


Development and Validation of the Yonsei Lifestyle Profile-Satisfaction (YLP-S) Using the Rasch Measurement Model

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Abstract

Lifestyle plays an important role in determining health and vitality among older adults. However, there is limited evidence regarding lifestyle assessment. This study examined the psychometric properties of the Yonsei Lifestyle Profile-Satisfaction (YLP-S). The participants in the study included 156 older adults. Rasch analysis was used to test unidimensionality, fit statistics, and the precision of the YLP-S. The YLP-S demonstrated a unidimensional measurement construct, and 18 items fit the Rasch model. The YLP-S illustrated reasonable precision (person strata = 5.37). Only 4 items showed differential item functioning by sex or age groups. The findings indicate that the YLP-S demonstrated sound internal validity and can be used by health professionals to measure the multifaceted lifestyle of older adults.

Keywords

lifestyle, elderly, health, Rasch analysis, assessment

What do we already know about this topic?

It is important to assess older adults' lifestyle quantitative patterns and satisfaction level of their own lifestyle before providing health-care plans or interventions.

How does your research contribute to the field?

By using appropriate assessment tools like the Yonsei Lifestyle Profile-Satisfaction (YLP-S), clinicians and other health professionals can make profiling their client's lifestyle and establish individual plans and lifestyle modification interventions to improve the health and quality of life of older adults.

What are your research's implications towards theory, practice, or policy?

Healthcare professionals working with community-dwelling older adults can apply the YLP-S to their clients, and the results can be incorporated into the evaluation and intervention planning process to improve their daily lifestyle.

Introduction

Lifestyle factors have been established as an important moderator of health, well-being, and quality of life across the lifespan.¹ Over the last few decades, there has been growing research interest in lifestyle globally.² This is because a healthy lifestyle is associated with individuals' health conditions, cognitive aging, and improved quality of life.³ According to research, approximately 60% of an individual's health-related quality of life depends on lifestyle patterns.⁴ Lifestyle factors such as exercise, nutrition, activity participation, smoking, and drug or alcohol use have been found to significantly affect various domains of health and quality of

life in older adults.^{5,6} Moreover, recent evidence from lifestyle research on older adults illustrated that a healthy lifestyle reduces the incidence of major chronic diseases such as

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diabetes and heart disease and, thus, can reduce disability and mortality rates.⁷⁻⁹ Based on existing research results, it is evident that lifestyle is an important aspect of healthy and successful aging. However, the multifaceted lifestyle of older adults is yet to be measured.^{10,11} Only a few tools evaluate individuals' lifestyle and these tools tend to assess dietary factors, physical exercise, smoking, and/or drinking habits.¹² Moreover, these tools only measure frequency such as duration and/or time for each lifestyle factor, thus they have limited ability to capture the individual's satisfaction of their lifestyle.¹² For example, the FANTASTIC instrument is a 25-item instrument assessing 11 lifestyle domains including family, friends, activity, nutrition, toxins, alcohol, stress, sleep, personality type, insight, and career.¹³ Each item is scored on a 3-point rating scale from 0 (*hardly ever*), 1 (*some of the time*), to 2 (*almost always*). A higher score indicates more control over one's lifestyle. Although they have 11 domains, they are limited to assessing how people are satisfied with their current lifestyle such as physical activities, activity participation, and nutrition. Furthermore, the authors had mentioned that the validity of the instrument was not examined.¹⁴ Additionally, another general lifestyle assessment called the Health Enhancement Lifestyle Profile (HELP) was developed using a self-report questionnaire designed for screening and monitoring health-related lifestyle factors.¹⁵ The authors validated the HELP using the Rasch measurement model. In their study, the HELP illustrated good validity; however, several problematic items were identified by the Rasch measurement model.¹⁵ For instance, the item in the leisure scale regarding "carpentering, auto/house fixing, or any other mechanical work for your hobby" was easier to answer for male participants. For this reason, we developed the YLP-S items to provide various leisure activities without gender preference. Also, the well-fitting items from the HELP were referenced when the YLP-S items were generated. In addition, the assessment also tended to measure the frequency or duration of activities or health behaviors. However, it is also important to measure one's lifestyle satisfaction. For instance, Diener's study¹⁶ and Gana's study¹⁷ have reported that lifestyle satisfaction is positively associated with subjective well-being and health. Therefore, it is necessary to measure not only an objective lifestyle that can measure frequencies or duration but also subjective lifestyle by using a satisfaction scale. However, there are limited assessments that can measure satisfaction with a multifaceted lifestyle.¹² Thus, there exists the need for a tool to measure the satisfaction of multifaceted lifestyle.

It is important to assess older adults' lifestyle quantitative patterns and satisfaction levels of their own lifestyle before devising healthcare plans or interventions. By using an appropriate assessment tool, clinicians, and other health professionals can profile their clients' lifestyle and establish individual plans and lifestyle modification interventions to improve the health and quality of life of older adults. Therefore, the aim of the present study was to evaluate the

psychometric properties of the YLP-S using Rasch analysis to optimize the validity and efficiency of the YLP-S items.

Methods

Participants and Data Collection Procedures

Participants in this study consisted of community-dwelling elderly aged over 55 years residing in South Korea, cognitively intact, and able to communicate fluently in Korean. The age of a population is classified differently depending on the country; in this study, individuals who were 55 years or older were considered to be the elderly population.¹⁸ There were no other specific exclusion criteria. The study was approved by the Yonsei University institutional review board. Convenience and snowball sampling methods were used to recruit participants from various community sites. The research team provided information regarding the aim of the study and received informed consent from all participants before starting the study. As the participants were elderly, they required additional explanations on the concept of measuring satisfaction of lifestyle. Thus, measurement was conducted through individual interviews by trained researchers.

Outcome Measure

Yonsei Lifestyle Profile—Satisfaction (YLP-S)

The Yonsei Lifestyle Profile-Satisfaction (YLP-S) is a patient-reported outcome measure designed for screening and monitoring satisfaction of older adults' lifestyles.^{12,19} Piloting of the YLP-S was completed through the methods of a Delphi research of multidisciplinary health-care experts.¹⁹ Opinions from an expert panel with experience with older adults and their lifestyle were gathered, and items were reviewed and modified by the expert panel through the research. Finally, 18 items were selected. The average content validity ratio which is based on classical test theory (CTT) of the items was .92, and the consensus was .80 which were all high.¹⁹ The YLP-S consists of 18 items that examine satisfaction with meaningful activity participation and satisfaction with consumed nutrition according to their typical routine during the previous week. For example, people were asked to respond to the level of satisfaction with physical activity participation, other meaningful activity participations and consumption of nutrition (eg, during the last week, did you do aerobic exercise as you want?). Response categories included a 3-point rating scale: (1) *always less or more than I want*, (2) *sometimes less or more than I want*, and (3) *about right for me*.

The YLP-S was developed through 2 approaches. Firstly, a comprehensive literature review and Delphi studies with an expert panel were conducted to develop the items of the multidimensional lifestyle profile questionnaire. Secondly, the instrument psychometric properties were assessed in a sample of community-dwelling older adults in South Korea.²⁰

The YLP-S demonstrated high internal consistency reliability (Cronbach's alpha .83).²⁰ Regarding the test-retest, the intraclass correlation coefficient (ICC) was .97 for the total score of the YLP-S.²⁰ A total of 18 items comprised the individuals' lifestyle satisfaction level including physical activity, activity participation, and consumption of nutrition (Supplemental Material).

Statistical Procedures

Data Analysis

Rasch analysis conducted separately for the 2 YLP-S sections, including the activity participation section and nutrition section. Rasch analysis provides estimates of principal components analysis (PCA) of Rasch residuals, item fit, rating scale properties, and internal consistency.²¹ Measurement criteria include item fit, differential item functioning (DIF), and internal consistency (person separation reliability > .80).

A PCA of Rasch residuals was conducted to examine the unidimensionality assumption of the items in each measurement section. The unexpected variance in the first PCA contrast should have an eigenvalue of less than 2.0 or explain less than 10% of the variance.²²

Item fit was assessed using the information-weighted "infit" mean square statistic (*Infit Mnsq*), where a value of 1 indicates perfect fit and values between 0.6 and 1.4 are generally viewed as indicating acceptable fit.^{23,24} Misfit items outside these limits were iteratively removed until all remaining items demonstrated fit. In Rasch analysis, *Infit Mnsq* is considered a more critical and sensitive indicator of unidimensionality than *Outfit Mnsq*. This is because *Outfit Mnsq* is less threatening to measurement and easier to manage.²¹ The outfit statistics are responsive to outliers. Conversely, the infit statistics are weighted for expected variance and are therefore, adjusted for outliers.²⁵⁻²⁸ Since the YLP-S is developed for measuring an individual's lifestyle satisfaction, it is necessary to identify unexpected responses that do not match the level of the individual who answered. Therefore, in the present study, infit statistics are interpreted to be more valuable than outfit statistics.

Person separation statistics were examined to obtain an indication of the "spread" of persons along with the construct under measurement. Separation statistics ≥ 3 are generally viewed as a benchmark.^{23,29,30} Person reliability, the Rasch equivalent of Cronbach's alpha, was also calculated and a value greater than .80 was considered as acceptable reliability.^{29,31} We optimized the instrument by retaining the test items that met the item fit criteria.

Local independence assumes that once the dominant factor influencing a person's response to an item is controlled for, there should be no significant association among item responses.^{32,33} The criterion for the violation of local independence was defined as a residual correlation greater than 0.2 with any of the remaining items.³⁴

DIF analysis was conducted to examine the invariance of the test items by age ($\leq 75/\geq 76$ years) and sex (male/female). When an item's difficulty estimate location varies across subsamples by more than the modeled error, prima facie evidence of DIF exists.²⁰ In this study, DIF analyses for sex and age variables were performed based on the hypothesis that there was no difference in the estimated person or item difficulty parameters of the subgroups. The DIF detection criteria in this study were greater than 0.43 on DIF contrasts and any *P*-values less than .01, respectively.

The YLP-S was also examined for floor or ceiling effects. The floor or ceiling effects were considered to be present if more than 15% of respondents achieved the lowest or highest possible score, respectively.²⁴ Winsteps software version 4.4.5 was used for Rasch analysis.

Results

Sample Characteristics

A total of 5 trained interviewers conducted the survey. The trained interviewers consisted of 3 females and 2 males and they were graduated from bachelor's degree in occupational therapy. The trained interviewers were educated about the purpose of the YLP-S and scoring rules for conducting the assessment to elderly.

A total of 160 older adults completed the survey. Four were excluded from the analysis because they did not complete the full set of the test items. Thus, the final sample size was 156. The participants consisted of 54 males (34.6%) and 102 females (65.4%). Participants' age ranged from 55 to 96 years, with a mean age of 72.4 and a standard deviation of 11.53. Most participants were retired, and they reported the need to take medication daily because of their health problems. The respondents' demographics are reported in Table 1.

Unidimensional Construct

The unidimensionality of the 2 sections in the YLP-S was separately examined by PCA of Rasch residuals. The PCA illustrated that the assumption of unidimensionality was met. In the meaningful participation section of the YLP-S, approximately 40.4% of the total variance in the items was explained by 1 dimension with no critical unexplained variance remaining in the first contrast (eigenvalue=1.78). In terms of the nutrition section of the YLP-S, about 27% of the total variance in items was explained by unidimensionality and the eigenvalue in the first contrast was 1.59.

Rasch goodness-of-fit statistics further determined how well the items of each YLP-S scale fit the one-dimensional model of linear measure. All 18 items were within an acceptable statistical criterion for forming a unidimensional construct ($Mnsq \leq 1.4$; $ZSTD \leq 2.0$). Table 2 presents the 18 items of the YLP-S.

Table 1. General Characteristics.

Characteristic	Participants	
	n	%
Gender		
Female	102	65.4
Male	54	34.6
Age (year)		
55-65	48	30.8
66-75	36	23.1
76-85	62	39.7
86-96	10	6.4
Medication		
Yes	119	76.3
No	37	23.7
Living status		
Living alone	35	22.4
Living with others	121	77.6
Education		
None	8	5.1
Elementary school	37	23.7
Middle school	42	26.9
High school	45	28.8
College or university	23	14.9
Missing	1	0.6
Retirement		
Yes	104	66.7
No	52	33.3
Residence		
Metropolis	40	25.7
Medium & small cities	115	73.7
Rural area	1	0.6

Note. N = 156.

Hierarchical Order of Items

The Rasch model establishes the hierarchy of items and people along an equal-interval continuum. In the meaningful activity participation, “satisfaction with participating in moderate intensity physical exercise for a week” demonstrated the highest difficulty estimate (+0.76 logit) in the scale. On the other hand, “satisfaction with participating in daily activities for a week” was the easiest item (−0.76 logit). For the nutrition, “satisfaction with the amount of minerals consumed during the week” was the most difficult item (0.32 logit), whereas “satisfaction with the amount of carbohydrate consumed during the week” was considered the easiest item (−0.21 logit). There were no floor effects (no participant obtained a maximum score) or negligible ceiling effects (three participants obtained a minimum score [1.9%]) in the meaningful activity participation sections. The nutrition section demonstrated both floor (28.8%) and ceiling effects (0.6%). Thus, the observed floor and ceiling effects in the YLP-S are fitted within the established criteria (<15% floor and ceiling effects) for an appropriate measurement model except for the floor effect of the nutrition section.

Person Fit and Match with the Instrument

As the Rasch model assesses a person’s level of satisfaction regarding their lifestyle, including activity participation and nutrition, it offers a method to determine how well the YLP-S measures the sample under study. Person separation reliability indicates the ratio of unbiased sample standard deviation to the average standard error of the test³⁴ and it is analogous to Cronbach’s α in traditional statistics.³⁵ The person separation reliability of satisfaction with meaningful activity participation was high (.94). The person separation index (PSI) is person spread divided by error.²⁹ There were 2 sections calibrated by the Rasch model. So the PSI and person reliability of the 2 sections should be reported. The PSI was 3.78. The person strata was calculated using the formula $Strata = (4 * PSI + 1) / 3$.²⁹ The person strata of this part was 5.37. When the statistically distinct strata are defined as satisfaction with activity participation, 3 measurement errors apart, the person separation index indicates that the scale separated this sample into approximately 5 statistically distinct levels of satisfaction regarding activity participation. Acceptable to good separation and reliability indices were demonstrated in this section. However, there were low person strata in the satisfaction of the nutrition section (1.01).

DIF

DIF was performed to assess measurement invariance across age ($\leq 75 / \geq 76$ years) and sex (male/female) groups (Table 3). The overall items of the YLP-S demonstrated uniform DIF according to age and sex. The item “satisfaction with meaningful activity participation” displayed nonuniform DIF according to sex (male/female). The item “Q10. satisfaction with participating in productive activities (paid work) for a week” showed DIF according to sex. In addition, the item “Q7. satisfaction with participating in daily activities for a week” exhibited DIF according to age ($\leq 75 / \geq 76$ years). Regarding the satisfaction of the nutrition, 2 items (Q14, Q16) displayed DIF according to age ($\leq 75 / \geq 76$ years).

Discussion

The purpose of this study was to examine the construct validity of the YLP-S, which was developed for assessing the lifestyle profile of older adults. Although there is evidence of lifestyle interventions aimed at enhancing the health and quality of life of older adults, most studies tend to concentrate on health outcome measures such as weight, absence of chronic diseases, and physical functions.³⁶ In fact, there are limited assessments that can evaluate satisfaction of lifestyle as an outcome measure. Therefore, YLP-S was developed to measure satisfaction lifestyle. Through Rasch analysis, we improved the usefulness of the measure by performing the following procedures.

First, before attempting to link measures to the meaningful description of an individual’s lifestyle, it is crucial to

Table 2. Infit Statistics on 18 Items.

YLP-S item	Measure (Logits)	Model SE	Infit		Outfit	
			MnSq	ZSTD	MnSq	ZSTD
Satisfaction with meaningful activity participation						
Q1. Satisfaction with participating in aerobic physical exercise for a week	-0.12	0.11	1.19	2.10	1.12	0.71
Q2. Satisfaction with participating in anoxic physical exercise for a week	0.54	0.11	0.76	-2.49	0.74	-1.67
Q3. Satisfaction with participating in high intensity physical exercise for a week	-0.32	0.11	0.93	-0.74	0.96	-0.14
Q4. Satisfaction with participating in moderate intensity physical exercise for a week	0.76	0.12	0.80	-1.80	0.80	-1.15
Q5. Satisfaction with participating in mild intensity physical exercise for a week	0.60	0.11	0.88	-1.12	0.76	-1.50
Q6. Satisfaction with participating in walking for a week	-0.48	0.11	0.97	-0.23	0.79	-1.05
Q7. Satisfaction with participating in daily activities for a week	-0.76	0.12	0.97	-0.23	0.79	-1.05
Q8. Satisfaction with participating in leisure activities for a week	0.30	0.11	0.98	-0.19	0.90	-0.58
Q9. Satisfaction with participating in social activities for a week	-0.01	0.11	1.03	0.33	0.92	-0.44
Q10. Satisfaction with participating in productive activities (paid work) for a week	-0.19	0.11	0.93	-0.74	0.96	-0.14
Q11. Satisfaction with participating in education for a week	0.45	0.11	1.04	0.45	0.91	-0.52
Q12. Satisfaction with participating in sleep for a week	-0.77	0.12	1.13	1.15	1.05	0.30
Satisfaction with consumed nutrition						
Q13. Satisfaction with the amount of protein consumed during the week	0.04	0.16	1.06	0.51	1.05	0.45
Q14. Satisfaction with the amount of carbohydrate consumed during the week	-0.21	0.16	1.05	0.48	1.06	0.50
Q15. Satisfaction with the amount of fat consumed during the week	-0.16	0.16	0.90	-0.79	0.89	-0.81
Q16. Satisfaction with the amount of vitamins consumed during the week	-0.06	0.16	0.80	-1.74	0.78	-1.85
Q17. Satisfaction with the amount of calcium consumed during the week	0.07	0.16	0.90	-0.84	0.90	-0.80
Q18. Satisfaction with the amount of minerals consumed during the week	0.32	0.16	1.24	2.00	1.28	2.20

Mnsq=mean square standardized residual; ZSTD=standardized Z value.

Table 3. Differential Item Functioning for Age and Sex.

Items	Less than 75 years vs more than 75 years		Male vs female	
	DIF contrast	Probability	DIF contrast	Probability
Satisfaction with meaningful activity participation				
Q1. Satisfaction with participating in aerobic physical exercise for a week	0.12	0.57	0.03	0.81
Q2. Satisfaction with participating in anoxic physical exercise for a week	-0.13	0.57	-0.40	0.21
Q3. Satisfaction with participating in high intensity physical exercise for a week	-0.15	0.51	-0.15	0.33
Q4. Satisfaction with participating in moderate intensity physical exercise for a week	0.13	0.60	-0.19	0.71
Q5. Satisfaction with participating in mild intensity physical exercise for a week	-0.17	0.46	0.12	0.40
Q6. Satisfaction with participating in walking for a week	0.26	0.25	-0.09	0.75
Q7. Satisfaction with participating in daily activities for a week	0.56	0.02	0.27	0.62
Q8. Satisfaction with participating in leisure activities for a week	-0.20	0.37	-0.13	0.99
Q9. Satisfaction with participating in social activities for a week	0.00	1.00	0.14	0.69
Q10. Satisfaction with participating in productive activities (paid work) for a week	-0.34	0.13	0.88	<.001
Q11. Satisfaction with participating in education for a week	0.12	0.61	-0.31	0.24
Q12. Satisfaction with participating in sleep for a week	-0.16	0.51	-0.23	0.24
Satisfaction with consumed nutrition				
Q13. Satisfaction with the amount of protein consumed during the week	0.33	0.64	-0.67	0.11
Q14. Satisfaction with the amount of carbohydrate consumed during the week	1.01	0.05	-0.32	0.61
Q15. Satisfaction with the amount of fat consumed during the week	0.20	0.44	0.00	0.78
Q16. Satisfaction with the amount of vitamins consumed during the week	-0.68	0.01	0.25	0.23
Q17. Satisfaction with the amount of calcium consumed during the week	-0.45	0.23	0.44	0.23
Q18. Satisfaction with the amount of minerals consumed during the week	-0.31	0.76	0.22	0.78

confirm unidimensionality. The PCA of residual showed that satisfaction with meaningful activity participation and nutrition met the unidimensionality assumption. Second, the YLP-S statistics showed good fit. Goodness-of-fit statistics of the YLP-S illustrated that all 18 items fit the Rasch one-dimensional model. Finally, the results of the Rasch analysis of the YLP-S revealed the underlying hierarchical order of item difficulty. Satisfaction with participating in moderate-intensity physical exercise for a week was the most difficult item, whereas satisfaction with participating in daily activities for a week was the easiest item. This can be explained by the degree of functional levels and required effort. For example, participation in moderate-intensity physical exercise may have been challenging because this item required high level of physical and cognitive functions compared with the activities of daily living. These findings indicate that older adults tend to participate less in moderate-intensity physical activities on a daily basis; therefore, it might be difficult to feel satisfied with this activity. When we considered the nutrition in older adults, the most difficult item was “mineral consumption,” whereas the easiest item was “carbohydrate consumption.” The Rasch-derived item hierarchy formed using logits provides an expected pattern of older adults’ healthy lifestyle, which the health professionals can use in their clinical fields. However, it should be noted that there was a significant floor effect in the aspect of nutrition. Floor and ceiling effects were defined as the proportion of respondents that scored either the highest (ceiling) or lowest (floor) possible score for that domain.²⁴ In this study, 28.8% of floor effects were reported. This can be explained by the fact that participants tended to be older and most of them lived in medium or small cities. Previous studies have shown that older people tend to have decreased appetite and nutritional deficiencies because of physical limitations and chronic diseases.³⁷ Moreover, there was a significant difference in nutrition levels between older people who lived in metropolitan areas and older people who lived in small cities and rural areas.^{38,39} Therefore, in future studies, people from different living environments should be recruited.

Acceptable to good PSIs and reliability coefficients were found in the meaningful activity participation. In addition, the strata derived from the separation indexes suggest that meaningful activity participation can conceptually differentiate people into at least 4 to 5 distinct lifestyle groups. However, poor PSI and reliability coefficients were found in the nutrition. This is because we developed 6 essential items of nutrition for older adults. Thus, these items require modification in future research.

Most of the items did not display DIF according to sex and age. However, items 7 (“satisfaction with participating in activity of daily livings for a week”) and 10 (“satisfaction with participating in productive activities for a week”) displayed DIF according to age and sex, respectively. This is because aging is associated with a decline in the functional ability to participate in instrumental and basic

activities of daily living in community-dwelling older adults.⁴⁰ Impairment in instrumental activity of daily living (IADL) and activity of daily living (ADL) tends to appear among older adults.^{41,42} Thus, it can be seen that there is a difference in the degree of satisfaction with the activities of daily living among age groups. Additionally, in the Korean context, strong gender role division can result in DIF in item 10. According to Kostat,⁴³ men are likely to spend less time on non-paid activities. Furthermore, because of the immature pension system in Korea, men are likely to stay longer in the labor force and return to part-time or casual jobs after retirement.⁴⁵ Regarding satisfaction with nutrition, 2 items displayed uniform DIF according to age. Based on the literature, there are highly significant age differences in food choice and consumption.⁴⁴ However, these items should be reexamined in future studies.

The good psychometrics of the YLP-S support its utilization in community health care settings. Healthcare professionals working with community-dwelling older adults can apply the YLP-S to their clients, and the results can be incorporated into the evaluation and intervention planning process to improve their daily lifestyle.

Several limitations should be considered in this research. First, the current study was based on data derived from a relatively small sample consisting of community-dwelling older adults. Therefore, the results of the study should be carefully implemented, and further studies should be conducted. Second, the data of this study were gathered through personal interviews. As people tend to give more socially acceptable answers during face-to-face interaction than they might in other survey methods,⁴⁴ the results of the study should be interpreted carefully. As discussed above, the nutrition subscale required further scrutiny and revision to improve the PSIs and reliability.

Conclusions

The Rasch analysis demonstrated that the YLP-S represented a unidimensional construct and conceptually logical item difficulty hierarchy. The item-level Rasch analysis supports the preliminary psychometric properties of the YLP-S. The 18 items of the YLP-S provide a holistic viewpoint of different types of satisfaction in the elderly’s daily lifestyle.

Declaration of Conflicting Interests

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Research Ethics Section and Patient Consent

The study was approved by Yonsei University Mirae Campus (1041849-202002-SB-015-01).

Supplemental Material

Supplemental material for this article is available online.

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