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# Dysfunctional Patterns of Food Intake by Anxiety during Isolation by COVID-19 in Chile, Colombia and Mexico

Patrones disfuncionales de la ingesta alimentaria por ansiedad durante el aislamiento por COVID-19 en Chile, Colombia y México

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## Abstract.

The aim of this research was to compare food intake dysfunctional patterns score with the subjective perception of anxiety and sociodemographic characteristics of the participants in isolation by COVID-19 from Chile, Colombia, and Mexico. A cross-sectional research was carried out, with a virtual questionnaire of subjective perception of anxiety and the questionnaire of three 18-item feeding factors. 958 people of both sexes participated ( $F = 83\%$ ,  $M = 17\%$ ), mainly in the 18 to 35 age range. Dysfunctional eating patterns presented high scores in people who perceived anxiety, as well as in participants from Chile. Additionally, it was found that women present greater cognitive restriction and emotional intake, and college students showed greater disinhibition. In conclusion, the scores of the three dysfunctional eating patterns were higher in people with subjective perception of anxiety during social isolation due to COVID-19, and there were also differences according to country, sex, and educational level.

## Resumen.

El objetivo de esta investigación fue comparar el puntaje de los patrones disfuncionales de la ingesta con la percepción subjetiva de la ansiedad y características sociodemográficas de los participantes en aislamiento por COVID-19 de Chile, Colombia y México. Se realizó una investigación de tipo transversal, con un cuestionario virtual de percepción subjetiva de la ansiedad y el cuestionario de tres factores de alimentación 18-items. Participaron 958 personas de ambos sexos ( $F = 83\%$ ,  $M = 17\%$ ), principalmente en el rango de edad de 18 – 35 años. Los patrones disfuncionales de la ingesta presentaron puntajes altos en personas que percibieron ansiedad y en participantes de Chile. Adicionalmente, se encontró que las mujeres presentan mayor restricción cognitiva e ingesta emocional y los estudiantes universitarios mostraron mayor desinhibición. En conclusión, los puntajes de los tres patrones disfuncionales de la ingesta fueron más altos en las personas con percepción subjetiva de ansiedad durante el aislamiento social por COVID-19 y así mismo se presentaron diferencias de acuerdo al país, sexo y nivel educativo.

## Keywords.

Anxiety, confinement, restriction, disinhibition, emotional eating, COVID-19.

## Palabras Clave.

Ansiedad, confinamiento, restricción, desinhibición, ingesta emocional, COVID-19.

## 1. Introduction

The current global situation due to the coronavirus pandemic COVID-19 has led to social control decision-making, choosing to apply preventive measures based on previous experiences, such as the epidemic of severe acute respiratory syndrome (SARS), influenza A H1N1, and Middle East respiratory syndrome (MERS). For example, applying social isolation as a strategy that involves social distancing has been successful in different epidemics (Wilder-Smith & Freedman, 2020). In Latin American countries, the application of this measure has beneficial results in epidemiological control; however, it also presents unfavorable effects in the general population, since this unexpected lifestyle change led the majority of the population to remain at home, carrying out their study activities or work in a virtual way, which can generate anxiety. In addition, other stressful stimuli such as uncertain and prolonged duration, frustration, boredom, fear of infection, lack of direct social contact, limitations in personal space, and financial difficulties secondary to the pandemic, are causing emotional distress and high levels of anxiety, resulting in unhealthy behaviors (Wang et al., 2020).

In this context, anxiety is an unpleasant emotional reaction to a stimulus that is perceived as a threat. It is manifested at a cognitive, physiological, and motor level and is characterized by its anticipatory nature and the ability to anticipate or signal danger to the individual. Additionally, it can have a functional value because it facilitates the response to face the situation, that is, an adaptive biological protection mechanism; nevertheless, if the intensity, frequency, and duration occur in non-threatening situations for the organism, it can provoke emotional, behavioral, and biological alterations related to the development of various disorders and pathologies (Sierra et al., 2003).

For example, a higher level of dysfunctional patterns of food intake such as cognitive restriction (CR), disinhibition or uncontrolled eating (UE), and emotional eating (EE), have been found in people with anxiety, which impacts the way of eating and changes health-disease conditions; this phenomenon is known as emotional eating (Cardi et al., 2015; Lavender et al., 2013). In this perspective, CR includes people who voluntarily restrict their intake as a means of controlling their weight (Rodin, 1975; Rodin & Slochower, 1976); the UE is the response to external stimuli related to food, independent of the internal state of hunger or satiety (Schachter et al., 1968); and EE, is focused on the response of some individuals to mood states (Kaplan & Kaplan, 1957). Clinically, eating emotionally or modifying eating patterns in response to emotional factors is recognized as a risk factor for increased body weight and the development of eating disorders (Gene Wang et al., 2009).

In the context of the UE and EE, it has been shown that individuals that confuse their emotional state with feelings of hunger, tend to make a signal association that leads to excessive intake (Kaplan & Kaplan, 1957). Indeed, individuals have been reported to refer food anxiety when they experienced a high level of stress from different situations (Goodman et al., 2018; Groesz et al., 2012; Wallis & Hetherington, 2009), and food anxiety is positively associated with excessive intake, which is related to UE and EE (Burton et al., 2007; Verzijl et al., 2018). In addition, the emotional eating occurs mainly in overweight and obese people (Tan & Chow, 2014); therefore, its prevalence in these countries should be taken into account: Chile (74.2%) (Ministerio de Salud, 2017) Mexico (75.2%) (Instituto Nacional de Salud Pública [INSP], 2018), and Colombia (56.5%) (Devonport et al., 2019). In summary, in this time of isolation, anxiety can increase. As a result, people use food to mask negative emotions (emotional eating), increasing the level of dysfunctional patterns of eating behavior, especially in these three countries, where the prevalence of excess weight is high.

The aim of this research was to compare the score of dysfunctional patterns of food intake with the subjective perception of anxiety and sociodemographic characteristics of the participants in isolation by COVID-19 in these three Latin American countries.

## 2. Method

### 2.1 Type of Research and Participants

This was a cross-sectional study. An online questionnaire form was published on social networks, following the snowball technique. To estimate the sample size, the total population of the three countries was taken into account,  $N = 196308.056$  (Mexico = 127000.000; Colombia = 50372.424, and Chile = 18935.632). With a 95% confidence level and a 5% margin of error, a minimum sample of 385 people was calculated, with a proportional allocation of 128 participants from each country. However, the possibility of increasing this proportional size was allowed.

Among the inclusion criteria were people who were in isolation by COVID-19, people of legal age (> 18 years) from Chile, Colombia or Mexico, and voluntary acceptance of participation. As exclusion criteria, those participants who, despite answering the questionnaire, stated that they were not in isolation during this period were considered.

### 2.2 Questionnaires

Questions of sociodemographic characteristics were asked; self-perception of food anxiety was registered in a yes/no question (“have you felt greater anxiety for consuming food at this time?”) The reference period for the response is the onset of isolation. The three feeding factors

of 18 items questionnaire, Spanish version (Jáuregui-Lobera et al., 2014), was applied to determine dysfunctional eating patterns: cognitive restriction (CR), uncontrolled eating (UE), and emotional eating (EE), obtaining an average score for each category. Ranges are 6 to 24 for cognitive restriction, 9 to 36 for uncontrolled eating, and 3 to 12 for emotional eating. A higher score indicates a higher level of each dysfunctional pattern of food intake behavior. The internal consistency of this scale in the Spanish version, according to Cronbachs alpha, was .87.

### 2.3 Ethical considerations

According to the regulations of Mexico's, Norma Oficial Mexicana NOM-012-SSA3-2012, article 23, this study is classified as a research without health risk. However, the necessary procedures for the application of ethical considerations in the research were applied: the participants voluntarily accepted their participation through a virtual authorization that indicated the objective of the study, the freedom to withdraw their consent, the guarantee of receiving a response, as well as clarification to any questions and protection of the privacy of the participants.

### 2.4 Analysis of data

Sociodemographic variables are presented by frequency distribution. Kolmogórov-Smirnov test was applied to evaluate the normality of continuous variables, for those with a non-parametric behavior; therefore, the Mann-Whitney test was applied for comparison between two groups and the Kruskal-Wallis test for comparison between several unpaired groups, and Dunn's post hoc test, for multiple comparisons. The analyzes were performed at two tails with a confidence level of 95% in the Graph-Pad Prism (version 5.0) statistical program.

## 3. Results

### 3.1 Sociodemographic characteristics

A total of 958 people under isolation or quarantine (160 men and 798 women), of whom 28.6% are Chilean, 46.9% Colombian, and 24.5% Mexican, were analyzed in this study. 83% of the population was female, 77% young adults (18-35 years old), and 44% with a professional educational level (Table 1).

### 3.2 Dysfunctional patterns of food intake according to subjective perception of anxiety by country

For the analysis of the subjective perception of anxiety according to the dysfunctional patterns of intake by country considered two categories: those who reported having said anxiety and those who did not. An increase in UE and EE was found in people who perceived anxiety for the three countries ( $p < .0001$ ). When the total population was analyzed, a higher CR level was also observed ( $p = .028$ ) (Table 2).

Table 1

*Sociodemographic characteristics of the participants*

|                        | n   | %    |
|------------------------|-----|------|
| <b>Country</b>         |     |      |
| Chile                  | 274 | 28.6 |
| Colombia               | 449 | 46.9 |
| Mexico                 | 235 | 24.5 |
| <b>Sex</b>             |     |      |
| Male                   | 160 | 16.7 |
| Female                 | 798 | 83.3 |
| <b>Age</b>             |     |      |
| 18–35                  | 737 | 76.9 |
| 36–59                  | 203 | 21.2 |
| 60–70                  | 15  | 1.6  |
| 71–90                  | 3   | 0.3  |
| <b>Education level</b> |     |      |
| High school            | 39  | 4.1  |
| College student        | 284 | 29.6 |
| Professional           | 419 | 43.7 |
| Postgraduate           | 216 | 22.5 |

Table 2

*Dysfunctional patterns of food intake according to subjective perception of anxiety by country*

| Dysfunctional intake pattern | Anxiety    | No Anxiety | p value |
|------------------------------|------------|------------|---------|
| <b>Chile</b>                 | (n = 219)  | (n = 55)   |         |
| CR                           | 15.0 ± 3.2 | 14.1 ± 4.1 | .11     |
| UE                           | 20.6 ± 5.9 | 16.3 ± 4.5 | < .0001 |
| EE                           | 6.9 ± 2.4  | 5.3 ± 2.0  | < .0001 |
| <b>Colombia</b>              | (n = 271)  | (n = 178)  |         |
| CR                           | 14.2 ± 3.3 | 14.2 ± 3.9 | .97     |
| UE                           | 19.6 ± 5.2 | 14.4 ± 4.4 | < .0001 |
| EE                           | 6.6 ± 2.5  | 4.5 ± 1.9  | < .0001 |
| <b>Mexico</b>                | (n = 133)  | (n = 102)  |         |
| CR                           | 14.0 ± 3.6 | 13.3 ± 3.2 | .24     |
| UE                           | 20.0 ± 5.4 | 15.6 ± 4.3 | < .0001 |
| EE                           | 6.7 ± 2.5  | 4.4 ± 1.7  | < .0001 |
| <b>Total</b>                 | (n = 623)  | (n = 335)  |         |
| CR                           | 14.4 ± 3.4 | 13.9 ± 3.7 | .028    |
| UE                           | 20.0 ± 5.5 | 15.1 ± 4.4 | < .0001 |
| EE                           | 6.7 ± 2.5  | 4.6 ± 1.9  | < .0001 |

Note. CR: cognitive restriction, UE: Uncontrolled Eating, EE: emotional Eating. Test Mann Whitney.

### 3.3 Dysfunctional intake patterns in Latin American countries: Chile, Colombia, and Mexico

The comparison between countries showed a higher level of the three dysfunctional intake patterns in Chile, obtaining a higher CR ( $p = .0003$ ), UE ( $p < .0001$ ), and EE with respect to Colombia and Mexico ( $p < .0001$ ) (Table 3).

Regarding analysis by sex, the entire sample showed a higher CR and EE in women, and when analyzed by country, a higher CR score was also found in Chile ( $p =$

Table 3

*Dysfunctional patterns of food intake according to subjective perception of anxiety by country*

|    | Chile ( $n = 274$ ) | Colombia ( $n = 449$ ) | Mexico ( $n = 235$ ) | <i>p</i> value |
|----|---------------------|------------------------|----------------------|----------------|
| CR | 14.8 ± 3.4          | 14.2 ± 3.5             | 13.7 ± 3.5           | .0003          |
| UE | 19.7 ± 5.9          | 17.6 ± 5.5             | 18.1 ± 5.4           | <.0001         |
| EE | 6.6 ± 2.4           | 5.8 ± 2.5              | 5.7 ± 2.5            | <.0001         |

Note. CR: cognitive restriction, UE: Uncontrolled Eating, EE: emotional Eating. Test Kruskal Wallis. Dunns Multiple comparison tests; \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ . **CR**: \*\*\* Chile vs Mexico, \* Chile vs Colombia, ns Colombia vs Mexico; **UE**: \*\*\*Chile vs Colombia, \*\*Chile vs Mexico, ns Colombia vs Mexico; **EE**: \*\*\*Chile vs Colombia, \*\*\* Chile vs Mexico, ns Colombia vs Mexico.

.002) and Mexico ( $p = .040$ ), and of EE in Colombia ( $p = .027$ ) (Table 4).

Likewise, the analysis by educational level in the entire sample evidenced significant differences with an increase in CR in postgraduate and UE in college students. A similar behavior only in Colombia, which presents statistically significant differences for the three intake patterns, with an increase in CR in people with postgraduate degrees, and higher UE as well as EE in college students (Table 4).

#### 4. Discussion

In the present study, people who reported having anxiety had a significant increase in the three dysfunctional intake patterns CR, UE, and EE. The above is similar to the results of authors who evaluated the symptoms of anxiety and emotional eating, reporting high levels for UE and EE (Penaforte et al., 2019).

On the other hand, there is evidence of the link between CR and food anxiety, with greater disinhibition or UE compared to those who eat without restrictions. This is explained with the affective neuroscience model (Silva, 2008a, 2008b; Silva et al., 2002, 2013), even several studies have confirmed that restricted consumption subsequently increases overfeeding (Burton et al., 2007; Cardi et al., 2015; Evers et al., 2018). At a general level, people in this research presented both CR and UE, which could be explained by the aforementioned model.

This research shows a higher level of the three dysfunctional patterns of food intake in Chile, compared to Colombia and Mexico. Taking into account that food intake in response to negative emotional signals is associated with body weight gain (Bennett et al., 2013), this could be part of the factors that explain the excess weight in Chile, which is at 74.2% (Ministerio de Salud, 2017). However, it is important to remember that it is a multifactorial pathology. Although the objective of this investigation was not the association with weight or fat mass, it is recommended to consider for future studies to evaluate the possible association of this variable with altered eating patterns.

Evidence has shown that men and women have different experiences with food anxiety, since men report

more anxiety for salty foods and women for sweet foods. Likewise, some researchers report that the female sex experiences with more frequently stress and anxiety, and identify it as the triggers of emotional feeding, frequently followed by guilt, which is why they tend to have periods of restriction and others of disinhibition; conversely, men identified emotions such as anxiety and boredom as the trigger for emotional eating and food as a distraction to these emotions, although they are less likely to experience guilt (Bennett et al., 2013).

Taking into account the above, in our research, the analysis by sex presents a limitation with a low sample size of men, due to its low response rate. However, it is a common characteristic found in similar research, where women represent a proportion of more than 60-70% of the sample (Bourdier et al., 2018; Penaforte et al., 2019; Poínhos et al., 2013; Sanlier et al., 2015). This study shows a higher CR and EE in women in comparison to men, finding a significant increase in CR in Mexico, and EE in Colombia. Although there is no similar research that contrasts these dysfunctional patterns of food intake with anxiety, it has been reported that with a negative emotional state, such as stress, emotional eating occurs, and taking into account that anxiety and stress generate similar physiological responses, we could expect this result (Tan & Chow, 2014), especially in women (Poínhos et al., 2013; Sanlier et al., 2015).

We found no difference by sex for UE, but it has been reported that women and men can report similar levels of anxiety induced by external food signals and similar neuronal activity after exposure to these signals, which is related to the pattern of UE intake and would explain why there are no differences between sexes for disinhibition (Gene Wang et al., 2009). Similarly, in another investigation, women were 2.68 times more likely to report anxiety about sweet foods (Penaforte et al., 2019), and it is more frequent in women than in men (Chao et al., 2016).

Regarding educational level, postgraduate students showed a higher CR score compared to the other groups, while college students showed higher UE and EE, especially in Colombia. Possibly, people with a postgraduate degree, which means a higher level of education, can con-

Table 4

*Dysfunctional intake patterns by country according to sex and educational level*

|                 | Female            | Male              | <i>p</i> | High school      | College student   | Professional      | Postgraduate      | <i>p</i> |
|-----------------|-------------------|-------------------|----------|------------------|-------------------|-------------------|-------------------|----------|
| <b>Chile</b>    | ( <i>n</i> = 254) | ( <i>n</i> = 20)  |          | ( <i>n</i> = 7)  | ( <i>n</i> = 59)  | ( <i>n</i> = 164) | ( <i>n</i> = 44)  |          |
| CR              | 15.0 ± 3.3        | 12.4 ± 3.3        | .002     | 13.4 ± 3.8       | 14.2 ± 3.3        | 14.9 ± 3.5        | 15.9 ± 2.9        | .092     |
| UE              | 19.7 ± 5.9        | 20.1 ± 5.9        | .75      | 19.4 ± 8.6       | 19.5 ± 5.1        | 19.7 ± 6.0        | 19.8 ± 6.0        | .99      |
| EE              | 6.6 ± 2.4         | 6.2 ± 2.3         | .43      | 6.1 ± 3.5        | 6.6 ± 2.4         | 6.6 ± 2.4         | 6.5 ± 2.6         | .84      |
| <b>Colombia</b> | ( <i>n</i> = 366) | ( <i>n</i> = 83)  |          | ( <i>n</i> = 26) | ( <i>n</i> = 104) | ( <i>n</i> = 193) | ( <i>n</i> = 126) |          |
| CR              | 14.3 ± 3.5        | 13.5 ± 3.4        | .075     | 13.4 ± 3.4       | 13.7 ± 3.5        | 14.1 ± 3.4        | 14.8 ± 3.7        | .026     |
| UE              | 17.6 ± 5.4        | 17.3 ± 6.0        | .55      | 18.8 ± 7.2       | 19.5 ± 5.7        | 17.3 ± 5.2        | 16.1 ± 4.9        | <.0001   |
| EE              | 5.9 ± 2.5         | 5.2 ± 2.4         | .027     | 5.4 ± 2.4        | 6.7 ± 2.7         | 5.5 ± 2.4         | 5.5 ± 2.3         | .0007    |
| <b>Mexico</b>   | ( <i>n</i> = 178) | ( <i>n</i> = 57)  |          | ( <i>n</i> = 6)  | ( <i>n</i> = 121) | ( <i>n</i> = 62)  | ( <i>n</i> = 46)  |          |
| CR              | 14.0 ± 3.6        | 12.9 ± 3.1        | .040     | 15.3 ± 4.3       | 13.6 ± 3.6        | 13.9 ± 3.8        | 13.6 ± 2.8        | .55      |
| UE              | 18.2 ± 5.6        | 17.7 ± 4.9        | .64      | 18.2 ± 10.2      | 18.0 ± 5.8        | 18.0 ± 5.4        | 18.2 ± 5.0        | .94      |
| EE              | 5.9 ± 2.5         | 5.2 ± 2.3         | .11      | 6.5 ± 3.6        | 5.4 ± 2.5         | 6.0 ± 2.3         | 6.1 ± 2.3         | .10      |
| <b>Total</b>    | ( <i>n</i> = 798) | ( <i>n</i> = 160) |          | ( <i>n</i> = 39) | ( <i>n</i> = 284) | ( <i>n</i> = 419) | ( <i>n</i> = 216) |          |
| CR              | 14.5 ± 3.5        | 13.2 ± 3.3        | <.0001   | 13.7 ± 3.6       | 13.7 ± 3.5        | 14.4 ± 3.5        | 14.8 ± 3.4        | .001     |
| UE              | 18.4 ± 5.6        | 17.8 ± 5.6        | .25      | 18.8 ± 7.7       | 18.9 ± 5.4        | 18.4 ± 5.7        | 17.3 ± 5.3        | .018     |
| EE              | 6.1 ± 2.5         | 5.4 ± 2.4         | .0003    | 5.7 ± 2.7        | 6.1 ± 2.6         | 6.0 ± 2.4         | 5.7 ± 2.4         | .32      |

*Note.* CR: cognitive restriction, UE: Uncontrolled Eating, EE: emotional Eating. **Level education, Dunns multiple comparison tests**; \**p* < .05, \*\**p* < .01, \*\*\**p* < .001, ns=no significative. **Chile (CR: ns; UE: ns; EE: ns).** **Colombia (CR: \*College student vs postgraduate; UE: \*\* College student vs professional \*\*\* College student vs postgraduate; EE: \*\*College student vs professional, \*\*College student vs Postgraduate).** **Mexico (CR: ns; UE: ns; EE: ns).** **Total (CR: \*College student vs professional, \*\*College student vs postgraduate; UE: \*\*College student vs postgraduate; EE: ns)**

trol their food anxiety more. However, this would be the first evidence in this regard, for which further research is suggested about it. In contrast, normally college students, due to their transition through the University, experience negative emotional states such as stress and anxiety (Bennett et al., 2013). Even though higher regulation of their emotions and active coping strategies have been reported in college students in Spain, increases have been found in the three dysfunctional intake patterns in students from Portugal (Poínhos et al., 2013), as well as in college students of Turkey, with higher EE in women compared to men, and participants of healthy weight (Sanlier et al., 2015). Nevertheless, the daily context of Latin American countries is different from that of European countries and has not been evaluated in isolation conditions, which, according to our findings, can lead to inadequate management of anxiety and food intake.

The current study provides new and clinically important information on the increase in the level of dysfunctional patterns of food intake when anxiety is perceived and according to country, sex, and educational level. These findings can help to understand the different responses of food intake of individuals in each country. In this social emergency situation, due to COVID-19, other authors established an association between increased levels of anxiety and food cravings in people with eating disorders and obesity compared to healthy

people. Therefore, preventive and educational interventions for emotional regulation should be a strategy of health professionals who work with emotional eaters, for the design of interventions that focus on individuals food dysregulation, with the aim of preventing psychological consequences, behavior disorders, and weight gain (Tan & Chow, 2014).

This research presented some limitations as the abrupt change from normality to isolation by the pandemic did not allow comparing this variable in a previous period. However, questions were specifically directed to the perception and characteristics of isolation, taking into account the starting period. Likewise, the ideal for future research would be to have an equal proportion of participants by sex, as differences in EE have been reported. As a perspective, it is expected to be able to carry out a later comparison when the isolation measures are completely lifted and to be able to evaluate possible changes presented in these populations. Therefore, more research is needed in this regard, taking into account social, cultural, and biological variables.

In conclusion, CR, UE, and EE scores were higher in people with self-perceived anxiety during social isolation by COVID-19. There was a higher level of these three dysfunctional patterns of food intake in Chile, compared to Colombia and Mexico. In addition, women had a higher CR and EE score, and according to educational

level, college students had a higher UE, while professionals or people with postgraduate studies had a higher CR.

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