feel like, he cannot think carefully, that kind of thing.” (S006)
		Recall	“Sometimes people ask things, I might forget.... I cannot recognise places.” (C005)
Mental well-being	Speech/Thought formulation	Speech/Thought formulation	“Sometimes people... need to explain more then [I] can understand. If not I also don't know how to respond.” (C005)
		Emotions	“I like to control my life. So if I can't do things and I am not able to do, I get very upset.” (M017)
Mental well-being	Emotions	Agitated/Irritated	“I think it [illness] puts a lot of pain, both to the patients and the family members” (S020)
		Emotional pain	“Good health I think to me is happiness. if you are healthy, I think you'll be very happy.” (M009)
Mental well-being	Happy	Happy	“You can't have all these kinds of happiness, always feel very sad, very lonely, like nobody is with you. That kind of thing.” (M015)
		Sad	“You can't have all these kinds of happiness, always feel very sad, very lonely, like nobody is with you. That kind of thing.” (M015)
Mental well-being	Stress	Stress	“...for mental wellness you have to take care of your mental stress, take care of your psychological stress...” (M013)
		Worry/anxiety	“Poor health to me I think is [...] worry, a lot of worry... if a lot of worry, then maybe your health will get worsen?” (C010)
Mental well-being	Mindset	Hatred/Kindness	“Good health came from the heart. If you have good heart[...]means you are good to people, you don't have that kind of hatred.” (M015)
		Motivation	“You don't feel like going anywhere and probably you will get yourself enclosed I mean... stay at home.” (C006)
Mental well-being	Resilience	Resilience	“...once it affects your mental, it [thinking ability] will not operate properly... you can't think well because you have a lot of problems... you can't think well in the way that, you can't think, “oh this can be solved”.” (M015)
		Open/Close mindedness	“...people with poor health tend to feel so in a way they don't think so positively, very narrow their thoughts and everything...” (C014)
Mental well-being	Self-concept	Self-concept	“...you feel sick of yourself.” (M019)

Table 3 Exemplars of identified health concepts (Cont'd)

Domain	Theme	Subtheme	Example of quote
Social Relationship	Available support		“Family is not there. Then you got work problem which you don’t know who to turn to or who to talk to. Then you feel depressed all the time. You can’t go out anywhere, you cannot do your normal things because you keep thinking about it. Then it affects your own self.” (M005)
	Burden to others		“...the whole family also has to go through that kind of problem, not only the patient himself. The whole family have to undergo a lot of problems.” (S006)
Quality of relationships	Family relationship		“Good health can also mean be happy with the family, so everyone is happy.” (M007)
	Social relationship		“Good health to me is like I can walk about, going out meet my old friends for lunch every weekend.” (C015)
Medical conditions and treatment	Family medical history		“Excellent means like your family history got nothing.” (C020)
Financial burden			“Poor health means need more money to go to hospital, clinics, buy medication. Sometimes if you are financially troubled, then it’s really very difficult for [you]...” (M007)
Medical diagnosis			“Poor health is when someone is physically ill... are mentally affected or depressed, you know.” (M010)
Medical treatment	Doctor visits		“...everyday got to visit doctor, visit hospital, I think that is poor health.” (C010)
Hospitalisation			“Good health is something where you stay away from hospitals, being admitted and all.” (S011)
	Medical test		“You have to go to the hospital, do your health checkups.” (S004)
	Medication		“...where you are on medication throughout your life or for certain period of your life.” (S011)
Operation			“I had an eye operation.” (C003)
	Adequate sleep		“...good health, [one] must have...ample sleep. (M011)
Behaviours			“Stay away from alcohol.” (S009)
	Dietary habits/restrictions		“Whatever you eat, it is not you cannot eat but must eat in moderation.” (C020) “Good health means that you can eat everything. Like right now I have high purine so I cannot eat too much red meat and beans.” (M005)
Engaging activities			“My mind is never empty you know... my mind is thinking about something else... even if you don’t do anything you must at least have a hobby.” (C015)
Exercise			“Excellent health to me would be you have to consistently do your exercise regime to continuously keep fit.” (M013)
Hygiene			“Poor health [and] the condition of your house [is] very dirty, messy, that can also cause poor health. (S003)
Smoking			“...good habits about yourself, you know, like don’t smoke.” (M010)
Knowledge			“Know what are the correct types of food to eat.” (S009)

*“[Due to] gastric problems, I cannot eat my favorite spicy food, sour food.” (C008)*

Mental well-being: Mental well-being was also considered to have a significant effect on QoL. Excerpt below shows how anxiety can affect QoL.

*“Once you get cancer, it is... so sad. Her [cancer patient] enjoyment is not there already... she will be worried, worried, worried. She won't know when is her last day.” (S004)*

Social well-being: Issues such as being confined at home, withdrawal or isolation from their social networks were said to potentially decrease QoL drastically.

*“I cannot be close to my loved ones or friends. I would probably be very isolated.” (C014)*

#### *The Comprehensiveness of EQ-5D Dimensions*

In general, the 5 dimensions in the EQ-5D DS were said to be adequate in describing health status. This is reflected in the excerpts below.

*“I think it is quite complete. I think it covers all mostly all the areas.” (C010)*

Although the questionnaire was regarded positively, some suggestions were given by the participants for improvement. These included dimensions of health that are not found in the existing questionnaire. The nominated dimensions fell under the same five categories identified from section one of the interviews and are summarised below.

Physical health: Under this category, participants suggested adding questions regarding appetite, ability to eat, dietary restrictions, sleep, and vision.

*“They didn't talk about your appetite. I think they should put it in [the questionnaire]” (S012)*

*“Not being able to eat means you cannot take certain food due to illness... it is not under [any dimensions in EQ-5D].” (C018)*

*“Sleep... [is] not included here.” (S011)*

Mental well-being: Under this category, a participant pointed out that EQ-5D might not be able to capture the impact on cognitive functioning due to dementia.

*“Dementia is different from the rest of the five aspects.” (M002)*

Social relationships: Questions regarding family relationships, available support, and the experience of being a burden to others were suggested by participants

*“Maybe you can add ‘Any problems with family life?’” (M011)*

*“Some people don't have finance problem, you know. At least they got, government supporting them. This kind of, nobody supporting them, like no father, no mother, no sister.” (S010)*

*“I want to add... ‘Burden to family’.” (M013)*

Medical conditions and treatment: A need to include questions on medical situations (such as medical diagnosis and treatment) and financial burden was raised by some participants

*“They don't have a question [which] asks about whether you have any kind of sickness.” (C019)*

*“Cost of medicines is not similar to any of the 5 aspects.” (M003)*

#### *Comments and Suggestions for Improving EQ-5D DS*

Participants who elaborated on why they thought the EQ-5D DS was good revealed that they found the questionnaire easy to understand and is of suitable length.

*“No, better don't change it because this one is simple, you can ask elderly; elderly can answer you.” (S004)*

The most often alluded negative comment was that the EQ-5D DS does not probe sufficiently into respondent's health and that the questionnaire can include more items from the same dimensions.

*“[EQ-5D] is quite general, I would say. It doesn't go into details, right? Very general.” (C006)*

Other negative comments included difficulty in understanding some of the terms used in the questionnaire such as ‘anxiety’, ‘depression’, ‘mobility’ and ‘discomfort’. There was also difficulty in differentiating the terms ‘slight’ and ‘moderate’ found in the response options of the English version. Another comment raised was that the item “anxiety/depression” is a sensitive topic.

*“I know depressed but what is anxious?” (S008)*

*“It's [‘moderate’ and ‘slight’] quite similar. I mean look at it. I have a slight pain. I have a*

*moderate pain. It's quite close unless you can tell them a degree of [difference].” (S011)*

*“Like this one—severely anxious/ depressed... They [the respondents] will hide. They won't tell the secret.” (S008)*

Participants also recommended combining dimensions of EQ-5D due to similarities and overlaps in concepts. The dimensions suggested to be combined are ‘Usual Activities’ with ‘Mobility’ and ‘Self-Care’ with ‘Mobility’.

*“I think this one [Usual Activities] and this one [Mobility] can combine because I think walking is a usual activity.” (C018)*

*“Especially like ‘self-care’, it shows your mobility, I think they are quite linked.” (S011)*

On the other hand, one participant recommended separating the item ‘Anxiety’ from ‘Depression’.

*“It's [EQ-5D] not directly asking you what kind of anxiety or what kind of depression. Like, sometimes I don't have depression but I might have anxiety.” (S005)*

In order to facilitate respondents' understanding, concrete examples for each response option were suggested to be included.

*“This ‘Mobility’, right? Maybe they [the questionnaire] can prompt you that, certain distance or uphill [or] downhill that [sort of thing].” (S019)*

Some participants also suggested replacing the current response format for ‘Pain and Discomfort’ item with a face or number scale.

*“Then rate the pain, 1 to 10.” (S015)*

*“How we always evaluate the pain score, can put the face level so they know that. It's easier than words...so that it will cater to all age groups.” (S012)*

## Conclusions

In this study, all 5 health dimensions of EQ-5D DS were found in the framework of health concepts nominated by Asians living in Singapore, namely, mobility as a basic function (category: physical health), self-care and usual activities as activities (category: physical health), pain/discomfort as undesirable bodily sensations, and anxiety/depression

as worry/anxiety and happy/sad (category: mental well-being). Health concepts that emerged when discussing participants' most undesirable health problems also coincided with the 5 dimensions in the EQ-5D DS. It is noteworthy that these health concepts were elicited from participants before they saw the EQ-5D-5L questionnaire so that their responses would not be influenced by prior knowledge of instrument content. In addition, respondents generally commented the EQ-5D DS to be adequate; only a few respondents suggested other possible dimensions to be included in the instrument, which, for them, would presumably help to improve the adequacy of the EQ-5D DS. These findings suggest that even though the EQ-5D DS was originally designed by researchers in European countries, it does have a considerable degree of content validity in this multi-ethnic and multi-cultural Asian population. To the best of our knowledge, no evidence on the content validity of the EQ-5D DS in Asian populations is available in the literature. Therefore, our study is an important first step in filling the gap in evidence for the content validity of the EQ-5D instrument in Asia.

While content validity appears to be satisfactory, the EQ-5D DS covers only a small portion of the health concepts identified in the study and respondents did propose a number of additional health concepts which they thought would improve the comprehensiveness of the questionnaire. It should be noted, though, that a recent systematic review found that not all ‘bolt-on’ dimensions improve measurement properties.<sup>20</sup> Furthermore, addition of new items to EQ-5D would mean an increase in respondent and administrative burden which needs to be balanced against any potential increase in content validity and other measurement properties. It is not clear, from the current findings, which additional health dimension(s) would bring the most psychometric advantage and/or improvements to content validity in EQ-5D when assessing the health status of Singaporeans. That was not the aim of this study and further research would be required to explore whether health dimensions such as appetite and ability to eat, which are assigned high value in Singapore culture, are considered equally or more important than the health dimensions already included in the instrument and whether those dimensions could improve the measurement of Singaporeans' health.

Our study suggests a special issue that users of the EQ-5D questionnaire may face among Asian in Singapore. Although the questionnaire is brief and simple, respondents with low literacy levels may have

difficulty understanding some of the wording such as ‘mobility’ and ‘anxiety/depression’. It is also possible that some respondents might have difficulty differentiating between ‘slight problems’ and ‘moderate problems’. The issue of respondents’ failing to recognise the relative severity described by ‘slight’ and ‘moderate’ was reported in previous studies.<sup>21,22</sup> These issues suggest that interview-administration might be more appropriate when study samples comprise individuals with low literacy levels, such as old people.

Our study also suggests ways in which EQ-5D could be improved. For example, one way is to separate the 2 dual dimensions, namely, ‘pain/discomfort’ and ‘anxiety/depression’. The dual dimensions may be confusing to respondents and therefore difficult to answer; it therefore may be less informative than assessing the 2 component problems separately. Indeed, another study conducted in the United Kingdom on patients with asthma showed that ‘anxiety’ and ‘depression’ were considered by respondents as separate issues and that the combination of the two concepts into a single item was not optimal.<sup>11</sup> Modifying the questionnaire in this way, however, would increase the total number of questions which would increase respondent and user burden. Moreover, addition of dimensions means new valuation studies would be required, which entails a lot of work. Therefore, the gains and losses need to be weighed very carefully before any changes are made.

The conceptual framework of health developed from the results observed in this study had similarities and differences with an earlier framework put forward by Thumboo et al.<sup>23</sup> In that study, patients and health professionals in Singapore were first asked to indicate areas of life they considered important in order to be happy and satisfied with life before completing a similar exercise which only focused on health. Participants identified a total of 27 health concepts. While both studies identified health concepts falling into the 3 broad categories of physical health, mental health and social health (which were pre-specified in Thumboo et al, but not in our study) only our study identified concepts related to medical conditions and treatments and health promotion knowledge and behaviours. This could be explained by the types of questions asked during the interview process.

While our study probed more into health problems, Thumboo et al’s study took a broader approach where participants were asked to think about “areas of life they considered important in order to be happy

and satisfied with life” followed by focusing on “health” and “the subset of areas in health”. As there was more emphasis on negative aspects of health, it is perhaps unsurprising that, in contrast to Thumboo et al, we elicited dimensions and themes such as ‘medical condition’ and ‘smoking’ or ‘alcohol’ consumption. We also retained a higher level of granularity when including health concepts in the conceptual framework, by including domains, themes, and sub-themes, which means that we included a larger number of health concepts. We believe this enhances the framework’s informatively. For example, Thumboo et al included ‘emotions’ as a domain without breaking that down into specific components; in contrast, we preferred to retain specific emotions such as ‘worry/anxiety’ and ‘happy/sad’ within the framework, in part because the components of the emotions domain could vary by country. A further important difference between the two frameworks is that we identified ‘usual activities’, including ‘work’, as a relevant health concept whereas Thumboo et al found that ‘work’ and other activities were not cited as important aspects of health or QoL but rather that health was described as a requirement to engage in these activities. It is not clear why this difference should have arisen but again it may have something to do with the type of questions asked, for example by our inclusion of questions on health problems and what bad health means. At least some of the references to the inability to work being an important health problem arose in that section of the interview.

This study was based on a general population sample only, in part because EQ-5D is intended for use in a range of population types, including the general population. This is also because the EQ-5D index score is based on the preferences of the general public for the health states described by the descriptive system. Therefore, it would seem to make sense to ask the general population to evaluate the descriptive system. Although it might appear to make sense to also carry out this sort of study in patient samples, great care would need to be taken to ensure that content was not biased toward or against particular patient populations.

Another limitation of the study is the use of face-to-face interview as the sole data collection method. Health may be a sensitive topic to discuss for some Asians, especially through a one-to-one, face-to-face conversation. Therefore, a combination of both in-depth interviews and focus group discussion where participants could encourage one another to express their views might be a better strategy for this study.

Indeed, sexual function surfaced as an important health domain in another study in Singapore where both modes of data collection were used,<sup>23</sup> but was not alluded to in our study. Nevertheless, similar health concepts were generated from our study, suggesting that this limitation might not have biased our findings towards incompleteness significantly. Due to manpower constraints, we had excluded Malay and Indian participants who did not speak English. This meant that the views of older Malay and Indian participants with lower levels of education were not included in this study.

In this study, only participants aged 40 and above were invited to take part. The study team believed that, compared to this group of participants, younger participants might not have had as much experience with poor health and chances to reflect upon the concept of health. Thus, this age restriction was implemented to involve participants who were thought to be better able to contribute to the discussion of the concept of health. The study team acknowledges that concepts of health deemed important to younger people might differ. Nevertheless, our findings were similar to those reported in the Thumboo et al study, which did include younger participants. This suggests that the inclusion of younger adults in our study may not have led to very different results. It would be of interest, however, for future studies to explicitly explore whether there are differences between younger and older respondents in terms of the health concepts they consider most important.

In conclusion, our study provides preliminary evidence of the content validity of the EQ-5D for measuring the health of a multi-cultural, multi-ethnic Asian population. Findings from this study may be used to inform future research aiming to assess or improve the instrument in Asia.

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