

SCALE DEVELOPMENT STUDY: ADAPTATION TO CHRONIC ILLNESS

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ABSTRACT

Aim: The study was performed in order to develop the “Adaptation to Chronic Illness Scale (ACIS)” for the determination of the adaptation levels of individuals with chronic illnesses to their condition.

Methods: The study was performed with a methodological design. Context, structural, criterion validity and internal consistency reliability and test-retest validity-reliability analysis were performed. The statistical meaningfulness level in all tests was determined as $p < 0.05$.

Results: As a result of context validity, factor analysis and item analysis, a 25 item scale with 3 sub components was obtained. In the scale, the variance amount explained by the three sub components was on a very good level (88.64%). The fact that all of the Cronbach alpha, Spearman-Brown and Guttman internal consistency coefficients of the scale and all of its sub components are above 0.70. When the test retest reliability coefficients of the whole scale and its sub components were examined, the scale was found to present consistent results in different applications and the scale was found to be reliable with regard to the constancy coefficient. The ACIS shows highly meaningful correlation with a scale of proven validity and reliability.

Conclusion: The “Adaptation to Chronic Illness Scale (ACIS)”, which was just added to literature, is a valid and reliable tool that can be used to evaluate adaptation to illness in individuals with chronic diseases.

Key words: Scale Development, Adaptation, Chronic Illness, Validity, Reliability.

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Introduction

Adaptation is defined as the power to accept changes coming from the internal and external environment and exhibit the appropriate attitude and behavior⁽¹⁾. The adaptation process includes effective coping and coming to terms, and requires a mutual relationship between the mind and body^(2,3). Adaptation is the level to which the behavior of the patient complies to clinical suggestions such as using medicine, applying the necessary diet, or performing other lifestyle changes⁽⁴⁾. Adaptation to illness is a continuous and complex process. Adaptation includes physiological, psychological, technological, and duration related factors^(5,6).

Symptoms, complications, and other factors related to chronic diseases (treatments, medicine, disruption in family relations, changes in body image etc.) can become stressors and change the capacity of an individual for adaptation. All of the factors related to the disease and treatment affect adaptation to illness. Similarly, adaptation to illness affects the course of the disease positively or negatively^(5,7-9).

Understanding difficulties in adaptation, developing the appropriate coping methods, and planning supportive care interventions are all important with regard to quality of life. In order to provide adaptation to an illness, first one must understand the beliefs, attitudes, behavior, and fears

of a patient regarding his/her disease. Each patient understands his/her disease and condition through personal evaluation. Health care workers should provide the patient with information and assurance, and help patients in coping with the difficulties caused by the disease. Understanding the plans, expectations, and feelings of a patient such as fear and anger and changing mistaken beliefs if necessary will help the patient gain a lifestyle and habits more appropriate to his/her illness and speed up the adaptation process^(10,11). The aim of treatment and care in chronic diseases is to realize the cooperation and adaptation of the individual to his/her disease and the treatment program, raising disease related quality of life^(8,9). Supporting the individual in accepting the disease in this period he/she must go through can increase adaptation. Individuals who have accepted the disease and attuned to it can live on very long without decreasing their quality of life^(12,13).

When the literature was examined, even though scales that measure adaptation to diseases in various fields were found⁽¹⁴⁻¹⁷⁾, a measurement tool specifically designed to determine the general level of adaptation to chronic diseases couldn't be found. For this reason, we decided to develop the "Adaptation to Chronic Illness Scale (ACIS)".

Method

Aim of the study

The study was performed in order to develop the "Adaptation to Chronic Illness Scale (ACIS)" for the determination of the adaptation levels of individuals with chronic diseases to their condition.

Type of the study

The study was performed with a methodological design.

The location and date of the study

The study was performed in the Private Yeni Hayat Hospital between September and November 2015.

The universe and sample of the study

The universe of the study consisted of all of the individuals presenting with chronic heart diseases at the clinic the study was conducted in (coronary artery disease). In order to develop a meaningful and reliable measurement tool, the number of patients the scale was applied to had to be at least

five times the item number of the scale⁽¹⁸⁾, and it has been suggested that 5 to 10 people for every scale item should be included⁽¹⁹⁾. In the study, 200 individuals to whom the 40 item draft scale was applied formed the sample of the study. Criteria for inclusion to the study were being diagnosed medically with chronic disease at least 3 months ago, having no communication issues, being able to answer all of the questions, and agreeing to participate.

Research questions

The study was conducted in order to answer the following research questions:

- Is the "Adaptation to Chronic Illness Scale (ACIS)" a valid scale in determining the adaptation level of patients to disease?
- Is the "Adaptation to Chronic Illness Scale (ACIS)" a reliable scale in determining the adaptation level of patients to disease?
- Does the "Adaptation to Chronic Illness Scale (ACIS)" have sub components?
- What are the sub components of the Chronic Diseases Adaptation Scale?

Data collection tools

Data for the study was collected using the Adaptation to Chronic Illness Scale and the "Psychosocial Adaptation to Illness Self Report Scale (PAIS-SR)".

The Psychosocial Adaptation to Illness Self Report Scale (PAIS-SR) is a multi componental scale aiming to evaluate psychosocial adaptation to physical illness developed by Deragotis (1986)⁽¹⁶⁾. The Turkish validity and reliability test of the scale was performed by Adaylar (1995)⁽²⁰⁾. The lowest score that can be taken from the scale is 0, while the highest is 138. Scores below 35 show "good psychosocial adaptation", scores between 35 and 51 show "medium level of psychosocial adaptation", and scores over 51 show "bad psychosocial adaptation" in the scale⁽²⁰⁾. The scale consists of 46 items and seven sub components. These sub components are adaptation to health care, occupational environment, family environment, sexual relations, extended family relations, social environment, and psychological distress⁽¹⁶⁾.

The Adaptation to Chronic Illness Scale (ACIS) was developed in order to measure the adaptation levels of individuals with chronic illnesses to their illness. The healing process and quality of life in individuals with chronic illnesses are affected by adaptation levels. Knowing the adapta-

tion levels of the patients can guide treatment, care, education, and counseling planning. Thus, we decided to develop this scale.

In the development process of the Adaptation to Chronic Illness Scale first scale questions were prepared according to literature and the experiences of the researchers. Then, an item pool study was performed for the ACIS. An item pool was formed by writing down items positive and negative concerning adaptation (45 items). Special care was given to make the items contain physiological, psychological, and social adaptation terms. The questions prepared were presented to the opinions of a Turkish language expert.

The ACIS is a 5 way likert type scale. Scaling is done by scoring 1= I Don't agree at all, 2= I don't agree, 3=Indecisive, 4=I agree, and 5= I totally agree. The negative items on the scale are the items 7.,8.,11.,16.,18.,27.,29.,33.,38.,and 39. Negative terms are scored as 1=5, 2= 4, 3=3, 4=2, 5=1. While calculating scale scores, the scale total score is taken and the scale score is obtained by dividing this score by the number of items. Adaptation to chronic illness increases with increasing scale scores.

Data collection and evaluation process

After the necessary permissions and approvals were taken, the study was started in the relevant hospital. Patients were first explained the aim, application style, and expectations related to the study and included in the study afterwards. The data collection process took 10 to 20 minutes for each individual. The test retest application was performed with a three week interval.

Data evaluation was performed using the SPSS (Statistical Package for Social Science) version 21.0 program. In validity reliability analyses, the averages, standard deviations, minimums, and maximums of the scale items were calculated descriptively. For measurements with relationships, the t test, correlation based item analysis, the Kaiser-Meyer-Olkin (KMO) sample test, Bartlett's test, factor analysis, and internal consistency analysis (Cronbach Alpha) were used. The statistical meaningfulness level in all tests was determined as $p < 0.05$. Statistical analyses performed for validity and reliability were given in Table 1.

Context Validity: A context validity test was performed in order to determine whether the ACIS was appropriate for the characteristic to be measured, whether the measurement was made accord-

ing to the rules, and whether the measurement data reflected the characteristic to be measured.

Validity Study	Method
Context Validity	Context Validity ratio (Lawshe tekniği)
Structural validity	Exploratory factor analysis (Principal Components ve Varimax rotation)
Criterion validity	Pearson's correlation coefficient, PAIS-SR
Reliability Study	
Internal consistency reliability	Item Analysis, Cronbach Alpha, Spearman-Brown, Guttman
Time constancy analysis:	The test retest reliability (Pearson's correlation coefficient)

Table 1: validity and reliability study methods.

Factor Analysis: Factor analysis, which was performed to determine structure validity, is essentially grouping a number of variables under a title. The factor load of each term should be >0.4 in factor analysis⁽²¹⁾. The sufficiency of the sample is decided by checking the Kaiser-Meyer-Olkin (KMO) value. KMO values are evaluated as perfect when between 0.90 and 1.00, very good between .80 and .89, good between 0.70 and 0.79, medium between .60 and .69, weak between .50 and .59, and unacceptable under .50⁽²²⁾. The Bartlett's test is said to show whether the items in a scale are appropriate for factor analysis⁽¹⁸⁾. In single component scales, the stated variance rate is expected to be at least 30%, while this number is higher in multi component scales⁽¹⁹⁾.

Item Analysis: The aim in this method, which is also known as item reliability, is to evaluate the contributions of each item to the scale and determine how related each item is to the whole of the scale. In item selection, the level of item total score correlations is an important criterion. The item total score correlation coefficient is accepted as at least 0.25. Items between 0.30 and 0.40 are stated to be "good" while items above 0.40 are stated to be discriminative on a "very good" level and thus, reliable. The reliabilities of items increase with increasing correlation coefficients⁽²³⁾.

Internal consistency analysis (Cronbach Alpha): In order to examine internal consistency between test scores, Cronbach Alpha reliability is calculated in the case of scale items having three or more answers. The reliability coefficient being 0.70 or above is sufficient for the reliability of test scores⁽¹⁹⁾.

Split half test reliability: “Spearman-Brown correlation value and the Guttman Split-Half value”. Reliability determination processes performed by splitting data collected by a measurement tool to two pieces of equal value and comparing the scores in these halves are called split half reliability tests. The more consistent the scores obtained from these two halves, the more reliable the measurement tool is⁽²⁴⁾.

Time constancy analysis: The test retest reliability analysis performed in order to demonstrate time constancy is applying the same scale under the same conditions to the same group with a certain time interval and checking the relationship between the measurements through the Pearson moments multiplication correlation coefficient method. In this test, it is suggested to have at least two and at most six weeks between the first and second test and to perform the test with at least 30 people. The obtained coefficient is accepted as the constancy indicator of the scale scores and is expected to be at least 0.70⁽²⁵⁾.

Criterion validity: This is checking the relationship between the measurements made through the developed scale and another previously developed highly valid scale through the Pearson moments multiplication correlation coefficient method⁽¹⁹⁾.

Ethical aspect

In the progression of the study, scientific principles as well as the ethical principles of the Helsinki Declaration were held. In this context, the principles of informed consent, autonomy, secrecy and the protection of secrecy, fairness, and no harm were taken into consideration. Necessary written permissions from the necessary institutions were taken. In order to conduct the study, the written permission and approval of the Ethics Committee were received. Before the application, patients were explained the aim, plan, and benefits of the study. Informed consent was taken from the patients.

Results

Context Validity: The views of 10 experts were taken for the context validity of the scale. Through the Expert Evaluation Form, the experts were asked to state their views on each item as “appropriate”, “partially appropriate”, and “not appropriate” and make suggestions. In the evaluation of the answers taken from the experts, the Context Validity Rates

(CVR) for each item was calculated through the Lawshe technique, and these were compared to the Minimum Context Validity Rates given in Table 2. $CVR = \frac{\text{the number of experts who found the item necessary}}{(\text{the total number of experts}/2) - 1}$.

The number of experts	The minimum value of KGO
7	.99
8	.78
9	.75
10	.62

Table 2: minimum context validity rates.

Three items with a context validity rate below 0.62 were excluded from the scale. Additionally, 4 items in the scale were reduced to 2 because of similarities. As a result, the 40 item draft scale was reached. Additionally, some items were corrected according to expert views.

Structure validity

The Kaiser Meyer Olkin (KMO) and Bartlett test results of the scale were given in Table 3.

KMO		0.912
Bartlett Testi	Approx. Chi. square	5472.68
	degrees of freedom (df)	235
	p	0.000**

Table 3: Kaiser Meyer Olkin (KMO) and Bartlett test results of the scale.
Not: ** $p < 0.001$

The KMO value of the scale was found to be 0.912 and its Bartlett test results was found to be 5472.68 ($p < .000$). In exploratory factor analysis, the eigenvalue was taken as 1.00, and three sub dimensions were determined. The plot regarding factor eigenvalues can be seen in Figure 1.

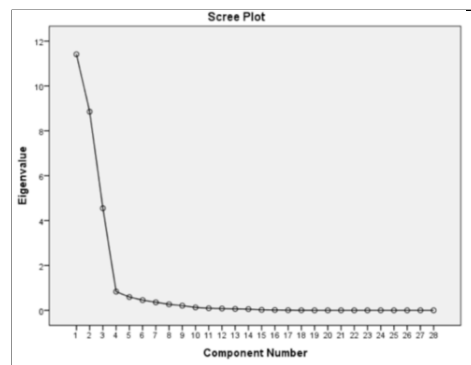


Figure 1: Plot regarding the sub components of the Chronic Illness Adaptation Scale.

When the plot regarding factor (sub components) was examined, a breaking point could be seen in the third factor and a rapid decline is seen in the plot after this point. For this reason, the number of factors in the scale was limited to three. The variance rates explained by the sub components of the scale as a result of factor analysis were given in Table 4.

Components	Initial eigenvalues		
	Total	Variance (%)	Cumulative (%)
1. component	10.63	37.99	37.99
2. component	7.7	27.49	65.49
3. component	6.48	23.15	88.64

Table 4: The variance rates explained by the sub components of the scale.

The variance rate explained by the first factor with an eigenvalue of 10.63 was 37.99%, the variance rate explained by the second factor with an eigenvalue of 7.70 was 27.49%, and the variance rate explained by the third factor with an eigenvalue of 6.48 was 23.15%. The total variance explained was found to be 88.64%.

Item No	Communalities	Factor loadings		
		1. component	2. component	3. component
L01	.88	.91	***	***
L02	.96	***	.96	***
L03	.76	.80	***	***
L04	.89	***	.92	***
L05	.98	***	***	.98
L07	.96	***	.94	***
L08	.98	***	***	.96
L10	.96	***	.95	***
L11	.61	***	.77	***
L13	.98	***	***	.96
L14	.85	.85	***	***
L15	.97	.93	***	***
L17	.89	***	***	.90
L18	.79	***	***	.85
L21	.97	.93	***	***
L22	.94	.95	***	***
L25	.94	.90	***	***
L26	.76	.87	***	***
L27	.90	***	.92	***
L28	.94	.93	***	***
L29	.81	***	.89	***
L32	.83	.90	***	***
L33	.90	***	***	.94
L34	.92	***	***	.92
L35	.82	.83	***	***
L36	.84	.86	***	***
L38	.84	.86	***	***
L39	.81	***	.89	***

Table 5: Factor Loads of the items forming the Sub Components of the Scale.

When the first results of the exploratory factor analysis were examined, the factor load values of 12 items were found to be beneath .40. After factor

rotation, the first sub component of the scale consisted of 13 items (m1, m3, m14, m15, m21, m22, m25, m26, m28, m32, m35, m36, m38), the second consisted of 8 items (m2, m4, m7, m10, m11, m27, m29, m39), and the third consisted of 7 items (m5, m8, m13, m17, m18, m33, m34). As a result of the analysis, the CDS, which consists of three components and 28 items, was formed (Table 5).

The factor loads of the items in the first component varied between 0.80 and 0.95, the factor loads of the items in the second component varied between 0.77 and 0.96, and the factor loads of the items in the third component varied between 0.85 and 0.98 (Table 5).

Before item analysis, the components were tried to be named by taking into account the contents of the items. The items in the first sub component consist generally of items measuring physical adaptation, the items in the second sub component consist generally of items measuring social adaptation, and the items in the third sub component consist generally of items measuring psychological adaptation. The names given to the components and the item numbers forming the components were shown in Table 6.

Component name	Item numbers
1. component: physical adaptation	1, 3, 14, 15, 21, 22, 25, 26, 28, 32, 35, 36, 38
2. component: social adaptation	2, 4, 7, 10, 11, 27, 29, 39
2. component: psychological adaptation	5, 8, 13, 17, 18, 33, 34

Table 6: The names given to the components and the item numbers forming the components.

Item analysis, Cronbach Alpha, Spearman-Brown, Guttman Internal Consistency Coefficients

When the item total score correlations of the 28 items were examined for the reliability study of the Chronic Illnesses Adaptation Scale, the correlation coefficients of 25 items were seen to vary between $r=0.25$ and $r=0.81$, and the items were found to have a positive and statistically advanced relationship ($p<0.001$). The remaining three items (3, 11, 32) were found to have correlation coefficients beneath 0.25 despite statistically meaningful reliability coefficients, and were removed from the scale ($p<0.01$, $r=0.18 - 0.19$) (Table 7).

The Cronbach Alpha internal consistency coefficient of the scale was found to be 0.88. The Spearman-Brown and Guttman internal consistency

coefficients of the scale, found by splitting the scale into two halves, were found to be 0.93 and 0.92, respectively (Table 7).

Item no	Item Total	Cronbach alpha's if item deleted	
L01	0.68**	.86	
L02	0.51**	.86	
L03	0.18*	.88	
L04	0.44**	.86	
L05	0.51**	.87	
L07	0.25**	.87	
L08	0.36**	.86	
L10	0.53**	.86	
L11	0.19*	.87	
L13	0.47**	.86	Cronbach Alpha
L14	0.51**	.85	0.88
L15	0.58**	.87	
L17	0.32**	.87	
L18	0.36**	.87	Spearman Brown*
L21	0.58**	.87	0.93
L22	0.65**	.85	
L25	0.66**	.85	
L26	0.59**	.86	Guttman*
L27	0.38**	.87	0.92
L28	0.65**	.85	
L29	0.26**	.87	
L32	0.19*	.88	
L33	0.36**	.87	
L34	0.45**	.86	
L35	0.73**	.84	
L36	0.81**	.84	
L38	0.75**	.84	
L39	0.26**	.86	

Table 7: Item analysis results pertaining to the whole of the scale and internal consistency coefficients (n=200).
* $p < 0.01$ ** $p < 0.001$

Item No	Item Total **	Internal Consistency Coefficients	
Physical adaptation sub component			
L01	0.92		
L14	0.83		
L15	0.93		
L21	0.93		
L22	0.96	Cronbach Alpha	0.97
L25	0.96	Spearman Brown*	0.92
L26	0.84	Guttman*	0.93
L28	0.96		
L35	0.79		
L36	0.81		
L38	0.82		
Social adaptation sub component			
L02	0.97		
L04	0.92	Cronbach Alpha	0.98
L07	0.97	Spearman Brown*	0.95
L10	0.97	Guttman*	0.96
L27	0.93		
L29	0.88		
L39	0.88		
Psychological adaptation sub component			
L05	0.98		
L08	0.98	Cronbach Alpha	0.98
L13	0.98	Spearman Brown*	0.98
L17	0.92	Guttman*	0.98
L18	0.85		
L33	0.92		
L34	0.92		

Table 8: Item Analysis Results pertaining to the sub components of the scale and Internal Consistency Coefficients (n=200).
* $p < 0.01$ ** $p < 0.001$

The item total correlations for the items in the physical adaptation sub component of the Adaptation to Chronic Illness Scale vary between 0.79 and 0.96. Accordingly, all of the items in this component were found to be statistically meaningful on a level of $p > 0.001$, and were decided to remain in the physical adaptation sub component of

the ACIS. The Cronbach Alpha internal consistency coefficient for these items was found to be 0.97, and the Spearman-Brown and Guttman internal consistency coefficients for these items were found to be 0.92 and 0.93, respectively (Table 8).

The item total correlations for the items in the social adaptation sub component of the Adaptation to Chronic Illness Scale vary between 0.88 and 0.97. Accordingly, all of the items in this component were found to be statistically meaningful on a level of $p > 0.001$, and were decided to remain in the physical adaptation sub component of the ACIS. The Cronbach Alpha internal consistency coefficient for these items was found to be 0.98, and the Spearman-Brown and Guttman internal consistency coefficients for these items were found to be 0.95 and 0.96, respectively (Table 8).

The item total correlations for the items in the psychological adaptation sub component of the Adaptation to Chronic Illness Scale vary between 0.85 and 0.98. Accordingly, all of the items in this component were found to be statistically meaningful on a level of $p > 0.001$, and were decided to remain in the physical adaptation sub component of the ACIS. The Cronbach Alpha internal consistency coefficient for these items was found to be 0.98, and the Spearman-Brown and Guttman internal consistency coefficients for these items were found to be 0.98 and 0.98, respectively (Table 8).

Time constancy analysis

For the test retest reliability analysis of the 25 item ACIS with three sub components, the same scale was applied to 30 people with an interval of 21 days. He test retest reliability coefficients of the scale were given in Table 9.

	r	p
Total ACIS	0.92	p=0.000
Physical adaptation sub component	0.98	p=0.000
Social adaptation sub component	0.94	p=0.000
Psychological adaptation sub component	0.84	p=0.000

Table 9: Test retest reliability coefficients of the scale (n=30).

As it can be seen in Table 9, a positive, strong, and statistically advanced relationship between the scores of the two measurements was found ($p < 0.001$).

Criterion validity

The score averages of ACIS and PAIS-SR were compared for criterion validity (Table 10).

	Ort ± SS	r	p
ACIS	106.08 ±7.45	-0.77	0
PAIS-SR	39.87 ±11.08		

Table 10: Findings regarding Criterion Validity.

A statistically meaningful negative strong correlation between ACIS and PAIS-SR scores was found ($p=0.000$).

Discussion

Validity is the level to which a measurement tool measures the characteristic it aims to measure accurately without mixing it with another characteristic⁽²⁶⁾. Reliability is related to how accurately the scale measures the characteristic it aims to measure⁽²⁷⁾.

Context Validity: The 45 item draft scale was presented to the views of 10 experts for context validity. According to the views stated by the experts regarding the items, the minimum value of the context validity rates of the items corresponded to 0.62 in the table formed by Veneziano and Hooper (1997). According to the Lawshe technique, items with lower than 0.62 CVR should be excluded from the scale. As a result, 3 items were removed from the scale because of low CVR, and 2 items were removed because of similarities.

Factor analysis: The remaining 40 item scale was applied to 200 chronic coronary artery patients, and factor analysis was performed. Since the KMO value of the scale was 0.912 ($p=0.000$), the sample sufficiency can be stated to be perfect. The result of the Bartlett's test ($p=0.000$) was meaningful, which means the items in the scale were appropriate for factor analysis. As a result of exploratory factor analysis, 12 items were removed from the scale and a 28 item scale with 3 sub components was obtained. In the scale, the variance amount explained by the three sub components was on a very good level (88.64%).

Item analysis: For the reliability study of the ACIS, the item - total score correlations of the 28 items were examined and three items (3, 11 and 32) were removed from the scale because of correlation values beneath 0.25 and the 25 item ACIS was formed.

Internal consistency analysis: The fact that all of the Cronbach alpha, Spearman-Brown and Guttman internal consistency coefficients of the scale and all of its sub components are above 0.70 shows that the final 25 item form of the scale is reliable and formed of items that are highly correlated and consistent.

Time constancy analysis: When the test retest reliability coefficients of the whole scale and its sub components were examined, the scale was found to present consistent results in different applications and the scale was found to be reliable with regard to the constancy coefficient.

Criterion Validity: The ACIS shows highly meaningful correlation with a scale of proven validity and reliability.

Conclusion

In the scale, which took its final form with three sub component and 25 items, items 1., 14., 15., 21., 22., 25., 26., 28., 35., 36., and 38 measure physical adaptation, items 2., 4., 7., 10., 27., 29., and 39 measure social adaptation, and items 5., 8., 13., 17., 18., 33., and 34 measure psychological adaptation. Items 1., 2., 4., 5., 10., 13., 14., 15., 17., 21., 22., 25., 26., 28., 34., 35., and 36 are scored normally, while items 7., 8., 18., 27., 29., 33., 38., and 39 are scored reversely. The total score that can be taken from the scale is 125. The adaptation levels of patients increase with increasing scores.

The ACIS, which was just added to literature, is a valid and reliable tool that can be used to evaluate adaptation to illness in individuals with chronic illnesses. We think that studies being performed to use and test this scale in wider sample groups and in samples with different chronic illnesses may contribute significantly to literature.

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