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Validity, Reliability and Feasibility of the Eating Behavior Pattern Questionnaire (EBPQ) among Iranian Female Students

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ABSTRACT

Background: The aim of this study was to assess the validity, reliability and feasibility of eating behavior pattern questionnaire (EBPQ) in female university students.
Methods: In this study, after forward-backward translation, the questionnaire was reviewed by a panel of nutritionists and a psychologist and further thirty participants for the content validity measurement. The translated and modified questionnaire was completed by 225 female students of Tabriz University in 2013. Principle axis factoring, confirmatory factor analysis and known group analysis were conducted for construct, convergent and discriminant validity. Internal consistency and test–retest reliability were assessed by Cronbach's α coefficient and intra-class correlation coefficient (ICC). Ceiling and floor effects were also performed for evaluating the feasibility of the instrument.
Results: By using exploratory factor analysis, nine factors were extracted. Confirmatory factor analysis confirmed the convergent validity. Cronbach 's αand ICC were ranged between 0.55 to 0.78 and 0.67 to 0.89, respectively. The significant difference for some three subscales between diabetes and healthy subjects determined the discriminant validity. No ceiling and floor effects were found.
Conclusion: Our findings demonstrate the initial validity, reliability and feasibility of the Iranian version of EBPQ as a useful tool for eating behavior studies in young females.

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Introduction

The increasing changes in lifestyle and dietary patterns cause significant disability and premature death due to the increased prevalence of chronic diseases in both developing and newly developed countries.[1] Since eating behavior is one of the main modifiable determinants of chronic diseases, its alteration can result in reduction of diet-related diseases.[2] Eating behavior that influence energy intake and energy expenditure is per se affected by some internal and external determinants.[3]These determinants are food availability, knowledge, attitudes, emotional state, experiences of the individ-

ual and the social and cultural environment in which the behavior occurs.[3,4] Identifying these determinants is a growing area of research and several tools have been developed.[5-9] These instruments make the studies on eating behavior possible and will be more practical than laboratory tests which are objective measures and suitable only in limited participants.[10]

Eating behavior pattern questionnaire (EBPQ) is one of the suitable tools to evaluate the determinants of eating behavior through 51 items.[5]This is a self-report culturally specific likert scale measure. For the first time, this questionnaire was developed by Schlundt and his colleagues for predicting fat and fiber intake in African-American women with diverse socioeconomic status.[5]In a validation study of the questionnaire, there was a significant correlation between the subscales and micronutrient and macronutrient intakes obtained from Meharry Food Frequency Questionnaire.[5]The subscales extracted from the replication phase of this validity study were low-fat eating, emotional eating, snacking on sweets, cultural/ lifestyle behaviors, haphazard planning and meal skipping.[5]

According to Schlundt, EBPQ can be used in clinical evaluation of individuals, trials to assess the impact of intervention programs on dietary behavior and epidemiologic studies measuring relationship between eating behavior pattern and health outcomes.[5] Besides, since three subscales of EBPQ were correlated with total energy and total fat intake, it could also be a beneficial tool identifying the fat intake pattern of individuals.[5]

Since food behavior and preferences are influenced by ethnicity and cultural practices[11,12], it is essential to evaluate the validity and reliability of the questionnaire before using it in other societies. No validation study on EBPQ was found in the literature.

Therefore, in this paper, we aimed to assess the psychometric characteristics of EBPQ, addressing specific objectives: 1) translation process of EBPQ; 2) assessing i) content validity; ii) reliability (internal consistency and stability of EBPQ overtime); iii) construct validity (convergent and discriminant validity of EBPQ); and iv) feasibility of EBPQ.

Materials and Methods

Subjects and Study Design

This cross-sectional study was conducted from February to March 2013. University students with the age of >18 years were recruited from Tabriz University for the study. The students had diverse socioeconomic status and were from different cities. Participants included 225 female students without any drug abuse, psychiatric or serious medical/physical illness such as cancer or cardiovascular disease or metabolic disorders. Five or more participants per item constitute an acceptable sample size for factor analysis[13], while others suggest that a sample size of 200 is adequate in most cases of factor analysis.[14]

It was reassured that the information of subjects would be kept secretly. Self-report demographic questionnaire including age, marital status (single or married), educational level (BS, MS), native/un-native and residency (dormitory or not) was filled out by all participants. Weight and height were self-reported and Body mass index (BMI) was calculated as weight (kg) divided by height (cm) squared. Then subjects were asked to complete an Eating Behavior Pattern Questionnaire, the researcher stayed in the vicinity to check the answers and to receive the questionnaires personally. The duration of data collection for each participant was approximately 15-20 min. To perform test-retest reliability, the subsample of 25 students was asked to complete the questionnaire in two occasions with 2 weeks intervals. Furthermore, 50 diabetic patients were also asked to fill out the questionnaire in order to measure discriminant validity.

Ethical Issues

Informed consent containing the information regarding the research objectives was obtained from all participants. This study was approved by Ethical Committee of Tabriz University of Medical Sciences (code: 92108).

Selection of EBPQ

We reviewed literature focusing on the tools used to measure food intake and dietary behaviors.

"The Emotional Eating Test"[6] relates to factors measuring binge eating. "The Motivation to Eat Scale"[7], is mainly used in predicting eating, binging and purging. "The Motivation for Eating Scale"[8]measures motivations for eating such as environmental, social, emotional and physical factors. "The Food Choice Questionnaire",[9] addresses health and un-health related determinants of food choice. "Dutch Eating Behavior Questionnaire" contains scales for restrained, emotional, and external eating.[15]After all, we chose EBPQ, which is more general and simple and is not specified for eating disorders. This tool can be used easily in clinical and community studies and in practice.

Study instrument

The EBPQ was first specifically constructed in Vanderbilt University to evaluate dietary fat intake among African-American women.[5]The reliability and construct validity of the EBPQ has been established.[5]In this study we used the preliminary version of this questionnaire from UtahState University.[16] This questionnaire consists of 51 self-report items on healthy and unhealthy eating behaviors. Every item was rated in a 5-point Likert-scale ranging from strongly disagree to strongly agree. Six eating behavior patterns were assessed by the questionnaire including low fat eating (11 total items), snacking and convenience (10 total items), emotional eating (8 total items), planning ahead (6 total items), meal skipping (7 total items), and cultural / lifestyle behavior (9 total items). Prior permission for using the questionnaire was obtained from principle developer, David G. Schlundt.

Translation and content validity

The translation of EBPQ was carried out in a forward-backward procedure. The forward translation was conducted by a nutritionist with the help of bilingual professional translator and the backward translation to the original US English of Persian version was made by another professional translator. By using the back translation of results and the researcher attitudes, some alterations were made in the Persian version of the questionnaire. To evaluate qualitatively the content validity of the questionnaire, four nutrition experts and a psychologist were invited to review the items of the Persian version. The experts were asked to assess the relevancy, clarity and ambiguity of items and provide a written report of their attitudes. Then, the questionnaire was completed by 30 samples for linguistic evaluation. Based on the reports, after a few modifications, the content validity of the questionnaire was confirmed.

Construct (Factorial) validity

For construct validity, first two-step strategy of model building presented by Muliak and Millsap was used.[17]In the first step, EFA was carried out to extract the factors (latent variables) that fit the variance-covariance matrix of the observed variables. EFA was performed using principle axis factoring extraction method and Varimax rotation. Loading values higher than 0.25 for each factor-item were considered as a satisfactory loading for a contribution of the item to the factor.[18]Number of factors was determined based on Kaiser-Guttman rule (eigenvalue > 1), the scree plot test and interpretability. The scores for each factor, used in the analysis, were calculated by summing up items related to the scales. The second step involved CAF model to assess the relationship between indicator variables and latent variables in order to confirm the EFA model.[19]The estimation method was robust maximum likelihood. Asymptomatic covariance matrix was considered as a weighted matrix. Input matrix was covariance matrix of data.[20]For conducting CFA model, the Amos program, version18, was used. The fit of the model was confirmed by chi-square statistical method (χ^2), the ratio between chi-square and the degrees of freedom (χ^2/df), the goodness-of-fit index (GFI), the adjusted goodness-of-fit index (AGFI) and the root mean square error approximation (RMSEA). $\chi^2/d<5$,[21] CFI, GFI and AGFI$\geq$0.8,[22] RMSEA$<$0.08[23]are considered as fit indices and reasonable values.

Feasibility

Feasibility was assessed by ceiling and floor effects. Percentages of scores at the extremes of the

scaling range were used for evaluation of ceiling and floor effects.[24]The presence of floor and ceiling effects are considered when more than 15% of respondents achieve the lowest and highest possible score, respectively.[25]

Reliability

To test reliability and convergent validity, internal consistency with Cronbach's alpha coefficient was used. Alpha coefficient equal to or greater than 0.70 was considered satisfactory. Test–retest reliability of the questionnaire was assessed by repeating it for 25 students after a period of 2 weeks. To evaluate the stability of the questionnaire, intra-class correlation coefficient (ICC) was computed.[26] ICCs≤0.4 were considered poor to fair, 0.41–0.60 moderate, 0.61–0.80 good and>0.80 excellent.[27, 28]

Discriminant validity

For discriminant validity, the EBQP was administered to diabetes who considered having different eating behavior patterns. To compare the difference between healthy subjects and diabetes student's *t*-test was used.

Statistical analysis

Statistical analysis was performed using Statistical Package for the Social Sciences (SPSS, ver. 16; Inc., Chicago, IL, USA). The normality of data was evaluated using descriptive evidences.[29] Quantitative and qualitative data were expressed as "mean ± SD" as well as frequencies and percentages, respectively. *P*-values < 0.05 were considered significant.

Results

Sample characteristics

A total 225 completed questionnaire were analyzed. All subjects were female university students with BS or MS degrees. The means of age and BMI of study population were 22.32±2.54 years and 22.8±3.37 kg/m^2, respectively. From all subjects, 81.3% were native and 16.4% exercised at least 2 days a week.

Translation and content validity

The EBPQ was translated by a nutritionist and after backward translation and corrections; it was reviewed by a panel of 4 nutritionists and one psychologist and 30 subjects for evaluating content validity. Since the questionnaire had some cultural and social questions, in the Persian version, two items were changed according to the panel and the researcher attitudes. These questions included item 5 and 29, where the first item was changed from "I buy snacks from vending machines" to "I buy snacks from fast-food restaurants" and the latter was changed from "I eat at church socials" to "I eat in charities". These questions were changed based on the Iranian culture and society.

Construct (factorial) validity

Nine factors were extracted from exploratory factor analysis with Varimax rotation. For all subscales, Kaiser–Meyer–Olkin (KMO) value was more than 0.70(except for planning ahead with KMO= 0.5) and Bartelet test of sphericity was <0.001, both confirmed the adequacy of factor models. The factor results of the subscales were shown in Table 1. In the original EBPQ, the "low fat eating" subscale has 11 items while the "snacking and convenience" has 10 items. The factor structure of the Iranian students showed that the first subscale differentiated into two factors; "low-fat eating" and "healthy eating". In addition, the latter one split into three factors; "eating out", "snacking", and "sweets and biscuits". The other subscales extracted were the same as the main questionnaire; however, two items, question "*I snack more at night*" from emotional eating and question "*I never know what I am going to eat for supper when I get up in the morning*" from planning ahead were omitted in our EFA because of the loading values less than 0.25. Confirmatory Factor Analysis of the nine factors showed an acceptable fit of the suggested model (χ^2/df = 2.001 < 5, RMSR = 0.067, RMSEA (90% CI) = 0.056(0.040; 0.071). Furthermore, all parameters estimated by the model which relate the items to the factors and all correlations among factors were statistically significant (all *P*< 0.05); indicating the convergent validity of the measuring model (Figure1).

Table 1: Exploratory factor loadings for the nine subscales of the Eating Behavior Pattern Questionnaire (n=225)*

Subscales	Loadings	Subscales	Loadings
Low-fat eating		**Emotional eating**	
I count fat grams.	0.66	I eat when I'm upset.	0.69
I carefully watch the portion sizes of my foods.	0.63	When I am in a bad mood, I eat whatever I feel like eating.	0.65
I am very conscious of how much fat is in the food I eat.	0.58	I eat for comfort.	0.50
I choose healthy foods to prevent heart disease.	0.57	If I am bored, I will snack more.	0.47
I use low-fat food products.	0.44	I associate success with food.	0.36
When choosing fast food, I pick a place that offers healthy foods	0.42	When I buy snack foods, I eat until I have finished the whole package	0.33
I reduce fat in recipes by substituting ingredients and cutting portions	0.34	My emotions affect what and how much I eat.	0.26
Healthy eating		**Planning ahead**	
I try to limit my intake of red meat.	0.59	I take time to plan meals for the coming week.	0.44
Fish and poultry are the only meats I eat.	0.56	I take a shopping list to the store.	0.43
I eat meatless meals from time to time because I think that is healthier for me.	0.44	My eating habits are very routine	0.27
I have at least three to four servings of vegetables per day.	0.29	**Meal skipping**	
Eating out		If I eat a larger than usual lunch, I will skip supper.	0.61
I would rather buy take-out food and bring it home than cook.	0.78	If I am busy, I will eat a snack instead of lunch	0.61
I eat out because it is more convenient than eating at home.	0.69	If I eat a larger than usual lunch, I will replace supper with a snack	0.58
I hate to cook.	0.64	If I eat a larger than usual lunch, I will replace supper with a snack.	0.37
When I don't plan meals, I eat fast food.	0.41	Instead of planning meals, I choose what is available and what I feel like eating.	0.29
Snacking		I rarely eat breakfast.	0.29
I snack two to three times every day.	0.74	When I am upset, I tend to stop eating.	0.26
I am a snacker.	0.70	**Cultural/lifestyle behaviors**	
I sometimes snack even when I am not hungry.	0.45	I like to eat vegetables seasoned with fatty meat.	0.47
Sweets and biscuits		I buy snacks from fast-food restaurants.	0.45
To me, cookies are an ideal snack food.	0.59	I stop for a fast food breakfast on the way to work.	0.42
I usually keep cookies in the house.	0.51	Sometimes I eat dessert more than once a day	0.41
I have a sweet tooth.	0.48	I have a serving of meat at every meal.	0.40
I eat cookies, candy bars, or ice cream in place of dinner	0.35	On Sunday, I eat a large meal with my family.	0.40
		A complete meal includes a meat, a starch, a vegetable, and bread	0.39
		I buy meat every time I go to the grocery store.	0.35
		I eat in charities.	0.31

*Extraction method: principal axis factoring. Rotation method: Varimax with Kaiser Normalization.Values lower than 0.25 are not shown.Q17 and Q21 were excluded since their loadings were <0.25

Feasibility

The floor effects ranged from 0.0 for healthy eating, sweets and biscuits and meal skipping to 2.6% for snacking, and the range of ceiling effects were from 0.0 for low-fat eating, healthy eating, emotional eating, planning ahead and meal skipping to 5% for eating out(Table 2).

Reliability

Cronbach's α coefficient measured for the scale's internal consistency and test–retest reliability assessed by ICC for each subscale is shown in Table 2.

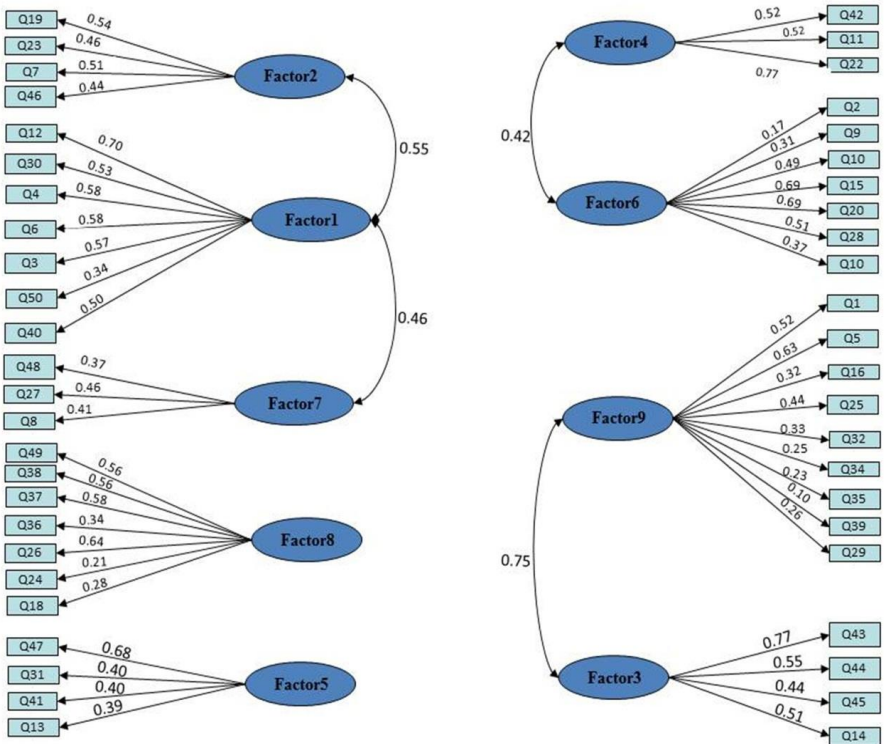

Fig. 1: Path diagram revealing the standardized parameters relating items to relevant factor.
Factor1: low-fat eating; Factor2: Healthy eating; Factor3: eating out; Factor4: snacking; Factor5: Sweets and biscuits; Factor 6: emotional eating; Factor7: planning ahead; Factor8: Meal skipping; Factor9: cultural/lifestyle behavior

Table 2: Means, standard deviation, and cronbach's α for the Iranian version of the EBPQ (n=225)

Subscales	Mean	SD	Skewness	Kurtosis	Cronbach's alpha	ICC	Floor n(%)	Ceiling n(%)
Low-fat eating	3.67	0.69	-0.47	0.11	0.782	0.785	5 (2.3)	0 (0.0)
Healthy eating	3.03	0.77	0.31	-0.21	0.561	0.811	0 (0.0)	0 (0.0)
Eating out	2.38	0.96	0.70	0.03	0.735	0.823	5 (1.2)	1 (5.0)
Snacking	3.28	0.91	-0.34	-0.35	0.660	0.889	5 (2.6)	1 (1.9)
Sweets and biscuits	3.15	0.78	-0.32	-0.22	0.550	0.807	0 (0.0)	1 (1.1)
Emotional Eating	2.98	0.71	0.39	0.04	0.600	0.844	5 (1.1)	0 (0.0)
Planning Ahead	2.35	0.70	0.04	-0.04	0.660	0.896	5 (0.8)	0 (0.0)
Meal Skipping	3.30	0.69	-0.30	-0.01	0.640	0.746	0 (0.0)	0 (0.0)
Cultural/Lifestyle Behaviors	2.94	0.53	0.16	0.002	0.600	0.672	5 (0.4)	1 (0.4)

* EBPQ: Eating Behavior Pattern; SD: Standard Deviation; ICC: Intra-class correlation coefficient

Cronbach's alpha coefficient for low-fat eating and eating out were satisfactory(>0.7), for snacking, emotional eating, planning ahead, meal skipping and cultural/lifestyle behaviors were moderate and for healthy eating and sweets and biscuits were poor. ICC for all subscales were considered good to excellent (ranged; 0.672-0.896) (Table 2).

Discriminant validity

There were significant differences for low-fat eating, sweets and biscuits, cultural and lifestyle behavior between diabetes and healthy subjects (0.005, 0.03, >0.001, respectively) and the difference for meal skipping was near the cut-off for statistical significant (*P*=0.059) (Table 3).

Table 3: Comparison of the EBPQ subscales between healthy subjects and diabetes

Subscales	Healthy subjects Mean(SD)	Diabetes Mean(SD)	*P*-value
Low-fat eating	3.73 (0.66)	3.37 (0.77)	0.005
Healthy eating	3.04 (0.77)	2.95 (0.74)	0.444
Eating out	2.40 (1.01)	2.30 (0.67)	0.411
Snacking	3.28 (0.93)	3.28 (0.76)	0.999
Sweets and biscuits	3.09 (0.78)	3.36 (0.76)	0.033
Emotional Eating	2.98 (0.74)	2.95 (0.52)	0.761
Planning Ahead	3.14 (0.68)	2.74 (0.57)	0.143
Meal Skipping	3.33 (0.69)	3.16 (0.64)	0.059
Cultural/Lifestyle Behaviors	2.96 (0.52)	2.79 (0.53)	<0.001

Discussion

In the present study, the validity and reliability of the EBPQ as a self-reported questionnaire were investigated and supported in female university students in northwest of Iran. To the best of our knowledge, there was no other study measuring validity and reliability of the EBPQ in other populations.

Regarding the cultural and social differences between our study group and the one EBPQ originated, two items were changed in the translated form of the questionnaire. The linguistic edit was also made after the completion of the questionnaire by 30 subjects. The content validity was confirmed by the experts on nutrition and psychology and the reports of linguistic evaluation. In Construct validity of EBPQ nine factors were extracted by EFA. In our factors, the low fat eating was separated clearly into 2 subscales. The first subscale included 7 items related to fat intakes and portion sizes of foods. The other one had 4 items related to meatless foods and also vegetable eating which we called "healthy eating". In the food pattern studies, healthy eating was mentioned to the food groups with more vegetables and fruits and less meat intake.[30,31] Besides, in this study three factors were extracted from "snacking and convenience" subscale. These three subscales were clearly differentiated in items, which related to snacking, eating out, sweets and biscuits. The other subscales extracted were the same as the main questionnaire; however, two items, question "*I snack more at night*" from emotional eating and question "*I never know what I am going to eat for supper when I get up in the morning*" from planning ahead were omitted in our EFA because of the loading values less than 0.25. The results of EFA were confirmed with CFA, which showed the satisfactorily fitted model and convergency of the items in each factor.

In the present study, Coefficient α statistics ranged from 0.55 to 0.78 for sweets and biscuits and low fat eating, respectively. The internal consistency for low-fat eating was satisfactory, more than 0.7,[32] however, it was poor or moderate for the remaining. We decided to maintain the subscales with Cronbach's alpha 0.55(sweets and biscuits) and 0.56(healthy eating) in the questionnaire because of the importance of the items included in these subscales.[33] In earlier studies, a similar procedure was used.[5,34,35] Since the items in some

subscales were low, - three or four-, it was not surprising that α levels were also low. The reason is that coefficient values can be directly influenced by the items of subscales.[32,36,37]In the main study of EBPQ, Cronbach's alpha coefficient ranged from 0.70 for meal skipping to 0.88 for low-fat eating.

In this study, the test-retest reliability ranged from 0.67 for cultural/lifestyle behaviors to 0.90 for planning ahead; indicating the strong stability of EBPQ over-time. In an instrument of eating stimulus index in low income, postpartum mothers the ICC were 0.83 for the entire scale and 0.50 to 0.76 for subscales.[32]In the main EBPQ, the ICC was not measured.

There were statistically differences between diabetic and healthy subjects in low-fat eating, sweets and biscuits, planning; demonstrating the discriminant (known-group) validity of the questionnaire. We chose diabetes patients, because previous studies were shown these patients had different eating behaviors due to their disease.[38]In a study with the goal of promoting health behavior changes in diabetes, subjects had the highest difficulty in making low fat choices, followed by snacking on sweets and emotional eating.[39]

The strength of the present study was the adequate sample size for the analysis. For factor analysis at least 200 sample sizes is considered enough[14]while in the present study 225 were studied. However, in the main study there were more subjects.

Our study had some limitations: first, the subjects of the study were all female university students, who would be considered as subjects with high educational status and could not be the representative of all population in the society. However, the main EBPQ were produced among were females with 76% high educational level in refinement and preliminary validation phase and 57% in the analysis of reliability and validity phase.[5] Furthermore, this study was conducted in northwest of Iran which exclude the findings from other parts of Iran that might have different eating behaviors. Further studies would be needed to evaluate the external validity of EBPQ. Additional research is also needed to test the correlation of this questionnaire with macronutrient and micronutrient intakes.

Conclusion

Using the EBPQ in the Iranian young females showed the internal consistency and stability of the questionnaire overtime. In addition, the construct and convergent validity was confirmed with the factor models. Further evaluation showed the discriminant validity, too. The Persian version of EBPQ might be a useful tool for clinical practice to understand eating behavior patterns in order to help changing the unhealthy habits. It can also be used to study the impact of interventions on eating behavior in this group. Furthermore, it can help epidemiological researchers to find out the problems of dietary behavior of the youth for further consideration and education programs to improve health and prevent health-related issues.

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Competing interests

The authors declare that they have no competing interests.

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