

Original Research Article

Development and validation of a quantitative tool for assessment of sense of grip on disease among PL-HIV: a confirmatory factor analysis

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ABSTRACT

Background: Every chronic illness involves specific physical, social, and psychological care. Patients must comprehend their diagnosis (sense) and gain control over the ailment (grip on the disease). The sense of grip on disease (SoGoD) of a person living with chronic disease can be explored using narrative interviews which are lengthy, and often subjective. Thus, there is a need for an objective quantitative tool to assess SoGoD status. Our objective was to develop a quantitative tool for the assessment of a sense of grip on disease based on the SoGoD model.

Methods: This institution-based tool development study was conducted among 120 PL-HIV visiting the ART center of a tertiary care hospital in Kolkata in 2023. Based on the deductive approach and literature review, a five-construct SoGoD tool was made, subsequently validated by three domain experts, pre-tested, and revised. Revised version used for data collection. Confirmatory factor analysis and reliability analysis were performed for the tool validation.

Results: A 15-item tool well mounted on five theoretical constructs of SoGoD was confirmed. Each item responded to a five-point Likert scale of one to five, considering the imposed weight, the global SoGoD score ranges from 3 to 15. A higher score indicates a higher sense of grip. The cut-off value was found to be seven. The tool was internally consistent with Cronbach's alpha of 0.883.

Conclusions: Sense of grip on disease is a relatively simple, easy-to-apply tool but the cut-off needs to be contextualized based on setting and population.

Keywords: Chronic diseases, Confirmatory factor analysis, Cronbach's alpha, Sense of grip on disease, Tool validation

INTRODUCTION

World Health Organization defines chronic disease as 'an illness for which there is no definite treatment are there but a range of various medical treatments and health behavior is there for its management'.¹ All chronic diseases have their specific characteristics but they all share a common ground that they stay for the lifelong, demanding addressal of disease-specific medical, social, and psychological needs such that people diagnosed with chronic diseases which is a critical experience in their lifetime have to engage themselves in the management of

their disease, has to understand the diagnosis and its implications, has to cope with the new challenges that come with the diagnosis.²⁻⁴

This critical experience can be described as an amalgamation of affective, visceral, and bodily experiences that cannot be expressed by words. These inexpressible phenomena are translated into comprehensible words by a process known as 'sense-meaning-making' or in short 'sense'. On the other hand development of psychological competencies required for disease management as well as personal and contextual

change post-diagnosis is known as ‘grip on disease’.⁵ Maiello et al gave the sense of grip on disease (SoGoD) model developed based on narrative, semiotic, and socio-constructive perspectives, explores the critical experiences a person goes through post-diagnosis of a

disease (sense) and its effect on mental competencies required for comprehensive disease management.⁵⁻⁷ It has the following narrative domains with their dimensions (Table 1) with two ultimate grip profiles of ‘dynamic grip’ and ‘compliant grip’.

Table 1: The SoGoD model and its construct.*

Grip profile		Dynamics grip		Compliant grip	
Narrative domains		Organization of temporality: How the disease affects their past, present, and future	Integration of disease: How they come to terms with the disease and integrate it into their daily life	Orientation to action: How they view the daily activities required for disease management i.e. exercise, decision making	Social sharing: How they talk about disease experience with their friends and family as well as health care providers
		Absence: No change at all Crystallization: Life freezes at the point of diagnosis Transformative: Life changes dramatically post-diagnosis	Conflict: Cannot to come terms with the diagnosis Tolerance: Accepted the diagnosis of disease but unable to integrate into life Co-existence: Integrate the disease into life fully	Limiting: Other activities of daily life are limited Executive: Rigid, and non-personalized activities made them feel trapped by obligations Flexible: Manages the daily activities required for disease management by themselves	Expression of Emotion: How they express emotion and feelings related to the disease Absence: Unable to share Interchange: Able to share with someone but that doesn't give emotional relief. Sharing: Able to share, which gives emotional relief and feelings of being understood Vagueness: Unable to express the cause(s) of emotion and feelings Differentiation: Able to express the emotion and feelings and the causes behind them

*As per Maiello et al⁵

So, the SoGoD status of an individual living with chronic disease can be explored using semi-structured face-to-face interviews but often these can be lengthy, and difficult to analyze, and nonetheless, subjective biases can't be excluded. It showed that there is a lack of an objective quantitative tool to assess the SoGoD status. Thus, our study aimed to develop a quantitative tool to assess the SoGoD status.

METHODS

An institution-based tool development study was conducted among 120 adult patients diagnosed with HIV visiting the ART center of the School of Tropical Medicine, Kolkata, from September to December 2023.

Sample size and sampling

As the final revised version of the tool contained 24 items, as per respondent item ratio of (5:1) total of 120 participants were included in the study.⁸

There were on average 70 people diagnosed with HIV visiting the study setting on a regular working day. Considering the selection of a maximum of 10 participants each day the sampling interval came to seven.

Thus, systematic random sampling was applied using the daily register to select every 7th visitor until the daily sample size was met.

Data collection

Upon selection, the individual was approached and they were explained about the research and its objectives. Those who were sick, and/or refused/unable to give written informed consent were excluded on ethical grounds. Upon agreement they were interviewed, using a close-ended semi-structured interviewer-administered questionnaire containing the socio-demographic details (age, gender) and the revised SoGoD tool.

Sense of grip on disease (SoGoD) tool

The quantitative tool to assess coping was formulated based on the SoGoD model given by Maiello et al.⁵ As per the model constructs wise items were framed through deductive reasoning, after a thorough review of the literature. The initial pool of 36 items was generated and then they were reviewed by three independent domain experts i.e. public health specialist, psychiatrist, and infectious disease specialist. Based on their feedback, the items were revised. The revised versions were translated

into local languages i.e. Bengali and Hindi and then again back-translated into English by two independent people to maintain compatibility.⁹ The revised tool was pre-tested among 20 adult PLHIV visiting another ART center for acceptability, clarity, and readability. Based on their suggestions further revision was done.

This final version containing 24 items was applied among 120 study participants.

Responses to the questions were coded on a five-point Likert scale of strongly disagree (1) to strongly agree (5), in such a direction that higher values reflected higher SoGoD status. Item numbers two, six, nine, ten, eleven, and thirteen were reverse scored.

Statistical analysis

The SoGoD tool was developed with a congeneric, and unidimensional five-factor confirmatory model containing 24 items. Initially, the dataset was screened for the assumptions needed to meet for conducting CFA i.e. Adequate sample size, Multivariate normality, etc.^{10,11}

The validity of the model was tested based on factor loading of the items with an acceptable cut-off >0.7, average variance extract (AVE) >0.5, and composite reliability (CR) >0.5.^{10,11}

The model fit was assessed and determined by: 1) statistical fit (χ^2); 2) absolute fit using the root mean square error of approximation (RMSEA) with values ≤ 0.08 indicating acceptable model fit and values ≤ 0.05

indicating close fit and the goodness of fit index (GFI) with values ≥ 0.90 indicating acceptable model fit and values ≥ 0.95 indicating close fit; 3) relative fit using the Tucker-Lewis index (TLI) and comparative fit index (CFI) with values ≥ 0.95 indicating close model fit and values ≥ 0.90 indicating acceptable fit.¹²

The internal consistency of the tool was assessed by Cronbach's alpha (α) statistic and the cut-off was taken as ≥ 0.7 .^{13,14} At first item-rest correlation was calculated with a cut of 0.20.¹⁵ Then average inter-item correlation within a construct was also assessed, with a desired value between 0.15 to 0.50.¹⁶ For each item, changes in the alpha of the tool if the item had been removed were also calculated. To determine the cut-off, item analysis was applied.^{17,18} Data were analyzed using MS Excel 2021 and SPSS software version 16.

Ethical consideration

Ethical permission was taken from the institutional ethics committee from STM, Kolkata (ref no. 2023-AS38), AIHH and PH, Kolkata, and NACO.

RESULTS

The mean age of the study participants was 46.8 ± 12.2 years. Out of 120 participants, 85% of them were literate. Table 2 shows the responses of the participants to the questions intended to formulate the SoGoD tool.

Table 2: Response of the study participants on the item (n=120).

Constructs	Item No.	Items (codes)	SA Number (%)	A	N	D	SD
Organization of temporality	1.	My whole life has changed after the diagnosis. (Org1)	11 (9.2)	11 (9.2)	18 (15)	49 (40.8)	31 (25.8)
	2.	My life has become stagnant from the point of diagnosis. (Org2)	11 (9.2)	7 (5.8)	36 (30)	47 (39.2)	19 (15.8)
	3.	I have made significant progress in my life after the diagnosis. (Org3)	6 (5)	18 (15)	32 (26.7)	35 (29.2)	29 (24.2)
Integration of disease	4.	I have accepted my diagnosis. (Int1)	13 (10.8)	13 (10.8)	44 (36.7)	38 (31.7)	12 (10)
	5.	This disease has become an integral part of my life. (Int2)	11 (9.2)	16 (13.3)	28 (23.3)	48 (40)	17 (14.2)
	6.	I failed to modify my life accordingly after the diagnosis. (Int3)	9 (7.5)	19 (15.8)	30 (25)	39 (32.5)	23 (19.2)
Sharing	7.	I can share my thoughts regarding my disease with anyone. (Shr1)	19 (15.8)	16 (13.3)	33 (27.5)	32 (26.7)	20 (16.7)
	8.	Sharing my thoughts regarding the disease with someone gives me emotional relief. (Shr2)	19 (15.8)	14 (11.7)	34 (28.3)	40 (33.3)	13 (10.8)
	9.	I have no one to share my thoughts regarding my disease (Shr3)	8 (6.7)	27 (22.5)	42 (35)	30 (25)	13 (10.8)
Orientation to action	10.	The activities I need to do for the management of my disease are rigid and non-personalized (Ori1)	11 (9.2)	14 (11.7)	37 (30.8)	33 (27.5)	25 (20.8)
	11.	My daily life is hampered because of the disease management activities. (Ori2)	13 (10.8)	9 (7.5)	31 (25.8)	48 (40)	19 (15.8)

Continued.

Constructs	Item No.	Items (codes)	SA Number (%)	A	N	D	SD
	12.	I can easily perform all the activities for the management of my disease without any hassle (Ori 3)	6 (5)	15 (12.5)	33 (12.5)	31 (25.8)	35 (29.2)
Expression of emotion	13.	I conceal my emotions and feelings, associated with my disease. (Exp1)	13 (10.8)	16 (13.3)	18 (15)	46 (38.3)	27 (22.5)
	14.	The emotional turmoil that I have experienced after my diagnosis is mainly related to my disease. (Exp2)	9 (7.5)	19 (15.8)	25 (20.8)	39 (32.5)	28 (23.3)
	15.	I have become more emotionally expressive after my diagnosis. (Exp3)	8 (6.7)	18 (15)	25 (20.8)	25 (20.8)	44 (36.7)

SA: Strongly Agree (5), A: Agree (4), N: Neutral (3), D: Disagree (2), SD: Strongly Disagree (1).

*Items number two, six, nine, ten, eleven, and thirteen were reverse-scored.

Table 3: Factor loadings of the items and construct-wise model validity statistics.

Factor	Items	Factor loading (λ)	Average variance extract (AVE)	Composite reliability (CR)	Percentage of total variance explained
Organization of temporality	Org1	1	0.84	0.97	51.3
	Org2	0.89			
	Org3	0.87			
Integration of disease	Int1	1	1.25	0.95	11.1
	Int2	1.23			
	Int3	1.12			
Sharing	Shr1	1	0.81	0.96	7.9
	Shr2	0.93			
	Shr3	0.77			
Orientation to action	Ori1	1	1	0.99	7.6
	Ori2	1			
	Ori3	1.01			
Expression of emotion	Exp1	1	0.95	0.99	5.2
	Exp2	0.95			
	Exp3	0.98			

Table 4: Reliability of items and domains.

Factors	Items	Average inter-item correlation	Item-rest correlation	Alpha (α) of the tool if the item is deleted	Alpha (α) of each Factor	Overall reliability
Organization of temporality	Org1	0.51	0.67	0.69	0.72	Alpha (α) of the tool 0.883 Average Item-rest Correlation 0.51
	Org2	0.5	0.65	0.77		
	Org3	0.53	0.69	0.78		
Integration of disease	Int1	0.48	0.62	0.75	0.75	
	Int2	0.56	0.74	0.72		
	Int3	0.54	0.72	0.65		
Sharing	Shr1	0.49	0.63	0.82	0.82	
	Shr2	0.47	0.60	0.71		
	Shr3	0.47	0.61	0.88		
Orientation to action	Ori1	0.48	0.62	0.76	0.7	
	Ori2	0.51	0.67	0.8		
	Ori3	0.5	0.65	0.68		
Expression of emotion	Exp1	0.54	0.71	0.78	0.8	
	Exp2	0.49	0.64	0.86		
	Exp3	0.52	0.69	0.75		

Table 5: Cut-off determination for the SoGoD tool (n=120).

Factors	Mean raw score (x)	Standard error of mean	Cut-off point	Total cut-off
Organization of temporality	7.35	0.29	1.3	6.8
Integration of disease	8.04	0.27	1.4	
Social Sharing	8.62	0.29	1.5	
Orientation to action	7.54	0.29	1.3	
Expression of emotion	7.37	0.31	1.3	

Cut-off point = $\Sigma [(\text{Mean raw score} - 2 * \text{Standard error of mean}) * \text{Correction factor}]$

Where, Correction factor = $(\text{Sum of total weighted score} / \text{Sum of total raw score}) = 918.45/4676 = 0.19$

Standard error of mean = $SD/\sqrt{n}$

Assumptions of CFA

Five theoretical constructs along with the communality of each item were more than 0.6 indicating a sample of 120 was adequate to conduct CFA.¹⁹ There was multi-variate normality. There were no missing values. We arrived at three items per construct. Thus, it was a Just-identified model.

Model validity

The model was valid with the factor loading (λ) of each item on their respective construct >0.7 , average variance extract (AVE) >0.5 , and composite reliability (CR) >0.5 . As for nomological validity, the observed findings coincide with theoretical constructs (Table 3). The five-factor model is shown in Figure 1.

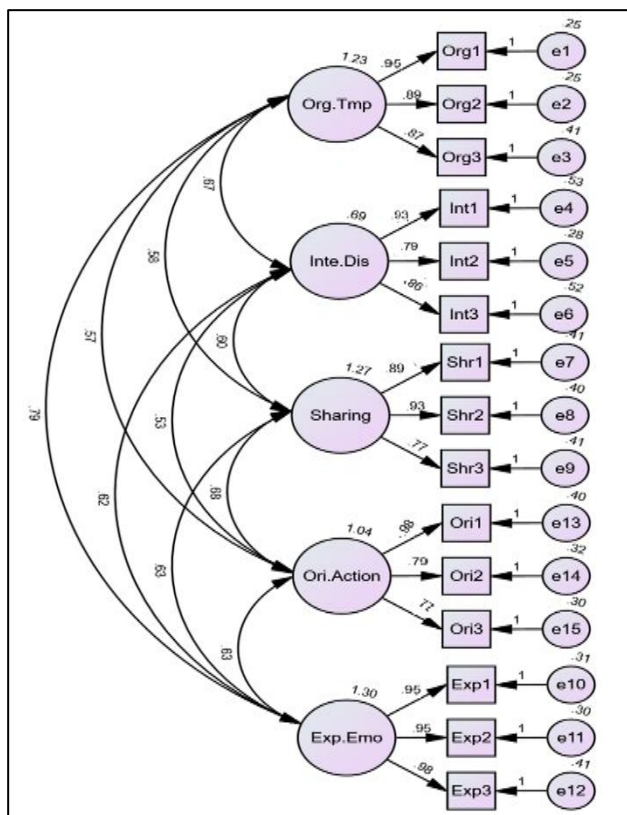


Figure 1: Five-factor confirmatory model for the 15-item SoGoD tool.

Model fit statistics

The chi-square value was 101.62, with χ^2/df value of 1.27 (p value 0.152), suggesting a good fit to the data. The RMSEA (0.048), CFI (0.938), and GFI (0.043) all suggested an acceptable fit, while the TLI (0.978) suggested a close fit. The standardized residual of all items was <2.5 , thus no item has been dropped.

Reliability statistics

The tool was internally consistent with the alpha of 0.883 (Table 4).

Weightage and cut-off determination

Considering the percentage of total variance explained by each construct (Table 4) we asserted weight, to arrive at a global SoGoD score = $[(\text{Item 1} + \text{Item 2} + \text{Item 3}) * 0.5] + [(\text{Item 4} + \text{Item 5} + \text{Item 6}) * 0.2] + [(\text{Item 7} + \text{Item 8} + \text{Item 9}) * 0.1] + [(\text{Item 10} + \text{Item 11} + \text{Item 12}) * 0.15] + [(\text{Item 13} + \text{Item 14} + \text{Item 15}) * 0.05]$. The cut-off was found to be 6.8, rounding off to seven (Table 5).

DISCUSSION

This study confirmed the SoGoD model, based on the data collected from 120 PL-HIV visiting a tertiary care hospital in Kolkata. The items included were based on the theoretical framework given by Maiello et al.⁵ 15 items were mounted on five factors, organization of temporality, integration of disease, orientation to action, social sharing, and expression of emotion, found to be well fitting.

Considering the imposed weight, the global SoGoD score ranges from 3 to 15. A higher global SoGoD score indicates higher SoGoD status. As for the cut-off value of seven, any SoGoD global score of seven or more will be considered to be a dynamic sense of grip, otherwise compliant sense of grip.

This study has some limitations. This tool is developed based on the response from PL-HIV only, who face a harsher environment in comparison to persons living with other chronic diseases. Thus, their responses can be extreme which renders the tool with a stringent cut-off

value, which can be contextualized based on setting and population.

CONCLUSION

This study revealed a simple and concise, quantitative tool to assess SoGoD status, that can be applied easily, easy to analyze, and interpret. Thus, this tool can be used further to measure coping behavior in PLHIV and also to find out the factors associated with it, which could be helpful to innovate new strategies for the improvement of quality of life for PLHIV.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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