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Trends

Validation of the Brazilian version of the Short Inventory of Grazing (SIG)

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Original Article**Title:** Validation of the Brazilian version of the Short Inventory of Grazing (SIG)

Short title: Validation of the Brazilian SIG

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Abstract

Background: Grazing is a disturbed eating pattern that has been associated with eating disorders and obesity. One of the new measures to investigate this eating behavior is the Short Inventory of Grazing (SIG), a two-item questionnaire that assesses grazing in general and grazing associated with the feeling of loss of control over eating (LOC grazing). However, the psychometric properties of SIG have not been assessed in the Brazilian population.

Objective: The present study aimed to cross-culturally adapt and validate the Brazilian version of SIG.

Methods: SIG was adapted to the Brazilian context following international guidelines. Then, 90 undergraduate students completed an online survey including questions from the SIG, the Binge Eating Scale (BES), the Patient Health Questionnaire-9 (PHQ9), the Generalized Anxiety Disorder-7 (GAD7), and questions related to self-reported health status. The internal consistency, test-retest reliability, and the convergent validity of the questionnaire were assessed.

Results: The prevalence of at least one weekly episode of grazing in general and LOC grazing was 71.1% and 54.5%, respectively. The internal consistency of the SIG was acceptable (0.81). In addition, SIG scores on both items were positively and significantly associated with BES, GAD7, and PHQ9 scores, and with poorer self-rated health. However, SIG scores on the test and retest differed significantly.

Conclusion: Overall, the Brazilian version of SIG demonstrated adequate psychometric properties. The instrument had an adequate internal consistency, with both items exhibiting good convergent validity with related measures.

Keywords: The Short Inventory of Grazing, validation, Brazil, self-report instruments, eating-related psychopathology.

Introduction

Grazing is a disturbed eating behavior characterized by the repetitive consumption of small amounts of food over long periods, outside the regular meals or snacks, and without planning. In addition, this unstructured eating occurs not in response to hunger or satiety sensations¹. Considering its associations with external and emotional eating, it is hypothesized that grazing could be regarded as a habitual behavior, performed automatically in response to aversive emotional states and exposure to food cues in the

environment^{2,3}. Recently, some authors proposed that grazing can be divided into two subtypes: (1) compulsive grazing (CG), in which grazing is associated with the feeling of loss of control (LOC) over eating; and (2) non-compulsive grazing (NCG), characterized by repetitive and distracted eating, without LOC^{1,2,4}.

Grazing seems to be a common eating disordered behavior in both clinical and non-clinical samples. Heriseanu et al. performed a systematic review with metanalysis about grazing prevalence in individuals with obesity and eating disorders (ED)³. They found a mean pooled prevalence of 33.2% in individuals seeking obesity treatment. Regarding subjects with ED, authors reported the following prevalence: 67.7% in Binge Eating Disorder (BED), 58.2% in Bulimia Nervosa (BN), and 34.3% in Anorexia Nervosa (AN)³. In non-clinical contexts, grazing occurs at least once a week in more than 80% of undergraduate students and general community samples^{5,6}. In addition, the point prevalence of LOC grazing and grazing without LOC is 10.2% and 38%, respectively⁵.

There is some evidence that grazing may impact weight loss treatments, general and eating-related psychopathology, and quality of life³. In clinical contexts, the presence of grazing negatively impacts the weight loss maintenance and the weight regain after weight loss treatment³. In addition, individuals with obesity and grazing display a greater frequency of binge eating episodes, more severe symptoms of depression and anxiety, and lower quality of life³. In community settings, grazing has been positively correlated with Body Mass Index (BMI), psychological distress, and ED symptomatology (e.g. cognitive restraint, weight, shape, and eating concerns)^{7,8}. However, individuals with LOC grazing exhibited higher levels of ED pathology than those with non-compulsive grazing⁷.

Grazing can be considered an individual attempt to regulate emotional states². It can be impacted by stressful and emotionally activating occasions, such as the coronavirus disease (COVID-19)⁹. Overall, the lockdown due to COVID-19 affected peoples' psychosocial functioning^{10,11}. Consequently, there was an increase in stress, anxiety, depression, and disordered eating behaviors, such as grazing and binge eating episodes, during this period⁹⁻¹³. Regarding grazing, a community-based study from Ramalho et al. revealed a prevalence of 80.9% in the first mandatory lockdown, in Portugal¹³. The authors indicated that the changes in the daily routine during the pandemic lead to increased psychological distress and resulted in more disordered eating¹³. Taken together, these findings suggest that the coronavirus outbreak negatively impacted eating behaviors and mental health.

Despite the growing interest in studying grazing, there are few instruments specifically developed to assess this eating behavior. The Grazing Questionnaire is a 7-item instrument that assesses grazing severity considering the time spent during the episodes². However, it does not provide information about grazing frequency. The Rep(eat)-Q is a 12-item questionnaire that evaluates grazing frequency in the previous four weeks⁸. Nevertheless, this is a relatively short time frame to assess if an eating behavior occurs regularly. Also, Rep(eat)-Q can be time-consuming to be employed in epidemiological surveys due to its number of items. To overcome the limitations of the previous measures, the Short Inventory of Grazing (SIG) was developed by Heriseanu et al.⁴ It is a two-item questionnaire that evaluates the frequency and severity of grazing in general and LOC grazing⁴. However, its psychometric properties have not been assessed in the Brazilian population. Thus, the present study aimed to cross-culturally adapt and validate the Brazilian version of SIG.

Methods

Participants and procedures

A sample of 90 undergraduate students enrolled in the Dietitians' course at Federal University of Rio de Janeiro (UFRJ) was invited to participate in this study through email and social media advertisements explaining study's aims and procedures. In addition, they received a link to access an online form containing questions about sociodemographic and clinical information, health status, general and eating-related psychopathology. Data collection was performed between May and September 2021. This research was approved by the Ethics Committee from Institute of Psychiatry from the Federal University of Rio de Janeiro. An online informed consent was obtained from all study participants before performing any procedures

To assess the temporal stability of SIG, the participants who fulfilled the survey questionnaire were invited to answer again the questions about grazing, within a two-week interval. This period is considered enough to avoid temporal changes in the answers¹⁴. The assessments were independent, and participants did not have access to the results of the first evaluation.

Measures

Short Inventory of Grazing (SIG)

SIG is a two-item questionnaire developed to assess the frequency and severity of grazing in general (first item) and LOC grazing (second item), independently. Grazing frequency is rated in a seven-point scale ranging from “none at all” to “eight or more times a week”⁴. The SIG does not provide a cut-off point based on a dimensional scale. The presence of regular grazing episodes is defined when they occur at least once a week, in the previous three months⁴. For the assessment of grazing severity, the episodes are categorized according to their frequency similarly to DSM-5¹⁵ criteria for BED severity, as follows: mild (1-3 episodes per week), moderate (4-7 episodes per week), and severe (8 or more episodes per week)⁴. As “Grazing in general” encompasses grazing with and without LOC, Heriseanu et al.⁵ proposed the establishment of the following two mutually exclusive categories of grazing according to SIG scores:

- A) Grazing without LOC: comprise individuals who endorsed in regular episodes of grazing without LOC but did not engage in regular LOC grazing.
- B) LOC grazing: comprise individuals who engaged in regular episodes of grazing accompanied by the feeling of LOC over-eating.

As the categories are mutually exclusive, where participants endorsed in both types of grazing, they were categorized as engaging only in LOC grazing.

Permission to cross-culturally adapt the SIG to the Brazilian context was requested from and granted by the authors of the original version of the questionnaire. The translation process was performed through the following steps^{16,17}: (1) Two independent forward translations were performed by bilingual researchers experienced in the field of eating disorders; (2) Ambiguities and discrepancies of the two translations were discussed in a committee with 10 eating disorders specialists; (3) A blind back-translation to English was performed by a bilingual person; (4) Items were discussed with one of the authors of the original SIG; (5) Final approval by the investigators.

Binge Eating Scale (BES)

BES is a 16-item questionnaire developed to assess the presence and severity of binge eating symptoms¹⁸. Each item presents a range of three to four statements regarding an aspect of binge eating (e.g. “I can control my impulses towards food” to “I feel totally unable to control my relationship with food and I try desperately to fight my impulses toward food”). BES scores vary from 0 to 46 points. Scores between 18 and 26 suggest

the presence of moderate binge eating¹⁸. Values greater than 26 indicate severe binge eating¹⁸. BES was translated and validated to the Brazilian context in a sample of women with obesity^{19,20}. The questionnaire was considered a valid measure for the screening of BED (sensitivity: 97.8%; specificity: 47.7%; positive predictive value: 66.7%; negative predictive value: 95,3%)²⁰. Cronbach's alpha for this study sample was 0.89.

Patient Health Questionnaire 9 (PHQ9)

PHQ9 is a nine-item questionnaire that assesses the presence of symptoms of depression in the previous two weeks, according to DSM-IV^{21,22} (e.g. "over the last two weeks, how often have you been bothered by little interest or pleasure in doing things?"). The frequency of symptoms is evaluated through a four-point scale ranging from "none at all" to "almost every day"²¹. The Brazilian version of PHQ9 was validated in a population-based study and the cut-off point of ≥ 9 showed the highest sensitivity (77.5%) and specificity (86.7%) for the screening of major depressive disorder²³. In the present study, PHQ-9 exhibited a Cronbach's alpha of 0.88.

Generalized Anxiety Disorder 7 (GAD7)

GAD-7 is a 7-item scale developed to measure generalized anxiety symptoms²⁴ (e.g. "over the last two weeks, how often have you been bothered by feeling nervous, anxious or on edge?"). Each item is scored in a 4-point scale based on the frequency of the symptoms over the last two weeks (e.g.: "not at all"; "several days")²⁴. Total scores range from 0 to 21 with higher values indicating higher symptomatology²⁴. GAD-7 was translated to Brazilian Portuguese and validated in community sample of adults²⁵. Cronbach's alpha for this study sample was 0.89.

Self-rated health status

The health status was assessed using a question from the 12-Item Short-Form Health Survey (SF-12)²⁶. It is a self-report instrument comprised by questions evaluating components of physical and mental health²⁶. SF-12 is widely used for the assessment of health-related quality of life²⁶. The Brazilian Portuguese version of SF-12 was validated in a non-clinical sample and showed good adequate psychometric properties (convergent validity and reliability)²⁷. For this study proposal, the first item of the questionnaire was employed, as follows: "*In general, would you say your health is:*". This item is rated in a 5-point scale (1= "excellent", 2= "very good", 3= "good", 4= "fair", and 5= "poor")²⁶.

Sociodemographic and anthropometric information

The following sociodemographic characteristics were assessed: age (years), sex (male; female), and ethnicity [white; non-white (including black, mixed, oriental, and indigenous)]. Anthropometric information included self-reported weight (kg) and height (m). In addition, the BMI was calculated ($\text{weight}/\text{height}^2$). BMI (kg/m^2) was categorized as follows: Underweight ($<18,5$), normal weight ($18,5-24,9$), overweight ($25-29,9$), and obesity (≥ 30)²⁸.

Statistical analysis

Data was inspected for normality using Kolmogorov-Smirnov test. It is the recommended method to test the normality of data in samples greater than 50²⁹. Analysis revealed that age, BMI, and the scores of GAD-7, PHQ-9 and BES were not normally distributed ($p < 0.001$). Thus, non-parametric tests were employed. The sample was characterized regarding sociodemographic information, BMI, and the scores in the measures of general and eating-related psychopathology (frequencies, means, standard deviations, minimum and maximum values). The Spearman-Brown coefficient was employed to assess the internal consistency of the SIG. This coefficient was obtained through the correlation between the two items of the questionnaire. It is the preferred method for assessment of internal consistency of two-item measures as it is less biased by the number of items of the questionnaire than Cronbach's alpha³⁰. In addition, test-retest reliability was assessed using Wilcoxon's Signed-Rank Test and Kendall's tau-b.

Correlations between the SIG and related measures was calculated using Kendall's tau-b association (for non-normally distributed data); effect sizes were based on Cohen's guidelines for r . As Kendall's tau-b is not directly interpretable and yields smaller values than r , a conversion was employed^{31,32}. Thus, the following cut-offs for effect size were used: small: $\text{tau} = .06$ (equivalent to $r = .1$); medium: $\text{tau} = .19$ (equivalent to $r = .3$); large: $\text{tau} = .33$ (equivalent to $r = .5$).

Further analyses were performed to compare participants who engaged in regular LOC grazing and those with regular episodes of grazing without LOC regarding demographic information, BMI, general and eating-related psychopathology. Between-group differences were analyzed with **Kruskal-Wallis** and chi-square tests. **The following cut-offs for effect size were used: $\eta^2 = .01 - <.06$ (small); $\eta^2 = .06 - <.14$ (medium); $\eta^2 = >.14$ (large)**³³.

Statistical analyses were conducted using SPSS - Statistical Package for the Social Sciences, version 22. Statistical significance was set at $p < 0.05$.

Results

Sample characteristics

The demographic and anthropometric characteristics of the sample, as well as the scores obtained on study measures of general and eating related psychopathology, and self-rated health status are described on table 1.

Table 1. Participants' sociodemographic and anthropometric information, and scores obtained in the study measures of general and eating-related psychopathology, and health status.

Variables	N=90	Min-Max
Age, mean (SD)	22.4 (3.8)	18-38
Sex, n (%)		
Female	85 (94.4)	NA
Male	5 (5.6)	NA
Ethnicity, n (%)		
White	57 (63.3)	NA
Non-white	33 (36.7)	NA
BMI, mean (SD)	23.2 (3.8)	17.3-37.8
BMI category, n (%)		
Low weight	9 (10)	NA
Normal weight	54 (60)	NA
Overweight	23 (25.6)	NA
Obesity	4 (4.4)	NA
BES score, mean (SD)	9 (7.4)	0-34
GAD7 score, mean (SD)	8.7 (5.3)	0-21
PHQ9 score, mean (SD)	9.9 (6.4)	0-24
Self-rated health, n (%)		
Excellent	4 (4.4)	NA
Very good	26 (28.9)	NA
Good	51 (56.7)	NA
Bad	9 (10)	NA

Notes: NA=non-applicable

Grazing frequency

The prevalence of grazing in general was 71.1%. In this regard, most of the participants reported “mild” or “moderate” grazing (54.4%). The frequency of regular LOC grazing (≥ 1 episode/week) was 51.1%, with most of the subjects endorsing “mild” LOC grazing (36.7%) **(Table 2)**.

Table 2. Frequency of grazing

Frequency of grazing, n (%)	SIG 1 - Grazing in general	SIG 2 – Grazing with LOC*
No grazing/<1 times/wk	26 (28.9)	44 (48.9)
1-3 times/wk (mild)	25 (27.8)	33 (36.7)
4-7 times/wk (moderate)	24 (26.7)	7 (7.8)
8 or more times/wk (severe)	15 (16.7)	6 (6.7)

Notes: Grazing in general includes grazing with and without LOC.

Psychometric properties of SIG

Internal consistency

Results indicated that the Brazilian version of SIG had a coefficient of 0.81. In addition, the two SIG items were strongly associated with each other (Kendall's tau-b=.553; $p<.001$).

Test-retest reliability

Participants were asked to answer SIG again within an interval of two weeks. A total of 44 (48.8%) subjects completed the second application of SIG (retest). Wilcoxon Signed-Rank Test revealed that scores on both SIG items showed a statistically significant difference between test and retest (Grazing in general: $Z=-2.909$, $p=0.004$; LOC grazing: $Z=-3.637$, $p<0.001$). Associations between test and retest were statistically significant for LOC grazing item (Kendall's tau-b=0.324; $p=0.03$). Conversely, associations between the first and the second applications of SIG were not statistically significant for grazing in general item (Kendall's tau-b =-0.162; $p=0.17$).

Associations between the SIG and related measures

The associations between scores on both SIG items and other study measures were estimated. Grazing in general and LOC grazing were significantly and positively associated with BES, GAD-7, and PHQ-9 scores ($p<0.001$). In addition, both items were significantly and positively associated with poorer self-rated health ($p=0.05$) (Table 3).

Table 3. Associations between SIG items and demographic characteristics, clinical and psychological variables

Variables	SIG 1 - Grazing in general	SIG 2 – Grazing with LOC
Age	.073	.062
Sex	-.008	-.116
BMI	.142	.067
BES score	.409*	.314*
GAD7 score	.273*	.302*
PHQ9 score	.312*	.297*
Self-rated health (bad)	.208**	.222**

Notes: * $p < .01$; ** $p < .05$; Associations represents Kendall tau-b values; Bold figures indicate significant associations with a medium or larger effect size.

Comparisons between grazing with and without LOC

We performed additional analyses to compare differences regarding sex, age, BMI, psychological aspects, and binge eating symptomatology between participants with regular LOC grazing ($n=46$) and those who engaged only in grazing without LOC ($n=22$). As both groups were mostly composed of women, no statistical difference was found [$X^2(1)=1.688$, $p=0.24$]. Similarly, self-rated health did not differ between participants with LOC grazing and those who engaged in grazing without LOC [$X^2(3)=4.583$, $p=0.20$]. **Kruskal-Wallis test revealed that individuals with LOC grazing showed significantly greater depression [$H(1)=3.429$, $p=0.05$] and anxiety symptoms [$H(1)=5.352$, $p=0.02$]. Although subjects with LOC grazing exhibited greater binge eating symptomatology than those engaging only in grazing without LOC, these differences were not statistically significant [$H(1)=2.068$, $p=0.15$] (Table 4).**

Table 4. Differences in psychological and eating related psychopathology scores between participants with and without LOC grazing

Variables	Grazing without LOC (n=22) Mean (Min; Max)	Grazing with LOC (n=46) Mean (Min; Max)	X²/H	p
Age (years)	22.4 (19; 36)	22.7 (19; 38)	0.08	0.78
BMI (kg/m ²)	23.7 (17.6; 30.8)	23.4 (17.3; 37.8)	0.12	0.73
BES score	7.8 (0; 17)	11.6 (1; 34)	2.07	0.15
GAD7 score	7.6 (0; 21)	10.5 (1; 20)	5.35	0.02
PHQ9 score	9 (0; 20)	11.9 (2; 23)	3.43	0.05

Notes: Bold figures indicate statistically significant differences **with medium or larger effect size.**

Discussion

In the present study we proceeded the cross-cultural adaptation of SIG to the Brazilian Portuguese and assessed its psychometric properties in a sample of undergraduate students. To the best of our knowledge, this is the first translation and validation of a self-report instrument that assesses grazing for the Brazilian context. SIG was adapted following standardized steps according to guidelines of cross-cultural adaptation. Overall, the Brazilian version of SIG showed satisfactory psychometric properties, such as an adequate internal consistency and positive associations with related constructs. However, the questionnaire exhibited a low stability over the time when applied twice within a two-weeks interval.

Overall, our results are similar to those found by Heriseanu et al.⁴ in the validation of the original version of SIG. They assessed the psychometric properties of the questionnaire in a non-clinical sample of both university students and subjects from the general community. Authors reported a Spearman-Brown coefficient of 0.73, with a strong association between the two items. In addition, both grazing in general and LOC grazing items were positively associated with measures of eating-related psychopathology, such as binge eating, weight and shape concerns, and LOC eating⁴.

Despite great part of our results was in line with the literature, there are some findings that were divergent from the previous research. We found that the scores in both items of SIG differed significantly between the test and the retest. This suggest that the diagnosis of grazing was not stable over the time in our sample. Conversely, the original versions of SIG (LOC grazing item) and Rep(eat)-Q showed a good test-retest reliability

after two applications within an interval of one and two weeks, respectively^{4,8}. Additionally, both authors reported statistically significant associations between grazing (specially LOC grazing) and BMI^{4,8}. In the present study, although we found positive associations between SIG items and BMI, they were not statistically significant.

In the current study, individuals who engaged in regular episodes of grazing associated with LOC over-eating showed greater impact on general and eating related psychopathology than those with regular episodes of grazing without LOC. Similarly, Conceição et al⁸ found that LOC grazing was strongly associated with ED psychopathology in both clinical and non-clinical samples. Accordingly, Heriseanu et al.⁴ reported that subjects with LOC grazing showed greater general psychopathology, ED and binge eating symptomatology than those with grazing without LOC. Taken together, these findings support the idea that LOC grazing seems to be a distinct category of grazing. However, further research is required to better understand the role of LOC over-eating in the psychopathology of grazing.

Our findings suggest that the Brazilian version of SIG showed significant associations with related constructs, such as general and eating psychopathology measures. However, SIG items showed a low test-retest reliability and were not significantly associated with BMI. Potential explanations to these findings include: (1) The temporal stability of an instrument may be influenced by the test conditions¹⁷. As our study was an online survey, we could not guarantee that both test and retest were performed in similar settings; (2) The small sample size of the present study. Usually, a minimum of 50 subjects is recommended for reliability studies^{34,35}. Although 90 participants completed the first assessment (test), only 44 participated in the retest. Thus, this would have underestimated the temporal stability of SIG. (3) Our sample was composed of dietitians' students. They have an increased knowledge about food and nutrition, which helps the maintenance of their BMI within the healthy range^{36,37}. Therefore, the low prevalence of underweight and obesity may have impacted the associations between grazing and BMI.

This study has some limitations. First, the study sample was somewhat homogeneous as it was comprised predominantly of Dietitians undergraduate young women, with the BMI in the normal range. Thus, this limits the generalization of the findings to different contexts. Second, the lack of the sample size calculation could have impacted the accuracy of the SIG. However, Sousa et al. recommend at least 10 participants per item of the questionnaire as the minimum sample size for validation

studies¹⁶. Third, from the 90 participants of the study, only 44 completed the SIG in the second application. The low response rate in the retest (49%) may have negatively influenced the temporal stability of the SIG. Fourth, the use of self-reported weight and height to assess the BMI. Although the risk of recall bias, such measures have been validated in clinical and non-clinical samples^{38,39}. Despite these limitations, our study has strengths: (1) The SIG was translated to Brazilian Portuguese following standardized steps according to the recommendations of cross-cultural adaptation guidelines^{16,17}; (2) Validated self-report instruments were employed to assess measures of general and eating-related psychopathology.

We showed that the Brazilian version of SIG has adequate psychometric properties for the assessment of grazing in this sample of undergraduate students. Despite the growing research interest in this topic on the last decade, there was a lack of instruments developed for the assessment of grazing translated to the Brazilian Portuguese. Thus, the present study provides a brief and valid questionnaire that will help researchers and clinicians to evaluate more accurately this disordered eating behavior in the Brazilian context.

Future research should evaluate the reliability and validity of SIG in larger samples and different contexts, such as clinical and community settings (e.g., people seeking treatment for obesity or eating disorders and in population-based epidemiological studies). In addition, further investigation should explore the associations between grazing subtypes and related-psychopathology and thus clarify the role of the LOC as a marker of worse symptomatology.

Conclusion

In conclusion, the Brazilian version of SIG demonstrated suitable psychometric properties. Although SIG scores had low stability over time, the instrument showed an adequate internal consistency, with both items exhibiting significant associations with related measures. Clinicians need such brief and accurate instrument to help identify this condition in their usual practice.

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Short Inventory of Grazing (SIG)

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Nome: _____

Data: _____

1- Eu gostaria de perguntar sobre o ato de “beliscar” ou “lambiscar”. Com isso quero dizer o ato de **repetidamente** (mais de duas vezes no mesmo período durante o dia) “beliscar” pequenas quantidades de comida **fora das refeições e lanches planejados.**”

NOS ÚLTIMOS TRÊS MESES, tipicamente, quantos episódios desse tipo de “beliscar” você teve por semana?

- 1 – Nenhum
- 2 – Menos de uma vez por semana
- 3 – Uma vez por semana
- 4 – Duas a três vezes por semana
- 5 – Quatro a cinco vezes por semana
- 6 – Seis a sete vezes por semana
- 7 – Oito ou mais vezes por semana
- 8 – Não sabe/não lembra

2- Essa pergunta se refere a quaisquer ocasiões de beliscamento em que **você sentiu que perdeu o controle sobre a sua alimentação** (por exemplo, a sensação de que não poderia evitar voltar a beliscar, mesmo quando tentou "se segurar", ou então quando se sentiu fortemente tentado a beliscar).

NOS ÚLTIMOS TRÊS MESES, tipicamente, quantos episódios desse tipo de “beliscamento” com perda de controle você teve por semana?

- 1 – Nenhum
- 2 – Menos de uma vez por semana
- 3 – Uma vez por semana
- 4 – Duas a três vezes por semana
- 5 – Quatro a cinco vezes por semana
- 6 – Seis a sete vezes por semana

7 – Oito ou mais vezes por semana

8 – Não sabe/não lembra

Categorias de gravidade

Nenhuma vez ou menos de uma vez por semana	-
1-3 vezes por semana	Leve
4-7 vezes por semana	Moderado
8 ou mais vezes por semana	Grave

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