

# Modification of Human Behavior due to Coronavirus Outbreak: A Brief Study on Current Scenario

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## Abstract

**Purpose:** The objectives of present study were to evaluate the properties of a behavior modification of people in India associated with coronavirus outbreak. The behavior modification is measure of coronavirus related psychopathology, which was validated through a large sample study on adults who reported significant change in behavior due to watching and reading about coronavirus pandemic. **Methods:** Door to door and online survey conducted in Morena and Gwalior District, Madhya Pradesh, India, for collection of data of 1050 adults'. The partakers were contacted individually, through online and complete information were taken out through a questionnaire of different parameters. Because the study focused on the effect of thinking and/or watching about coronavirus disease 2019 (COVID-19) on physical activity of body, behavior, mental stress, anxiety, faith in God, and appetite. **Results:** A total of 16 symptoms of behavior modification due to coronavirus outbreak were statistically defined through a principal component analysis with Varimax rotation. The results were confirmed by a two-component structure and the total variance explained 55.23% for first component accounting. The six prime loadings on the first component were selected for the behavior changes because these loadings well exceeded the criteria for psychometrically prime items. Especially, communalities extraction coefficients (CEC) ranged from 0.717 to 0.853, coefficients of structure/pattern ranged from 0.71 to 0.90, and cross-loadings ranged from 0.17 to 0.22. These symptoms were used for the determination of different parameters such as decreased physical activity, psychological disturbances, mental stress, anxiety, faith in God, and appetite before arising COVID-19 infection and were highly reliable ( $\alpha = 0.83$ ) as a cluster. **Conclusion:** For the coronavirus outbreak, models will be required for control the negative behavior modification of peoples so that they can use their skill for positive outcomes. The clear cut updated policy of should be implemented to reduce these types of modifications. The prime symptoms of behavior modification were validated and stabilized through statistical tools such as CEC, coefficients of structure/pattern, and analysis of variance. Hence, we can say that if opinions of some experts are correct, then world's most of population need special care to avoid behavior modification due to coronavirus outbreak.

**Key words:** Coronavirus, behavior modification, principal component analysis, analysis of variance, correlation

## INTRODUCTION

Coronavirus disease 2019 (COVID-19) is a very serious concern for the whole world due to its worst transmission rate in humans. Based on mortalities, the number of infections and the high transmission rate COVID-19 has declared a pandemic disease on March 11, 2020, by the World Health Organization (WHO).<sup>[1]</sup> To date (April 19, 2020) globally 4,170,424 were found positive for the COVID-19 and 2,87,399 deaths have been recorded.<sup>[2]</sup> Clinical symptoms of COVID-19 are very identical to that of viral pneumonia.

In the initial findings of Chinese scientist's it was declared as pneumonia, later it was diagnosed as novel coronavirus pneumonia.<sup>[3]</sup> Because of COVID-19 daily life of peoples has been changed and unprecedented across the globe.<sup>[4]</sup> On a world level, the COVID-19 outbreak has potentially affected

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the routine activities of peoples such as interaction with each other, how we work, engage in mundane activities, increased participation in house life, and maintain social distancing. We are exploring and readjusting ourselves at the personal and communal levels. We were propelled and compelled to find alternative ways for life to survive. The consequences of coronavirus disease do not affect only the social behavior of human it is also affecting the economic exploration of organizations. These consequences were appeared due to organizational shutdowns, closures of schools, quarantine, and social isolation of the most of population.<sup>[5]</sup> The previous epidemiological data have proved that there were three prime causes of the spreading of virus, that is, route of transmission, the source of infection, and susceptibility.<sup>[6]</sup> However, further research revealed that some persons contracted the viral infection while there is no record of a visit to of seafood market. These findings showed a human to the human transmission capability of coronavirus, which was subsequently scattered all over the world. The human to the human transmission of COVID-19 occurs due to togetherness with a corona virus-infected individual, exposed to sneezing, coughing, respiratory aerosols, or droplets. These droplets may be administered in the human body inhalation through the mouth or nose.<sup>[7-10]</sup>

There is a trigger heightened waves of anxiety and fear in individuals due to mass tragedies, particularly in cases of infectious diseases like COVID-19. These heightened waves are the main cause of huge disruptions of the psychological and behavioral well-being of most of the population.<sup>[11]</sup> For example, in recent surveys and studies of Chinese researchers, people were found highly susceptible to the COVID-19 infection and traumatic rate of stress, depression, generalized anxiety, and anxiety were observed 73.4%, 50.7%, 44.7%, and 36.1%, respectively.<sup>[12]</sup> Although these observations were disturbing even they were not isolated, according to the research psychological impact of COVID-19 outbreaks has proved the links between COVID-19 related anxiety and contamination concerns, elevated symptoms of stress, post-traumatic stress, health anxiety, and suicidality.<sup>[13-16]</sup> Therefore, the aim of the present study was to fill a gap in the response of mental health to this increasing public health severity by developing and examining current mental health to identify probable cases of symptomatic and dysfunctional anxiety due to COVID-19.

## METHODS

### Partakers and procedure

Door to door and online survey conducted in Morena and Gwalior District, Madhya Pradesh, India, for collection of data of 1050 adults'. The partakers were contacted individually, through online and complete information were taken out through a questionnaire of different parameters. Because the study focused on the effect of thinking and/

or watching about COVID-19 on physical activity of body, behavior, mental stress, anxiety, faith in God, and appetite.

The samples of studies consisted of 611 men and 439 women with a combined average age of  $31.68 \pm 2.50$  years. Most of the partakers were having normal health before the spreading of COVID-19 in India; most of the partakers were literate and did not diagnose with coronavirus disease and not took any of drugs for above-mentioned diseases.

Over the past 15 days, most of the partakers spent 1–2 h ( $n = 337$ ; 32.09%), followed by 3–4 h ( $n = 289$ ; 27.52%), 4–6 h ( $n = 227$ ; 21.61%), and 6 h or more ( $n = 197$ ; 18.24%) thinking and/or watching/reading media about the coronavirus disease. On the basis of study a significant elevation was observed during the past 15 days for mental stress, anxiety, faith in god due to coronavirus, and changes were observed for the physical activity of the body, behavior, and appetite.

## Measures

### Basic information

Partakers were asked to take information about gender, age, current address, education, coronavirus diagnosis and history of physical activity of body, behavior, mental stress, anxiety, faith in God, and appetite before arising COVID-19 infection.

### Construction of valid item

Partakers were asked to answers, using a 5-point time anchored scale (where 0 = not at all to 4 = about every day over the past 15 days), where “2” expressed as the item response. This type of construction was as a questionnaire for the purpose of avoiding partakers who may threaten the reliability of the study's outcomes by not appropriately answering to the content of the questionnaire.<sup>[17]</sup> So consequently, 113 partakers were excluded from the study sample.

### Physical activity of the body

Partakers were asked to answer, using a 5-point scale of physical activity of body (where 0 = very dissatisfied to 4 = very satisfied), their satisfaction for running/walking (Mean [mean] = 1.25; standard deviation [SD] = 0.20). Partakers were asked to answer “Overall, how satisfied with work out/physical activity during coronavirus pandemic?” using a 5-point scale (0 = very decrease to 4 = very increase), their satisfaction for overall work out/physical activity (M = 1.96; SD = 0.23). Partakers were asked to answer, using a 5-point scale (0 = very decrease to 4 = very increase), their habits for yoga/meditation (M = 2.20; SD = 0.36) due to effect of coronavirus. Partakers were also asked for their plans for physical activity of the body because of coronavirus. Partakers were asked to answer, using a 5-point scale (0 = very unlikely to 4 = very likely), their likelihood for future plan for physical activity (M = 2.44; SD = 0.46).

### **Behavior/psychological effects**

Partakers were asked for their experience of psychological changes/behavior changes due to the coronavirus outbreak using a 5-point discrete scale (where 0 = nil to 4 = high over the past 15 days), their extreme thinking about coronavirus (M = 1.78; SD = 0.14) was observed and their passive/negative thinking due to the coronavirus outbreak was measured as M = 1.95; SD = 0.12 by the item, "I am thinking that I will die due to coronavirus."

### **Mental stress**

Partakers were asked to answer, using a 5-point scale of mental stress (where 0 = rarely seldom to 4 = very often), their feeling about unable to control important things in their life (M = 2.45; SD = 0.20). Partakers were asked to answer using a 5-point scale (0 = never to 4 = very often), their experiences for headaches, nausea, chest pain, or changes in libido, and these characters were measured as M = 1.7; SD = 0.21. Partakers were asked to answer, using a 5-point scale (0 = very decrease to 4 = very increase), their anger (M = 1.96; SD = 0.23) due to effect of coronavirus.

### **Anxiety**

Coronavirus anxiety scale was created on the basis of measurement of ten items that were useful in the assessment of anxiety in adults during the past 7 days.<sup>[18]</sup> Each item was considered to investigate a unique manifestation of anxiety due to coronavirus outbreak. Specifically, these items included for getting cognitive information (i.e., worry; repetitive thinking; planning, dreaming, and processing biases), behavioral (i.e., avoidance; dysfunctional activities; and compulsive behaviors), emotional (i.e., anger; anxiety; and fear), and physiological (i.e., sleep disturbance/insomnia; tonic immobility; and somatic distress) anxiety due to dimensions of coronavirus. Each item was answered using a 5-point scale to investigate symptoms' frequency of anxiety ranging from 0 to 4 where, 0 = never and 4 = all of the time over the preceding 7 days. This scaling was based on the cross-cutting symptoms measure through adult self-answered protocol.<sup>[18]</sup>

### **Faith in god**

Partakers were asked to answer, using a 5-point scale (0-4 where 0 = not at all and 4 = increased every day over the last 15 days), how often they engaged in religious activity due to coronavirus outbreak. Negative religious thought (M = 1.11; SD = 0.10) was observed by the item, "Overthinking about coronavirus disease, I wondered if the creator was angry with or had ditched some individuals." Worship of God (M = 2.52; SD = 0.32) was measured by the item, "Overthinking about coronavirus disease, I start the worship of God then god save individuals."

### **Appetite**

Partakers were asked to answer, using a 5-point scale (0-4 where 0 = very poor and 4 = very good over the past

15 days), how often they feel the appetite due to coronavirus outbreak. The appetite (M = 1.95; SD = 0.13) was measured by the item, "After thinking about coronavirus disease, their appetite was mild poor." They feel hungry (M = 1.93; SD = 0.10) was measured by the item, "They feel hungry; rarely, occasionally, some of the times, most of the time, and all the times".<sup>[19]</sup>

### **Analytic methods**

The five steps approach was adapted to evaluate the change of behavior. The first step was the identification of the problem in the second step shreds of evidence collected and reviewed to plan activities that are useful to evaluate behavior change. In the third step, a logical model was framed to evaluate step by step activities for achieving the aim. Then identify all indicators (i.e., observations or measurements) that actually happen as predicted.

Various successive factor analytic approaches were used to the symptom of behavior modifications to examine a small and reliable subset of indications that best express the latent construct for behavior exploration and modification due to coronavirus fear or anxiety. To show the effects of sampling error, an internal replicability method was used by subjecting the data of the study to a principal component analysis (PCA) using a bias-corrected way. The PCA was used to examine the six most robust symptoms of behavior modification.

The entire study data were employed to identify the diagnostic viability and construct validity of the behavior modification symptoms due to coronavirus using a series of PCA and correlation analysis. Statistical analyses were conducted using SPSS (26.0 version).

Criteria for assessment of six symptoms for behavior modification were based on the characteristics of a psychometrically sound item.<sup>[20]</sup> Especially, the symptoms were extracted using PCA from the first component because they account for the maximum probability of squared correlation among the item pool. The six symptoms with the highest loading with the first component had to also yield good structure/pattern coefficients (>0.50), high coefficient of communality (>0.50), and minimum cross-loading (<0.50) on the second component, to consider for the exploration and modification of human behavior.

Criteria for assessment of the diagnostic viability of the modification of behavior screener and optimum scoring of cutoff value were on the psychiatric basis screen test research.<sup>[21-23]</sup> Especially, a good screening test must produce the value of area under curve  $\geq 0.65$  and is expressed by a scree curve that showed as a concave shape at the lower left side of the curve. The optimum scoring of cutoff must have an Eigen value of  $\geq 1$  and 6 component to be considered optimum for modification of behavior Figure 1.

## RESULTS

### Screening of data

A preliminary data screening suggested that 16 items were suitable for the analysis of behavior modification.<sup>[24]</sup> Especially, the collected data did not show issues pertaining to missing data, sample size, singularity or multicollinearity, and non-normality. However, the correlation matrices were defined through a factorial basis (Sphericity Bartlett's test =  $P < 0.001$ ; Meyer–Olkin test = 0.544). *t*-tests and Chi-square tests revealed as principal confirmatory analysis samples (1050). Here, the scree plot showed [Figure 2] the most prominent symptoms for study.

### PCA

A total of 16 symptoms of behavior modification due to coronavirus outbreak were statistically defined through a PCA with Varimax rotation. The results were confirmed by a two-component structure and the total variance explained 55.23% for first component accounting. The six prime loadings on the first component were selected for the behavior changes because these loadings well exceeded the criteria

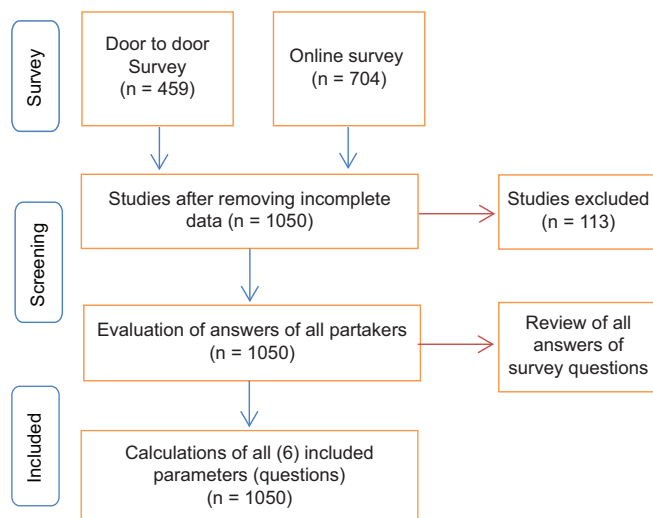


Figure 1: The process of survey

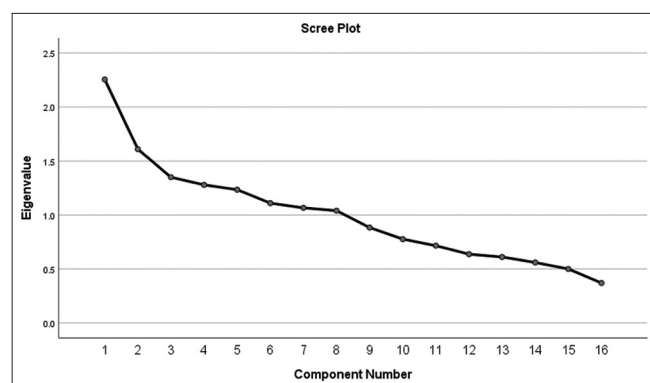


Figure 2: Scree plot for validation of symptoms

for psychometrically prime items [Table 1]. Especially, communalities extraction coefficients (CEC) ranged from 0.717 to 0.853, coefficients of structure/pattern ranged from 0.71 to 0.90, and cross-loadings ranged from 0.17 to 0.22. These symptoms were used for the determination of different parameters such as decreased physical activity, psychological disturbances, mental stress, anxiety, faith in God, and appetite before arising COVID-19 infection and were highly reliable ( $\alpha = 0.83$ ) as a cluster.

On the basis of correlation analysis the younger adults and literate people were have higher score for less physical activity [Table 2]. In terms of religion, there score for religious activity was higher due to coronavirus outbreak. The plans also effected due to COVID-19 pandemic. In terms of anxiety positively correlated with lockdown of country due to the coronavirus pandemic and likelihood of avoiding

Table 1: Different statistical parameters of symptoms for behavior changes

Symptoms of behavior changes	LD	CEC	Mean	SD
Psychological disturbances	0.90	0.853	1.86	1.26
Mental stress	0.87	0.789	2.03	1.30
Anxiety	0.71	0.880	1.78	1.25
Decreased physical activity	0.84	0.742	1.96	1.28
Appetite loss	0.82	0.728	1.94	1.25
Change in religious activity	0.78	0.717	1.81	1.12

CEC: Communalities Extraction Coefficients, SD: Standard deviation, LD: Structure/pattern coefficients for the first component, Correlation and analysis of variance (ANOVA) testing

Table 2: ANOVA analysis of different variables

Variables	P-values
Changes in libido	0.011
Anger	0.010
Passive Thinking	0.0001
Head ache	0.023
Anxiety	0.001
Physical Activity	0.030
Fear	0.004
Worry	0.021
Appetite	0.001
Extreme thinking	0.001
Insomnia	0.029
Religious Activity	0.015
Mental stress	0.031
Planning	0.025
Somatic distress	0.0001
Nausea	0.001

ANOVA: Analysis of variance

**Table 3:** Brief behavior changing symptoms (questions)

How often your activities during the past 15 days?	Not at all	Rare (for 1 or 2 days)	Several days	More than 7 days	~Every day (for last 15 days)
I felt extreme thinking when I watch or read about the coronavirus disease	0	1	2	3	4
I am thinking that I will die due to coronavirus	0	1	2	3	4
I felt lightheaded, worried, fear, when I watch or read about the coronavirus disease	0	1	2	3	4
I felt asleep/sleep disturbance, when I watch or read about the coronavirus disease	0	1	2	3	4
I felt my physical activity/work out disturbed, when I watch or read about the coronavirus disease	0	1	2	3	4
I felt that I am unable to control important things in my life, when I watch or read about the coronavirus disease	0	1	2	3	4
I experience headaches, nausea, chest pain, or changes in libido, when I watched or read about the coronavirus disease	0	1	2	3	4
I engaged in religious activity due to coronavirus outbreak, when I watched or read about the coronavirus disease	0	1	2	3	4
I felt that I didn't have interest in eating, when I watched or read about the coronavirus disease	0	1	2	3	4

outdoor movements. There were no relationships observed between behavior modification scores and gender and history of behavior changes.

## DISCUSSION

The objectives of present study were to evaluate the properties of a behavior modification of people in India associated with coronavirus outbreak [Table 1]. The behavior modification is measure of coronavirus related psychopathology, which was validated through a large sample study on adults who reported significant change in behavior due to watching and reading about coronavirus pandemic. Factors and PCA were used to evaluate items which were indicators of behavior modification, these items were shown high reliability ( $\alpha = 0.83$ ), and stability of study was confirmed by PCA.

The validity of content related to the behavior modification was also explained by the items and each item represents physiological and psychological arousal symptoms such as elevated fear and passive thinking. For example, physical activity, sleep disturbance, and anxiety are major and common items for measurement of behavior modification. Nausea was an indicator of behavior change because it was

correlated with digestive changes. Appetite loss was another item which also a common symptom of behavior change, a condition that often associated to panic disorder.<sup>[18]</sup> Loss of appetite was a sign for fear because when appetite of people is lost then biological process takes place as blood leaving the digestive tract and blood movement increase in those areas where person deal with imminent effect.<sup>[25]</sup>

The correlation between the behavior change scores and items especially positively associated with religious activity and negatively with physical activity and libido. Because these symptoms showed significant changes in interpersonal and behavioral attitude due to coronavirus related worry and fear [Table 3]. The six prime loadings on the first component were used for the behavior changes because these loadings well exceeded the criteria for psychometrically prime items. Reliability and validity of data for these loadings were stabilized through, CEC ranged from 0.717 to 0.853, coefficients of structure/pattern ranged from 0.71 to 0.90, and cross-loadings ranged from 0.17 to 0.22.

## CONCLUSION

For the coronavirus outbreak, models will be required for control the negative behavior modification of peoples

so that they can use their skill for positive outcomes. The clear cut updated policy of should be implemented to reduce these types of modifications. The prime symptoms of behavior modification were validated and stabilized through statistical tools such as CEC, coefficients of structure/pattern, and ANOVA. Hence, we can say that if opinions of some experts are correct, then world's most of population need special care to avoid behavior modification due to coronavirus outbreak.

## DECLARATIONS

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### Competing interests

No competing interests to declare.

### Ethics approval

Not applicable.

### Consent for publication

Not applicable.

### Availability of data and materials

The datasets of research were collected from experiments and analysis of variables during current study. These datasets are available from the corresponding author on reasonable request.

### Authors' contributions

PS designed and optimizes the study and developed the methodology. PS performed the survey, collection and interpretation data. PS, AP, and SJ wrote the manuscript. VJ contributed to manuscript revision and provided supervision. All authors read and approved the final manuscript.

## REFERENCES

1. World Health Organization. WHO Director-General's Opening Remarks at the Media Briefing on COVID-19 11 March 2020. Available from: <https://www.who.int/dg/speeches/detail/whodirector-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020> [Last accessed on 2020 Mar 12].
2. World Health Organization. Coronavirus Disease 2019 (COVID-19) Situation Report No. 114. Available from: [https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200513-covid-19-sitrep-114.pdf?sfvrsn=17ebbbe\\_4](https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200513-covid-19-sitrep-114.pdf?sfvrsn=17ebbbe_4) [Last accessed on 2020 May 14].
3. Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, *et al.* Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lancet* 2020;395:497-506.
4. Xiang Y, Yang Y, Li W, Zhang L, Zhang Q, Cheung T, *et al.* Timely mental health care for the 2019 novel coronavirus outbreak is urgently needed. *Lancet Psychiat* 2020;7:228-29.
5. Ferguson N, Laydon D, Nedjati-Gilani G, Imai N, Ainslie K, Baguelin M, *et al.* Impact of Non-pharmaceutical Interventions (NPIs) to Reduce COVID-19 Mortality and Healthcare Demand; 2020.
6. Barreto ML, Teixeira MG, Carmo EH. Infectious diseases epidemiology. *J Epidemiol Commun Health* 2006;60:192-95.
7. Phan LT, Nguyen TV, Luong QC, Nguyen TV, Nguyen HT, Le HQ, *et al.* Importation and human-to-human transmission of a novel coronavirus in Vietnam. *N Engl J Med* 2020;382:872-74.
8. Riou J, Althaus CL. Pattern of early human-to-human transmission of Wuhan 2019 novel coronavirus (2019-nCoV), December 2019 to January 2020. *Euro Surveill* 2020;25:2000058.
9. Parry J. China coronavirus: Cases surge as official admits human to human transmission. *BMJ* 2020;368:m236.
10. Li Q, Guan X, Wu P, Wang X, Zhou L, Tong Y, *et al.* Early transmission dynamics in Wuhan, China, of novel coronavirus infected pneumonia. *N Engl J Med* 2020;382:1199-07.
11. Balaratnasingam S, Janca A. Mass hysteria revisited. *Curr Opin Psychiatry* 2006;19:171-4.
12. Liu S, Yang L, Zhang C, Xiang Y, Liu Z, Hu S, *et al.* Online mental health services in China during the COVID-19 outbreak. *Lancet Psychiat* 2020;7:e17-8.
13. Chong M, Wang W, Hsieh W, Lee C, Chiu N, Yeh W, *et al.* Psychological impact of severe acute respiratory syndrome on health workers in a tertiary hospital. *Br J Psychiatry* 2004;185:127-33.
14. Wheaton MG, Abramowitz JS, Berman NC, Fabricant LE, Olatunji BO. Psychological predictors of anxiety in response to the H1N1 (swine flu) pandemic. *Int J Cogn Ther* 2012;36:210-8.
15. Wu P, Fang Y, Guan Z, Fan B, Kong J, Yao Z, *et al.* The psychological impact of the SARS epidemic on

- hospital employees in China: Exposure, risk perception, and altruistic acceptance of risk. *Can J Psychiat* 2009;54:302-11.
16. Yip PS, Cheung YT, Chau PH, Law YW. The impact of epidemic outbreak: The case of severe acute respiratory syndrome (SARS) and suicide among older adults in Hong Kong. *Crisis* 2010;31:86-2.
  17. Barger P, Behrend TS, Sharek DJ, Sinar EF. I-O and the crowd: Frequently asked questions about using Mechanical Turk for research. *I-O Psychologists* 2011;49:11-8.
  18. Craske M, Wittchen U, Bogels S, Stein M, Andrews G, Lebeu R. *Diagnostic and Statistical Manual of Mental Disorders*. 5<sup>th</sup> ed. Washington, DC: American Psychological Association; 2013.
  19. Margaret-Mary GW, David RT, Laurence ZR, John TC, Stephanie A, Amy B, *et al.* Appetite assessment: Simple appetite questionnaire predicts weight loss in community-dwelling adults and nursing home residents. *Am J Clin Nutr* 2005;82:1074-81.
  20. Ford JK, MacCallum RC, Tait M. The application of exploratory factor analysis in applied psychology: A critical review and analysis. *Pers Psychol* 1986;39:291-14.
  21. Spitzer RL, Kroenke K, Williams JBW, Lowe B. A brief measure for assessing generalized anxiety disorder: The GAD-7. *Arch Intern Med* 2006;166:1092-7.
  22. Van Dam NT, Gros DF, Earleywine M, Antony MM. Establishing a trait anxiety threshold that signals likelihood of anxiety disorders. *Anxiety Stress Copin* 2013;26:70-6.
  23. Weinstein MC, Berwick DM, Goldman PA, Murphy JM, Barsky AJ. A comparison of three psychiatric screening tests using receiver operating characteristics (ROC) analysis. *Med Care* 1989;27:593-607.
  24. Antezana G, Venning A, Blake V, Smith D, Winsall M, Orłowski S, *et al.* An evaluation of behaviour change techniques in health and lifestyle mobile applications. *Health Inform J* 2020;26:104-13.
  25. Cosmides L, Tooby J. Evolutionary psychology and the emotions. In: Lewis M, Haviland-Jones JM, editors. *Handbook of Emotions*. United States: Guilford; 2000. p. 91-115.

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