Reliability assessment and factorial analysis of health locus of control scale among 12 and 15 year old school children of Central India

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Abstract – The present study is an attempt to check the reliability as well as factor structure of locus of control scale among school children from Central India. The target population for the cross-sectional study was 12 and 15 year old school children from Bhopal city, Central India. The eleven-item health locus of control questionnaire (HLC) was used to assess locus of control and to predict health-related behavior. A total of 462 children were interviewed; 259 children were from 12- year age group and 203 children from 15 year age group. Principal component analysis was used to factorize the scale. Factor analysis principle components, varimax rotation was employed to assess the factor structure. The internal consistency of the health locus of control scale in the study population proved to be good; Cronbach's alpha was 0.82.The factor analysis after varimax rotation revealed four major factors with Eigen values above 1.0: 1.901, 1.457, 1.30 and 1.096. The analysis resulted in only four factors explaining total % variance of 17.28%, 13.25%, 11.9% and 9.97% thus making a total cumulative % variance of 52.30%. The factors which emerged with maximum loading, related health to luck, chance, doctors' instructions and other external controls. Reliability for each of these four factors was once again checked and Crobach's value for the factors 1, 2, 3 and 4 were found to be 0.72, 0.76, 0.68 and 0.69 showing them to be reliable. The emergence of factors with different components reinforced the view that if cultural differences and demographic variability play a role in determining the level of control among children then there are bound to be differences in pattern of constituent controls.

Introduction

Health is one of the many areas in which there has been a significant amount of interest in relating locus of control (LOC) beliefs to a variety of relevant behaviours. Locus of control in social psychology refers to the extent to which individuals believe that they can control events that affect them. Health locus of control (HLC) is a construct that refers to how individuals perceive the sources regulating their health[1]. Understanding of the concept was developed by Julian B. Rotter in 1954, and has since become an important aspect of personality studies. HLC is based on the assumption that health related locus of control scale would provide more sensitive predictions of relationships between internality and heath behaviours.

A product of Rotter's social learning theory, early HLC studies measured these beliefs on an Internal-External axis[2]. This scale of health beliefs ranged from Internal HLC, where control for one's health resides within the individual, to External HLC, relative powerlessness where control is external to the individual[1]. Internals were believed by Rotter (1966) to exhibit two essential characteristics: high achievement motivation and low outer-directedness.

This was the basis of the locus of control scale proposed by Rotter in 1966.

People who believe they have control over their health or life events are called internals, in contrast to those who feel other people or chance is responsible for what happens to their health (externals). Individuals with a high internal locus of control believe that events result primarily from their own behaviour and actions and are more likely to assume that their efforts will be successful. They have better control of their behaviour and are more likely to attempt to influence other people than those with a high external (or low internal respectively) locus of control. Literature indicates that internals are more likely to engage in wide range of health enhancing behaviours than those who believe in chance or social influence on health (Pitts & Phillips, 1998; Blaxter, 1990). Those with a low internal locus of control believe that powerful others, fate, or chance primarily determine events.

The 11-item Health Locus of Control (HLC) Scale developed in 1976 by Wallston, was a health-specific version of Rotter's 1966 I-E Scale, which was used to classify individuals as internals or externals. These scales are designed to assess a person's beliefs regarding whether his or her health status is determined by the actions of individuals (as opposed

to fate, luck, or chance) and, if so, whether the locus of that control is internal (i.e., residing in the person's own actions) or external (i.e., dependent on the actions of other people). The HLC construct is an improvement over the classic conceptualization; it measures health beliefs with a tripartite approach by differentiating External HLC into Powerful others HLC (eg, physicians) and Chance HLC[3]. Strong Internal HLC, then, reflects personal responsibility for affecting health status, strong. Powerful Others HLC reflects dependency on others, and strong Chance HLC reflects loss of agency to fortune. These three dimensions are traditionally treated as independent factors, though studies have revealed modest between-factor correlations[4,5].

Individual life experiences are thought to determine one's scores on each of these HLC subscales. It is thought that better understanding of HLC may enable clinicians to tailor their counseling to suit their patient's health beliefs. HLC is thought of as a relatively stable measure in a healthy population. Thus, population-based HLC studies should serve as an entry point to eliciting and understanding the health beliefs from patients. In addition to personal health history, a myriad of societal, cultural and religious factors are reflected in HLC. Another use of locus of control as a dependent variable involves comparisons of groups that differ in some way likely to be relevant to locus of control. Such known-groups comparisons and data relating locus of control to demographic variables provide evidence of construct validity of the scales. In essence, perception of personal influence and individual responsibility over health is a modifying variable enhancing coping efficacy and engagement in a healthy lifestyle.

The acceptable validity and reliability of the HLC scale have been well-documented over its 30-year history [4, 6], though there has been no such analysis among Indian population. If cultural differences and demographic variability play a role in determining the control levels of individuals, especially those who are less exposed to varying cultural situations and environments such as children then there are bound to be differences in pattern of control across various populations. Hence, the present study was conducted with the objective of assessing the reliability and factor structure of Health locus of control scale among 12 and 15 year school children from Bhopal city, Central India.

Material & Methods

The target population for the cross-sectional study was 12 and 15 year old school children from Bhopal city, Central India. There are 30 English medium higher secondary schools in Bhopal City, comprising around 4500 children. 10 % of this population was taken as sample size for the study, making it 450. Hence, five schools were randomly selected and all children from the study age group were invited to participate in the study. A total of 462 children were examined; 259 children were from 12- year age group

and 203 children from 15 year age group, the response rate being 96%.

Questionnaire

The eleven-item health locus of control questionnaire (HLC) was used to assess locus of control and to predict health-related behavior. The questionnaire was designed by Wallston in 1976; a health-specific version of Rotter's 1966 I-E scale, which was used to classify individuals as internals or externals. The same questionnaire in English was used in the present study. It comprised of 5 questions on internal health locus of control (IHLC) and 6 questions for assessing external health locus of control (EHLC).. External HLC comprises of Chance HLC and Powerful Others HLC. One question was used to assess Chance health locus of control (CHLC) and 5 questions were used for evaluation of Powerful others HLC (PHLC). The HLC Scale was scored so that high scores indicated agreement with internally worded beliefs. Individuals with scores above the median were labeled "health-internals"; who believe that the locus of control for health is internal and that one stays or becomes healthy or sick as a result of his or her own behavior. At the other end of the dimension, scoring below the median, were the health-externals, they were presumed to have generalized expectancies that the factors determining their health are ones over which they have little control; i.e., external factors such as luck, fate, chance, or powerful others.

Respondents rate each item on the HLC using a six point (1 to 6) Likert scale; thus, each scale of eleven questions has a scoring range from 6 to 66. Higher subscale scores reflect stronger perception of control in the given dimension. Information on demographic characteristics of participants was collected by means of personal interviews administered by the examiner. The examiner was assisted by a recording clerk, for maintaining the flow of the study and helping the students in filling the questionnaire.

Ethical clearance was obtained from the institutional review board. Informed written consent was taken from parents and school children prior to carrying out the survey. The survey was scheduled between the months of December 2010 and Feb 2011. All interviews were performed by a single examiner.

Statistical analysis

For the purpose of analysis of data, SPSS Version 15 was used. Principal component analysis was used to factorize the scale. Factor analysis (principle components, varimax rotation) was employed to assess the factor structure. Factor analysis uses the correlations between items on a scale to determine whether subsets of items exist that might relate to each other strongly, even though all scale items are related to the general concept of interest. Factor scores above 0.5 indicate a strong loading on a particular subset of items. The strength of these subsets is usually represented in Eigen values indicating which factors, or subsets of items, account

for the strongest part of the total scale variance. Eigen values above 1.0 are considered strong enough to be taken into account.

Results

A total of 462 children were examined; 259 children were from 12- year age group and 203 children from 15 year age group. There were 189 females and 273 males in the study population. (Table 1) Respondents utilized the full range of possible scores (Likert scale 1-6) on the HLC questionnaire. The mean IHLC score for the 12 and 15 year age group was 4.15 ± 1.48 and 4.24 ± 1.21. The mean EHLC score for the two age groups were 3.39 ± 1.78 and 3.48 ± 1.21 respectively. The mean PHLC score for 12 and 15 year olds were 4.20 ± 1.48 and 4.21 ± 1.02 respectively. Chance HLC mean scores were 2.58 ± 2.08 and 2.75± 1.4. (Table 2) A non significant increase in both internal and external health locus of control scores were noted with an advance from 12 to 15 years of age.

Reliability of the Locus of control scale
The internal consistency of the health locus of control scale in the study population was proved to be good; Cronbach's alpha was 0.82. For females, the Cronbach's alpha was 0.81 whereas for males it was 0.81.

Factor analysis

The factor analysis after varimax rotation revealed four major factors with Eigen values above 1.0: 1.901, 1.457, 1.30 and 1.096. On the first factor, explaining 17.28% of the variance, eight items had loadings less than 0.5. Questions 9, 10, and 11 had strong factor loadings ranging from 0.502 to 0.675. The second factor explained 13.25% of the variance and had four items loadings above 0.5 ranging from 0.513 to 0.593; these were questions 1, 5, 6 and 7. The third factor explained a variance of 11.9% with one item (question 4) showing loading of 0.641. The fourth factor explained a variance of 9.97% with one item (question 2) showing loading of 0.565. Most of the items in the first factor related health to luck, one's own carelessness and direct responsibility. The items in the second factor related health to self care, accidental happenings, doctor and strange diseases. The third and fourth factor related to health related actions. The analysis resulted in only four factors explaining total % variance of 17.28%, 13.25%, 11.9% and 9.97% thus making a total cumulative % variance of 52.30%. (Table 3) Reliability for each of these four factors was once again checked and Crobach's value for the factors 1, 2, 3 and 4 were found to be 0.72, 0.76, 0.68 and 0.69 showing them to be reliable.

Tables

Table 1: Age and Gender distribution of study subjects

Age group	Gender		Total
	Boys (%)	Girls (%)	
12 years	151 (58.3%)	108 (41.7%)	259
15 years	122 (60%)	81 (40%)	203
Total	273 (59%)	189 (41%)	462

Table 2: Mean Internal and External Health Locus of Control among study subjects

Variables	12 years	15 years	Collective	p Value
Internal HLC	4.15 ± 1.48	4.24 ± 1.21	4.19 ± 1.34	0.81
External HLC	3.39 ± 1.78	3.48 ± 1.21	3.43 ± 1.49	0.52
i) Powerful HLC	4.20 ± 1.48	4.21 ± 1.02	4.21 ± 1.25	0.74
ii) Chance HLC	2.58 ± 2.08	2.75 ± 1.4	2.67 ± 1.74	0.48

Table 3: Rotated locus of control schedule factor matrix for Indian children

Eigen Value & Scale Variance	Factor analysis for Locus of Control Scale			
	Factor 1	Factor 2	Factor 3	Factor 4
Eigen Value	1.901	1.457	1.300	1.096
% Total scale variance	17.28	13.25	11.90	9.96
Questions				
If I take care of myself, I can avoid illness	0.146	0.593*	0.225	-0.192
Whenever I get sick it is because of something I've done or not done	0.379	-0.140	0.254	0.565*
Good health is largely a matter of good fortune	0.275	-0.361	-.052	0.435
No matter what I do, if I am going to get sick I will get sick	-0.436	-0.181	0.641*	0.325
Most people do not realize the extent to which their illnesses are controlled by accidental happenings.	-0.153	0.513*	0.494	-0.088
I can only do what my doctor tells me to do	0.162	0.542*	0.490	-0.352
There are so many strange diseases around that you can never know how or when you might pick one up	0.481	0.529*	0.062	0.283
When I feel ill, I know it's because I have not been getting the proper exercise or eating right	0.429	-0.234	0.153	-0.280
Whether you keep your teeth or lose them is mostly a matter of luck	0.675*	0.098	0.426	-0.430
Bad oral health results from one's own carelessness	0.546*	-0.147	0.154	-0.370
I am directly responsible for my oral health	0.502*	-0.023	0.235	0.128

*Strongest factor loadings for the questions
Extraction Method: **Principal Component Analysis**
Rotation method: **Varimax**

Discussion

There has been a recent call for further refinement and testing of the HLC scales in ethnically diverse groups of study subjects. [5,7] Reliability of the health locus of control scale in the study population was found to be 0.82.. The Cronbach value was above 0.6 which coincided with the well accepted reliability limits as supported by Moss et al.[8] The Cronbach alpha's values obtained in the present study even meet the more stringent and widely recognized 0.7 thresholds.[9] The high reliability of the scale can be attributed to its focal characteristics and highly specific yet understandable questions. Following the general acceptability of the scale, the scores obtained for different items were further analyzed through factorization.

The factors which emerged with maximum loading, related health to luck, chance, doctors' instructions and other external controls – indicating that addressing these problems effectively may improve the overall health of school children. Thus although scale has a good reliability as reported, the mechanism affecting the psychology of the children may be different. This may be attributed to the cultural/ environmental differences. In developing countries like India, children are less exposed to health awareness campaigns. This in turn may be as a result of lack of awareness of local authorities. Since the driving force in building a child's psychology largely depends upon the personal experience of an individual, a comprehensive strategy is needed for building the psychology of a child in structured manner. This could further be implemented by recognition of locus of controls for children and then managing them effectively through the help of strategic planning.

Acharya (2008) conducted a study to appraise the effect of different stages of professionalization on the health locus of control among Indian dental students and concluded that the mean score for the Internal subscale was consistently higher than the mean scores for external HLC in all the years of study. [10] Erin L. O'Hea (2009) assessed sample of health locus of control beliefs among African American ethnic minority medical patients. Those with HIV/AIDS reported more external beliefs than those with type 2 diabetes. [11] Self-rated oral health, socio-demographic factors, and oral health behaviors were significantly associated with oral health control beliefs in a study conducted by Peter and Bermek (2010) using multi dimensional oral health locus of control scale. [12] Results are compared with studies which consist of populations of other ages and disease groups therefore it is also important to consider these differences.

Future research should take on more systematic and scientifically rigorous research taking various demographic factors like race/ethinicity, SES, geographic location , culture into consideration and controlling for confounding variables. For example, a study that compared the factor structure of the HLC scales in White Americans and African American samples taken from the same region with similar SES backgrounds would help elucidate ethnicity differences, or lack of differences, in factor structure of the HLC scales. Similarly, in order to look at SES effects, it may be helpful to compare the factor structure of the HLC scales in lower- versus higher-SES people from a homogeneous ethnic/racial group. Healthcare providers may benefit from understanding that people who are living in diverse conditions may have varying HLOC beliefs that can affect health behavior, and perhaps interventions can be implemented to increase internal control beliefs in at-risk populations.

Conclusion

In general, the objective of the study to conduct the reliability testing and factorial analysis of the locus of control scale among the study population was successfully fulfilled. The emergence of factors with different components reinforced the view that cultural differences and demographic variability play a role in determining the level of control among children. .

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Vitae

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