The psychometric properties of hopelessness scale among children

Mojtaba Habibi[1], Habibeh Kholghi[2], Hossein Abedi Parija[2], Ziba Parandvar[2], Maede Sadat Etesami[3]

1. Family Research Institute, Shahid Beheshti University, Tehran, Iran
2. Department of Counselling, Faculty of Educational Sciences and Psychology, Shahid Beheshti University, Tehran, Iran
3. Department of Psychology, Faculty of Psychology, Tehran University, Tehran, Iran

Correspondence to: Habibeh Kholghi, Department of Counselling, Faculty of Educational Sciences and Psychology, Shahid Beheshti University, Tehran, Iran
Email: habibehkholghi@yahoo.com

Abstract

Hopelessness, or negative expectations toward the future, is considered to be a central feature of depression. This can affect individual's personal, familial, occupational, educational and social functions negatively. The current research aimed to study the psychometric properties of hopelessness scale in children within the age range of 12-19. After translating items of HSC to Persian, a sample of 603 guidance and high school students (300 girls and 303 boys) were selected from all students of Tehran. To measure divergent/convergent validity of the scale, children depression scale (CDI) and adolescent's self-efficacy scale (SEQ-C) were performed in parallel. A first-order Confirmatory factor analysis was used to measure hopelessness scale in children (HSC) questionnaire. Cronbach's alpha coefficient of HSC in students was calculated 77% and was relatively satisfactory. The Factor analysis of HSC was confirmed by confirmatory factor analysis. An analysis of correlation coefficients has revealed that HSC has a significant positive relation with depression scale and a significant negative relation with self-efficacy scale which indicates that there is a convergent validity between HSC and depression scale in children and a divergent validity between it and self-efficacy in adolescents. First-order confirmatory factor analysis of HSC scale has shown a better fitness with observed data. The confirmatory factor structure, validity and reliability of HSC were relatively satisfactory for research purposes and clinical diagnoses.

Keywords: Children, Hopelessness, Reliability, Validity

Introduction

Hopelessness plays the role of mediator between the challenging events of adolescent's life and mental damages [1]. It stands opposite of hope and is one of the manifestations of depression [2]. Hopelessness in fluencies health and social relationships negatively and can be considered as a risk factor for depression and suicide [3-5]. Beck noted that hopelessness is a core symptom of depression and it not only paralyzes individual's willpower but also makes situation unbearable in a way that he/she tends to avoid any challenging situation completely [6]. In fact, hopelessness is when an individual is looking for negative events to happen and believes that nothing positive and pleasant will happen in the future [7].

Studies have shown high prevalence of hopelessness in the society [8]. According to these studies hopelessness is more prevalent among adolescent rather than other age groups as fourteen is the peak age [9]. Regarding further studies adolescent hopelessness which leads to depression has become a public health concern. 1 to 2 percent of preteens and about 3 to 8 percent of adolescence suffers from hopelessness [10]. It is also confirmed by most of the studies that girls are more vulnerable to internalized problems and higher prevalence has been reported among them [11].

It can be said that hopelessness can cause mental damages in children and adolescents and turns tension into depressed mood [1]. Which can effect individual's personal, familial, occupational, educational and social functions negatively [12]. When an adolescent gets disappointed, he/she replaces his/her long-term goals like graduating from school, or his/her physical health with short-term gains. During this time, an adolescent enjoys risky behaviors such as unprotected sex or sex with multiple sexual partners which provide immediate pleasure [13]. Researches have indicated that hopelessness and impulsivity are of important factors in imprisoned children and adolescents' misbehavior and depression [14]. Group of researchers investigated depression, hopelessness and agitated moods on students and the results have shown that all of three variables are predictors of depression and suicide [15].

Hopelessness is more observed in adolescents with low self-efficacy [16]. Efficacy expectations affect individuals' choices, hope, level of effort and persistence, ability to withstand hardships and problems and also their vulnerability to depression [17]. Some studies have concluded that self-efficacy can be considered as one of the predictors of mental health [18].

Kazdin's Hopelessness scale in children (HSC) is a useful tool for evaluating the children's hopelessness among 6-13 years old. This scale is designed according to Beck hopelessness scale in order to measure hopelessness in children. To evaluate psychometric properties, this test was performed on sample of children with mental disorders within the age range of 6-13. The retest reliability of hopelessness scale in this sample group was reported r=0.57 with a 6 weeks gap and in normal children was reported r=0.49after 10 weeks; which have represented the average stability of test; also, the Spearman-Brown split-half reliability was calculated 0.97 [19]. In another study, this scale was applied on 834 normal adolescents and 93 adolescents with history of suicide within the age range of 12-17; the internal consistency of test was reported 0.84 and the Spearman-Brown split-half reliability was obtained 0.91 [20]. Some studies have investigated HSC by one-factor structure method and some others studied it in two-factor method [17]. In this study, the normalization of this scale has been surveyed by two-factor structure measuring method.

According to present literature and last studies, there is no hopelessness measuring scale applicable for children in Iran. As mentioned before, hopelessness can play the role of an important mediating variable in depression, suicide and adolescents' mental health. In this research, it is intended to study the psychometric properties of HSC.

Method

The statistical population is consisted of all students of Tehran schools of in 2013-2014. In confirmatory factor analysis, for each question, 15-people sample is acceptable. 603 people (including 303 boys and 300 girls) were selected from present statistical population by multi-stage cluster sampling. After receiving authorities' permission to distribute questionnaire in schools, 3 districts of Tehran (1-3-6), 6 schools (2 middle schools, 4 high schools, 3 boys' schools and 3 girls' schools) were chosen. In both girls and boys samples, the youngest was 12 and the oldest was 19 and the average age of girls was 14 and for boys the average age was 15 and the total age average was 14.74. The sample of this study was provided from 6 grades of guidance and high school which include: 21.5

percent of second grade of middle school, 24 percent of third grade of middle school, 24 percent of first grade of high school, 15 percent of second grade of high school, 10 percent of third grade of high school and 3.5 percent of college. In case of ethnicity, 65 percent were Fars, 18 percent were Turkish, 2 percent were Kurdish, 5 Percent were Lor and 1.5 percent was Guilak. 43.5 percent of students were the first or single child and 18 percent were middle child and 35.5 percent were last child.

Hopelessness Scale in children (HSC): This scale was provided in order to evaluate hopelessness in children and was reviewed some years later. This scale includes 17 items that ask respondents to specify their agreement or disagreement with presented phrases by yes or no.Originally, this questionnaire is designed according to Beck hopelessness scale. In this scale, for most of the items, the positive answer gets one point and the negative answer gets no points. Only in 8 items (16, 11, 7, 1, 3, 4, 5, and 6) which are stated positively, Scoring is done in reverse. The final Score is calculated by summing scores of all items.17represents the highest level of hopelessness and zero represents the lowest level of hopelessness in children [19].

Children Depression Inventory: To describe depression symptoms in adolescents, Children Depression Inventory which is a self-report 27-item questionnaire was used. These items score on a three-point Likert-type scale (Zero (sometimes), One (often) and Two (always) measures depression in5 subscales of Negative mood, Interpersonal problems, Ineffectiveness, Anhedonia and Negative self-esteem. The higher score, the more severe the depression is rated. The study of external psychometric properties of this questionnaire has shown its acceptable internal consistency (each item's coefficient with total score was ranged between 0.21 and 0.60) and retest reliability (0.70). In this study, the Persian version of the questionnaire was used which its adequate internal consistency (With Cronbach alpha coefficients of 0.83) and retest reliability (0.82) were confirmed by performed study [22].

Self-Efficacy Questionnaire-Children: Self-efficacy questionnaire of children and adolescents contains 23 items which evaluate self-efficacy in two subscales (Academic self-efficacy and emotional self-efficacy). Its items score on a five-point Likert-type scale which higher scores indicate higher self-efficacy. Findings of external study has reported its adequate internal consistency (With Cronbach alpha coefficients of 0.80), retest reliability (reliability coefficient was 0.70) and validity. Analysis of the properties of Persian version of Self-Efficacy Questionnaire for adolescents which was applied in present study has also confirmed the adequacy of its internal consistency (Cronbach alpha coefficients were ranged between 0.87 to 0.89) and retest reliability (Reliability coefficient was 0.87 to 0.89) and therefore it can be performed in Iranian sample [23-24].

Results

Before investigating fitness of the measuring models several assumptions including: 1) normal distribution of variables, 2) multiple observed variables (At least 2 observed variables for each latent variable), 3) over-identified model, 4) interval measurement scale has been studied and verified [25]. For the first assumption, results of uni-variate and multi-variate normality test have been checked by LISREL software and due to the rejection of the assumption of normality in some of the variables, so the robust estimation method has been used against violation of normality.

Measurement model: At first, the statistical fitness of the research data measuring model was examined by LISREL 8.72 software. The model of study included two-factor oblique model with loading 17 items on two factors of the future expectations and overall happiness. Table 1 presents the factor loading, standard errors of estimates, T test for assessing the significance of parameters. Due to violation of the assumption of normality, maximum likelihood robust procedure was used to estimate model; and the following indices were used for fitness evaluation: Satorra-

Bentler scaled chi-square (χ^2), chi square to degree of freedom ratio (χ^2/df), goodness of fit index (GFI), adjusted goodness of fitness evaluation (AGFI), comparative fit index (CFI), root mean square error of approximation (RMSEA) and root mean square residual (RMR).

Table 1 *Results of the confirmatory factor analysis of the hopelessness scale in children*

Item	Factor loading	t-value	Item	Factor loading	t-value
1. I want to grow up because I think things will be better	0.29	5.5	10. I don't think I will get what I really want.	0.51	12.29
2. I might as well give up, because I can't make things better for myself.	0.43	8.09	11. When I grow up, I think I will be happier than I am now.	0.53	11.08
3. When things are going badly, I know that they won't be bad all of the time.	0.33	5.89	12. Things just won't work out the way I want them to.	0.54	13.47
4. I can imagine what my life will be like when I'm__(10 years older).	0.21	4.57	13. I never get what I want, so it's dumb to want anything.	0.56	10.89
5. I have enough time to finish the things I really want to do.	0.07	1.35	14. I don't think I will have any real fun when I grow up.	0.54	10.70
6. Someday I will be good at doing the things I really care about.	0.32	4.51	15. Tomorrow seems unclear and confusing to me.	0.49	11.82
7. I will get more good things in life than most other kids.	0.21	4.99	16. I will have more good times than bad times.	0.68	11.77
8. I don't have good luck, and there's no reason to think I will when I grow up.	0.48	9.47	17. There's no use in really trying to get something I want, because I probably won't get it.	0.63	12.17
9. All I can see ahead of me are bad things, not good things.	0.59	11.45			

The first-order factor structure of the HSC has shown a better fitness with the observed data. Examination of levels of factor loading represents the factor loading of all items on the related factors to be at satisfactory level except for items 1, 4, 5 and 7 (P.E. <0.3). The items 2,3, 8, 9, 10, 12, 13, 14, 15, and 17were loaded on the future expectation factor and the items 1, 5, 6, 7, 11 and 16 were loaded on the overall hope factor (Table 2).

Table 2 *Indices of confirmatory factor analysis for hopelessness scale in children*

SRMR	RMSEA	CFI	AGFI	GFI	χ^2/df	Df	Satorra-Bentler χ^2
0.06	0.049	0.94	0.92	0.93	2.46	118	1471.18

The evaluation of the difference of fitness of under-study models suggests that the model has a good fitness with the data, i.e. findings support the two-factor oblique model. Evaluation of fitness indices suggests that the model has relatively favorable fitness with model and if the chi-square test is not statistically significant, it shows a very good fitness; But this index is usually significant in samples greater than 100 and therefore it is not a reliable index to assess the fitness of a model; If chi square to degree of freedom ratio (x2 /df) is less than 3, it indicates a very good fitness. If CFI, AGFI and GFI indexes are above 0.95 and the RMSEA and RMR indexes are less than 0.05, it suggests a very good and favorable fitness and if CFI, AGFI and GFI indexes are above 0.90 and the RMSEA and RMR indices are less than 0.08, it suggests a good and favorable fitness. As a result, CFI, AGFI, and GFI indexes suggest very good and favorable fitness and RMSEA and RMR indexes suggest good and favorable

fitness and based on chi square to degree of freedom ratio (x2 /df), goodness of fitness is very acceptable (Table 2).

Two methods of Cronbach's alpha and test-retest coefficient were used to determine the reliability of this scale. Cronbach's alpha of HSC for each future expectation, overall subscales and total score is estimated respectively 0.77, o.53 and 0.77. The test-retest coefficient for each subscales of future expectation, overall and total score was estimated 0.97, 0.71 and 0.95 respectively.

The results of Pearson correlation between hopelessness components and self-efficacy in adolescent boys and girls (300 girls and 303 boys) have shown that there is a significant negative correlation between future expectation and mental and physical confrontation (r= -0.21, p<0.001); future expectation and negative thoughts (r= -0.21, p<0.001);the future expectation and dealing with irritability or aggression (r=-0.18, p<0.001); overall happiness with mental and physical confrontation (r= -0.1, p<0.001); overall hopefulness and negative thoughts (r= -0.14, p<0.001) and total hopefulness and dealing with irritability or aggression (r= -0.19, p<0.001).

The results of the Pearson correlation between the subscales of hopelessness and depression among adolescent have shown that there is a significant positive correlation between future expectation and negative mood (r= 0.50, p<0.001), future expectation and interpersonal problems (r= 0.40, p<0.001), future expectation and inefficiency (r= 0.35, p<00.1), future expectation and lack of pleasure (p<00.1,r=.0.45), expectations of the future and negative self-esteem (r= 0.50, p<0.001), overall hopefulness and negative mood (r=0.25, p<0.001), overall hopefulness and interpersonal problems (r= 0.25, p<0.001), overall hopefulness and inefficiency (r= 0.20, p<0.001), overall hopefulness and lack of pleasure(r= 0.25, p<0.001) and overall hopefulness and negative self-esteem (r= 0.30, p<0.001).

In this study, to survey the differences of hopelessness in two groups of boys and girls, multivariate analysis of variance (MANOVA) has been applied. Testing the assumption of homogeneity of Variance by Box's M test has confirmed the heterogeneity of variances (F (3/6.45) =0.55, Box's M=0.55, p= 0.905). The following table shows the statistical description of two groups in the subscales of hopelessness (Table 3).

Table3 *Comparison of the mean of boys and girls in the subscales of hopelessness*

Subscale	Group	Mean	Sd	Mean of squares	df	F	p-value	Effect size
Expectations of future	Boys	2.25	2.35	4.20	-598	0.80	0.35	0.001
	Girls	2.10	2.25					
Overall hope	Boys	1.50	1.30	14.02	-598	0.20	0.004	0.014
	Girls	1.85	1.32					

To compare the means of hopelessness subscales in two groups of boys and girls, findings of Multivariate analysis of variance were surveyed by Trace Hoteling's test and it has shown that there is a significant difference between the two groups (Hotelling's Trace= 0.20, F (2 and 595) = 6,η²=0.2, p=0.003).

Results showed that there is a statically significant difference between two groups of boys and girls in overall hopefulness (F (1 and 598) = 8.20, η²=0.014, p=0.004).

Discussion

Hopelessness in children and adolescents is an issue that needs immediate attention as it can lead to social, educational, vocational and further dysfunctions. Studies have shown that hopelessness is an important factor in

adolescents' depression so, the need for scales measuring hopelessness in children is well-recognized.

This research was conducted with purpose of studying the psychometric properties of hopelessness scale in children. Cronbach's alpha coefficient of student's HSC was at acceptable level. Factor structure of HSC was confirmed by confirmatory factor analysis. Analysis of the correlation coefficients have shown that HSC is correlated positively with depression scale and negatively with self-efficiency scale; which demonstrates convergent validity of HSC with children depression and divergent validity of hopelessness with the Adolescent's self-efficiency scale.

In this research, HSC was standardized by two-factor structure measuring method which was study done in some previous studies,[20] however, it is notable that in some other studies, one-factor structure measuring method were used to examine HSC [19-21].

In Kazdin's research, the test-retest reliability of the HSC obtained by one-factor method among the children with psychiatric disorders (over a 6-wk period) was reported r=0.57 and in normal children was calculated r=0.49 (over a 10-wk period) which indicates average stability of the test. The reliability resulted from Spearman-Brown split-half method was reported r=0.97 [19]. In the present research, reliability was evaluated by Cronbach's alpha and test-retest methods. The results of test-retest method in two subscales of future expectation and overall hopefulness after 1 week by two-factor method, were reported0.97 and 0.71 respectively and By Cronbach's alpha method, were reported respectively 0.77 and 0.53; These results, in accordant with Kazdin's research, have shown that stability and reliability of the test are moderate. In another research, to measure the reliability of this scale, it was performed among 834 13-17 years old high-school adolescents and, the scale was studied in two factors like the present research; regarding the first factor which indicates positive statements about future, alpha has been reported to be 0.86 and for the second factor which indicates negative statements about

future, alpha has been reported to be 0.77 Besides, the reliability of the test resulting from Spearman-Brown split-half method was reported 0.91 [20].

In a research, evaluation the validity of HSC was examined among high school students by the scores of 5-item questionnaires which was used to standardize Beck hopelessness scale and a positive correlation between them (r=0.71) has been reported. In this research, the convergent validity of the HSC was evaluated with 27-item Inventory of children's depression inventory (CDI) and obtained results suggested that there is a significant positive correlation between them [20]. In Kazdin's research, the validity of HSC was studied by CDI, self-esteem and social skills and findings have shown that HSC and CDI are positively correlated, and HSC and Self-esteem inventory and also Social skills inventory are negatively correlated [23].

In previous studies, validity of HSC was examined with CDI depression inventory and validity of Children attitude style questionnaire (CASQ), was examined with 2-factor structure method and the results have suggested that the CDI depression inventory has significant positive correlation with factor 1 of HSC and significant positive correlation with factor 2 of HSC and in general, there is a significant positive correlation. Also, in this research, Children attitude style questionnaire (CASQ), was evaluated with hopelessness factor structures and subscale of bad events has shown a significant positive correlation with factor 1, factor 2 and in general [20]. These results have indicated the convergent and divergent reliability of HSC which is fairly in accordant with findings of present research. In this research, factor structures of HSC has shown a significant positive correlation with subscales of CDI children depression inventory same as findings of previous researches. Also in this research, factor structures of this inventory have shown a significant negative correlation with subscales of Self-efficiency questionnaire.

There are more studies that focused on

hopelessness as an important component which plays a key role in basic structure of thoughts, suicidal behaviors and depression [5], and some studies also indicated that general self-efficacy has a positive relationship with optimism, self-regulation and self-esteem and is related negatively with anxiety, depression and hopelessness [15]. The recent study is consistent with these findings.

This study also has shown that there is a significant difference in HSC between girls and boys which girls have reported higher scores in hopelessness. There are several other studies in accordance with the findings of this study. In general, most of the previous studies have indicated that in comparison with boys, girls are more susceptible to internalizing problems [9]. Hopelessness is also one of internalized problems which are more reported among girls rather than boys [10,11].

It should be noted that the statistical population of this study were guidance and high school students; thereby it is important to be cautious about generalizing these findings to the elementary students. Using the questionnaire as an objective tool may lead to bias and dishonesty of respondent sand also precludes the attainment of accurate and complete information.

According to this study, evaluation of the reliability and validity of the hopelessness scale in children (HSC) in elementary students is suggested for further studies.

Conclusion

In general, the results of this study have indicated that HSC has acceptable validity and reliability in the population of Iranian children (middle and high-school ages). Due to the high reliability and validity of HSC, it can be said that this scale is a useful self-report scale to measure hopelessness and depression, especially in research purposes and can be used by Therapists and researchers in diagnosis, screening and researches.

Acknowledgements

Contribution

Study design: MH, HKH
Data collection and analysis: MH, HKH, HA, ZP
Manuscript preparation: MH, HKH, ME

Conflict of Interest

"The author declares that they have no competing interests."

Funding

References

1- Weir KF, Jose PE. A comparison of the response styles theory and the hopelessness theory of depression in preadolescents. *J Early Adolesc*2008; 28(3): 356-74.

2- Mohammadi M, Tjvidi B. The level of loneliness, hopelessness and self- esteem in major thalassemia adolescents. *Journal Birjand University of Medical Sciences*2013; 9(1): 36- 43.

3- Shams S, Hashemiyan K, Shafie Abadi A. The effect teaching method despair and sense of humor on social adjustment of depressed students in Tehran. *Journal Modern Thoughts in Education*2010; 3(1): 23-42.

4- Bayrami M, Eghbali A, Gholizade H. Personality factors interact with the symptoms of depression, hopelessness and suicidal thoughts among students. *Journal Tabriz University of Medical Sciences*2011; 34(1): 28-34.

5-Johnson J, Gooding PA, Wood AM, Tarrire N. Resilience as positive coping appraisals: Testing the schematic appraisals model of suicide (SAMS). *Behav Res Ther*2010; 48 (3): 86-179.

6- Mesbah N, Abediyan A. Relationship of stress and frustration in the student dorms. *Iranian Journal of Psychiatry and Clinical*2006; 2 (12): 159-4.

7- Abela JRZ, Gagnon H, Randy P, Auerbach. Hopelessness depression in children: an examination of the symptom component of the hopelessness theory. *Congress Therapy and Research*2007; 31(3): 401-17.

8- Rosenfeld B, Pessin H, Lewis C, et al. Assessing hopelessness in terminally ill cancer patients: development of the hopelessness assessment in illness

questionnaire. *Psychol Assess*2011; 23(2), 325- 38.

9- Grabe Sh, Hyde J Sh, Lindberg SM. Body object cation and depression adolescents: The role of gender, shame and rumination. *Psychology of Women Q*2007; 31(2): 164-75.

10-Torikka A, Kaltiala-Heino R, Rimpela A, Marttunen M, Luukkaala T, Rimpela M. Self-reported depression is increasing among socio-economically disadvantaged adolescents–repeated cross-sectional surveys from Finland from 2000 to 2011. *BMC Public Health*2014; 14(1): 408.

11- Maughan B, Collishaw S, Stringaris A. Depression in childhood and adolescence. *J Can Acad Child Adoles Psychiatry*2013; 22(1): 35-40.

12- Chapman AL, Specht MW, Cellucci T. Factors associated with suicide attempts in female inmates: The hegemony of hopelessness. *Suicide Life Threat Behav*2005; 35(5): 558-69.

13- Kagan S, Deardorff J, Mc Cright J, Lightfoot M, Lahiff M, Lippman SA. Hopelessness and sexual risk behavior among adolescent African American males in a low- income urban community. *Am J Mens Health*2012; 6(5): 395-9.

14- Wanklyn SG, Day DM, Hart TA, Girard T. Cumulative childhood maltreatment and depression among incarcerated youth: impulsivity and hopelessness as potential intervening Variables. *Child Maltreat*2012; 17(4): 306-17.

15- Troister T, Holden RR. Factorial differentiation among depression, hopelessness, and psych ache in statistically predicting suicidality. *Meas Eval Couns Dev*2013; 46(1): 50-63.

16-, Luszczynska A, Gntierrez DB, Schwarz R. General self-efficacy in various domain of human functioning: evidence from five countries. *Int J Psychol*2005; 2(40): 80-9.

17- Bandura A. Personal and collective efficacy in human adaptation and change .in J.G. Aaire (Ed), Hove, England: Psychology press/ Erlbaum; 1998.

18- Raggi A, Leonardi M, Mantegazza R, Casale S, Giulia F. Social support and self- efficacy in patients with myasthenia Gravis: a common pathway toward positive health outcoms. *Neurol Sci*2010; 31(2): 231-5.

19- Kazdin EA, Rodgers A, Colbus D. The hopelessness scale for children: psychometric characterisics and concurrent validity. *J Consult Clin Psychol*1986; 54(2): 241-5.

20- Spirito A, Williams CA, Stark LJ, Hart KJ. The hopelessness Scale for children: psychometric properties with normal and emotionally disturbed adolescents. *J Abnorm Child Psychol*1988; 16(4): 445-58.

21- Thurber S, Hollingsworth D, Millr L. The hopelessness scale for children: psychometric properties with hospitalized adolescents. *J Clin Psycho*1996; 52(2): 543-5.

22- Dehshiri GH, Najafi M, Sheykhi M, Habibi M. Investigating primary psychometric properties of children's depression inventory (CDI). *Journal of Family research* 2009; 5(18): 159-177.

23- Muris P. A brief questionnaire for measuring Self-efficacy in yoyth. *J Psychopathol Behav Assess*2001; 23(3): 145-9.

24- Habibi M, Tahmasian K, Ferrer-Wreder L. Self-efficacy in Persian adolescents: psychometric properties of a Persian version of the self-efficacy Questionnaire for Children (SEQ-C). *Int Perspect Psychol*2014; 3(2): 93.

25- Hayduk LA. Structural equation modeling with LISREL. Baltimore: Johns hopkins; 1987.