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Psychiatry

The relationship between irritability and autism symptoms in children with ASD in COVID-19 home confinement period

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Abstract

Objective: This study investigated the impact of COVID-19 home confinement on autism spectrum disorder (ASD) symptoms and irritability in children and adolescents with ASD.

Method: The study participants included 46 drug-naive children aged 4-17 years diagnosed with ASD. Parents of the participants completed the Autism Behaviour Checklist (AuBC) and Affective Reactivity Index (ARI) scales for both normal conditions and COVID-19 home confinement.

Results: All subscale scores for AuBC (sensory, relating, body and object use, language, and social and self-help) and ARI scores significantly increased during the COVID-19 home confinement period ($P < .05$). The participants' irritability and ASD symptoms were significantly worse during the COVID-19 outbreak and home confinement period compared to normal conditions. The variables that predicted irritability were the social and self-help subscales of AuBC.

Discussion: These results have alerted us of the importance of focusing on the symptoms such as irritability exhibited by extremely vulnerable populations during disease outbreaks and of the necessity of developing new strategies to avoid such adverse outcomes in similar situations.

1 | INTRODUCTION

Autism spectrum disorder (ASD) is a neurodevelopmental disorder characterised by the early onset of social communication difficulties and repetitive or stereotyped behaviours.¹ These symptoms may lead to an imbalance in emotional response, which is associated with increased anxiety and impaired emotional learning.² The long-term health outcomes related to ASD continue to impose a high burden of care, requiring scientific evaluation of how different comorbid conditions affect individuals with ASD.³ Although the aetiology of ASD remains unclear, it may be triggered by a combination of gene mutations and environmental factors or the interactions between genes and the environment. Assuming that an individual's environment strongly influences the development of communication skills

and relationships, it is therefore critical to focus on approaches that directly act on social barriers in ASD.²

Behavioural and educational therapies remain the mainstay of treatment for ASD. Treatment is individualized according to the patient's needs and involves a multidisciplinary/multicentre approach consisting of intensive behavioural therapy, educational programming, and ancillary services such as speech/language, occupational and physical therapy services. Depending on the patient's profile and severity of symptoms as well as the existence of comorbid conditions such as epilepsy, metabolic abnormalities, sleep disturbances, or attention deficit hyperactivity disorder (ADHD), psychopharmacological medications may also be used to target specific symptoms in the treatment of ASD.⁴ In order to obtain the aforementioned therapeutic services, children must be able to leave their homes.⁵

Irritability, described as a mood disturbance characterised by persistent angry negative affect and outbursts or tantrums, may be considered pathological.^{6,7} It is listed as one of the symptoms of internalizing and externalizing psychiatric disorders in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5⁸) and has also been linked to problem behaviours or mood disorders and impairments in social functioning.⁹ With regard to ASD, the term “irritability” has been applied to define severe behavioural disturbance.¹⁰ A child's irritability may engender negative emotions in others, which may take the form of fear, anger, and/or reaction against the irritability displayed by the child.¹¹ Evidence from related research areas suggests that individuals with ASD may have biologically based irritability.¹² Genome-wide studies and neuroanatomical studies show both shared genetic contributions and overlap between brain regions for ASD and irritability.^{13,14} Irritability should thus be evaluated as a strong feeling affecting the environment of the individual.

The outbreak of Coronavirus Disease 2019 (COVID-19) began in Wuhan (Hubei, China) at the end of 2019 and subsequently spread worldwide. According to the latest data, over 200 countries and 214 000 000 people have been infected by COVID-19.¹⁵ The rapid spread of the COVID-19 pandemic has seriously affected medical services on a global scale, and a great number of patients with various disorders/diseases have been forced to cancel their original hospitalisation plans. The pandemic has also shown considerable potential to negatively impact mental health, including in children.¹⁶ It is essential to appropriately assess and act upon this increased potential for psychopathology. From a public mental health perspective, the guidelines for responding to mass trauma and disasters underline the importance of focusing on resilience. Recent consensus guidelines emphasize that interventions that maintain calm, build community, and sustain hope play a key role in the immediate and ongoing response to trauma.¹⁷ Proper attention should be given to specific psychiatric symptoms that can be triggered or exacerbated by trauma and disasters. Probably no group of individuals with mental illness is as directly affected by the worsening outbreak of COVID-19 as children and adolescents with ASD, as many countries have taken measures such as home confinement to prevent the spread of COVID-19. Although the spread of COVID-19 has slowed during the period of home confinement, access to mental health services may be severely limited, especially for children. This issue poses an even greater problem for children with neurodevelopmental disorders who have severe difficulties with social interactions and communication, such as those with ASD. For such children, access to environments in which they are able to communicate with their peers, as well as to inpatient psychiatric services, appropriate special education, and supportive services, is essential.¹⁸ Although online mental health services have been provided during this period, these may be inadequate for patients with ASD who require multidisciplinary intensive therapies. All of these points raise the question: to what extent have the COVID-19 pandemic and home confinement affected children and adolescents with ASD in Turkey?

What's known?

- It is therefore critical to focus on approaches that directly act on social barriers in ASD.
- Irritability has been linked to problem behaviours or mood disorders and impairments in social functioning.
- Children with ASD, were significantly worse during the COVID-19 outbreak and stay-at-home period compared to normal conditions.

What's new?

- The severity of the participants' ASD symptoms during home confinement was found to predict irritability.

Hypothesis:

1. During home confinement, children with ASD will exhibit higher irritability and autism symptoms compared to normal conditions (in which they are not confined to home).
2. Irritability levels of children with ASD during home confinement will vary according to the severity of autism symptoms.
3. Under home confinement, there is a direct relationship between irritability in children with ASD and autism symptoms.

2 | METHODS

2.1 | Participants and procedure

This study was conducted in the Department of Child and Adolescent Psychiatry at Selçuk University in Turkey and included 46 children and adolescents aged 4-17 years diagnosed in our clinic with ASD according to criteria listed in DSM-5. Patients diagnosed with ASD who also had genetic/neurological disorders (eg, epilepsy) were excluded from the study, as well as those previously diagnosed with intellectual disability. The “Wechsler Intelligence Scale for Children-Revised (WISC--R)” and “Ankara Developmental Screening Inventory” were used to exclude intellectual disability when deemed necessary by the clinician in cases of suspected but previously undiagnosed intellectual disability. The parents of 11 children who otherwise would have qualified for the study refused to participate, and 4 other children were excluded from the study based on the aforementioned exclusion criteria. Our study was approved by the Local Ethics Committee of Selçuk University in 2020.

In our outpatient clinic, children and adolescents diagnosed with ASD according to DSM-5 are regularly followed up to evaluate their progress in special education, autism symptom severity with the Autism Behaviour Checklist (AuBC) and comorbid symptoms with Affective Reactivity Index (ARI). Because of the COVID-19 outbreak home confinement was declared in Turkey on April 3, 2020, for individuals under the age of 20. This study was carried

out by reaching the participants online between 3-17 June 2020, in the second month following the start of home confinement. Participants were composed of all patients who met the study criteria from the list of patients diagnosed with ASD who were followed up in our outpatient clinic between January 1, 2020, and February 29, 2020. Parents of children and adolescents with ASD who agreed to participate in the study were included in the study. In order to evaluate the participants' situation under home confinement, AuBC and ARI forms were filled out by their families through online video sessions with the child and adolescent psychiatrist.

2.2 | Measures

2.2.1 | Autism Behaviour Checklist (AuBC)

The Autism Behaviour Checklist is primarily used to determine the severity and frequency of autistic symptoms in school-age children¹⁹ but has also been shown to be useful for young children. It consists of 57 items and is meant to be completed by parents or teachers. The questionnaire is divided into the following five subscales: sensory, relating, body and object use, language, and social and self-help. The scale was determined to be valid and reliable for use with the Turkish

population; the Cronbach's alpha coefficient for the Turkish version was 0.92.²⁰

2.3 | Affective Reactivity Index (ARI)

The parent report (ARI-P) ($\alpha = 0.89$) and self-report (ARI-S) ($\alpha = 0.85$) scales of the Affective Reactivity Index, both of which were developed by Stringaris,²¹ are used to measure irritability. The scales consist of six items assessing irritable behaviour, including the frequency, duration, and threshold of the behaviour. Each item is scored on a 3-point Likert-type scale, ranging from 0 ("not true") to 2 ("definitely true"). The total scores are between 0 and 12 with high scores indicating chronic irritability. Kocael²² conducted the validity and reliability study for the Turkish version of the scale (parent, $\alpha = 0.83$, self, $\alpha = 0.85$). In our study, the ARI-P was completed by the parents of the participants.

2.4 | Data analysis

The IBM SPSS Statistics for Windows Version 22.0 (SPSS Inc; Chicago, IL, USA) was used for the statistical analysis of the data. The Kolmogorov-Smirnov test was performed to determine whether the

TABLE 1 Distribution of AuBC and ARI-P scores under normal conditions and during COVID-19 home confinement

	Normal state	COVID-19 home confinement	z/t/v2	P
ARI-P	3.28 ± 2.63	6.52 ± 3.93	-6.36	<.001
AuBC				
Sensory	8.30 ± 5.32	9.34 ± 5.68	-2.20	.032
Relating	15.76 ± 8.37	17.65 ± 9.30	-2.79	.008
Body and object use	11.60 ± 7.22	16.80 ± 8.91	-5.26	<.001
Language	10.34 ± 5.39	11.45 ± 5.81	-2.99	.005
Social and self help	10.39 ± 4.06	13.10 ± 4.42	-6.55	<.001
Total score	56.41 ± 19.36	68.36 ± 26.15	-6.23	<.001

Abbreviations: ARI-P, Affective Reactivity Index-Parent Report; AuBC, Autism Behaviour Checklist.

TABLE 2 Correlation between ARI-P and AuBC scores under normal conditions

	Sensory	Relating	Body and object use	Language	Social and self-help	AuBC Total score
ARI-P <i>r</i>	0.171	0.180	0.047	-0.051	0.239	0.173

Abbreviations: ARI-P: Affective Reactivity Index-Parent Report; AuBC: Autism Behaviour Checklist.

TABLE 3 Correlation between ARI-P and AuBC scores during COVID-19 home confinement

	Sensory	Relating	Body and object use	Language	Social and self-help	AuBC Total score
ARI-P <i>r</i>	0.392**	0.450**	0.391**	0.308*	0.600**	0.549**

Abbreviations: ARI-P: Affective Reactivity Index-Parent Report; AuBC: Autism Behaviour Checklist.

*Correlation is significant at the 0.05 level (two-tailed); **Correlation is significant at the 0.01 level (two-tailed).

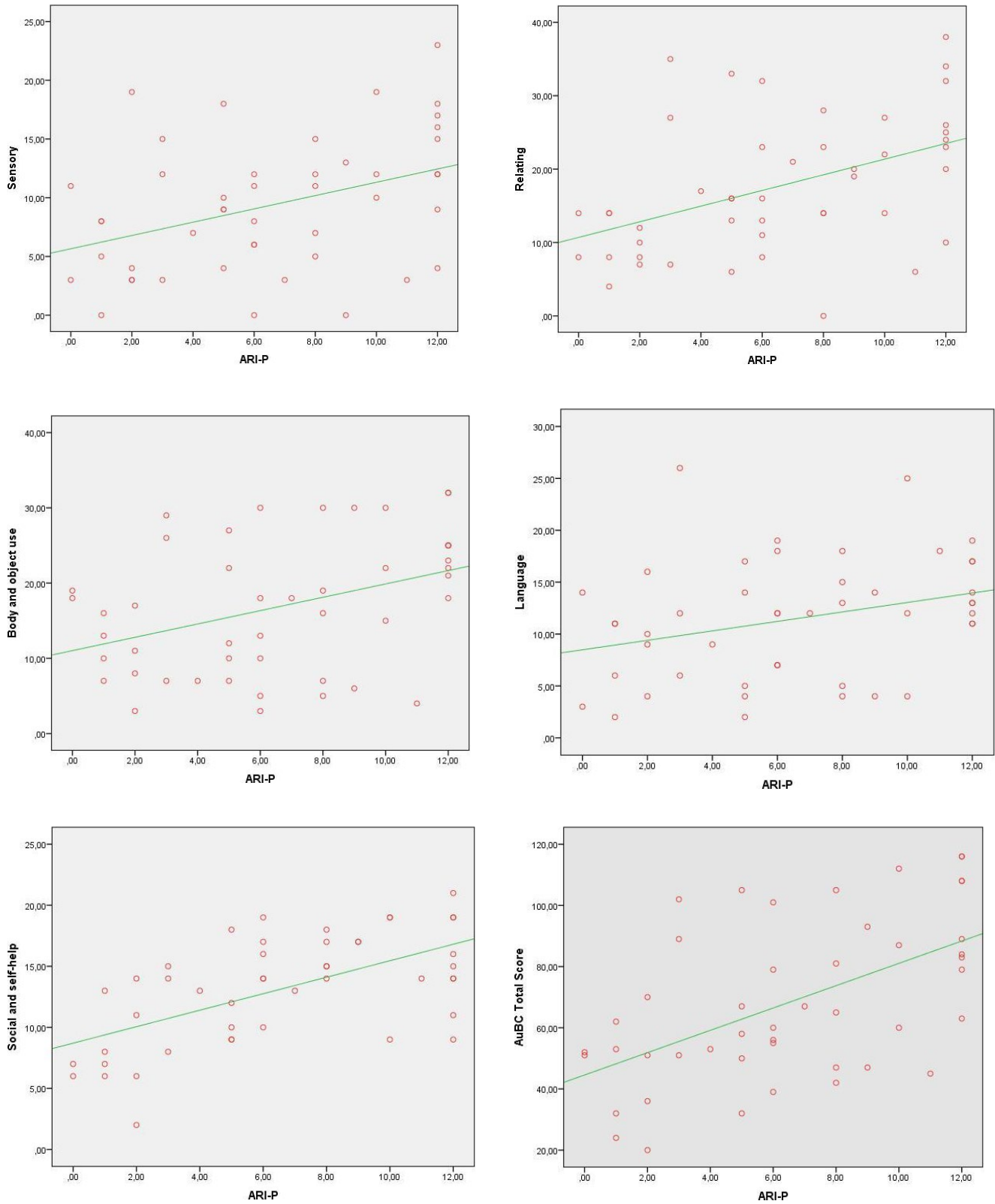


FIGURE 1 The correlations between ARI-P scores and AuBC scores during the COVID-19 stay-at-home period. Linear fit lines were added for the purpose of visualisation. ARI-P: Affective Reactivity Index-Parent Report

data exhibited normal distribution. The demographic and clinical characteristics of the participants were analysed using descriptive statistics. The paired sample *t* test (a parametric test) was used to compare

normally distributed data. To determine possible correlations between the ARI and AuBC scores, the Pearson correlation test was performed. Regression analyses were conducted to assess the effects of the AuBC

TABLE 4 Predictive effect of autism symptoms on irritability

	OR	B	P	CI
Sensory	0.052	0.036	.776	-0.218 to 0.290
Relating	0.097	0.041	.636	-0.133 to 0.216
Body and object use	0.029	0.013	.884	-0.163 to 0.188
Language	0.167	0.113	.210	-0.066 to 0.291
Social and self help	0.471	0.419	.003	0.148 to 0.689

Abbreviations: ARI-P, Affective Reactivity Index-Parent Report; CI, confidence interval; OR, odds ratio.

subscale scores on the ARI scores, with the former as independent variables. A *P*-value of less than .05 was considered statistically significant.

3 | RESULTS

A total of 46 subjects (38 boys and 8 girls) participated in the study. The mean age of the participants was 7.89 years (range = 4-17 years). None of the children included in the study benefited from online special education. Thirteen of the children with ASD had ADHD, and 11 children were receiving psychotropic medication due to comorbid ADHD.

Concerning Hypothesis 1, a significant difference was found between the participants' ARI-P scores and all subscale scores for AuBC, under both normal conditions and home confinement ($P < .05$). The ARI-P and AuBC scores for both scenarios are presented in Table 1. The results of the paired *t*-test supported Hypothesis 1.

For Hypothesis 2, the results of the Pearson correlation test showed a mild positive correlation between irritability and AuBC scores during the stay-at-home period ($P < .05$). When the relationship between irritability scores and AuBC scores under normal conditions was examined, no significant correlations were observed ($P > .05$). These correlations are presented in Tables 2 and 3 (Figure 1).

Regarding Hypothesis 3, the linear regression test was performed to evaluate the predictive effect of autism symptoms on irritability. The variables associated with irritability were found to be the social and self-help subscale of AuBC. (odds ratio [OR] = 0.47, $P = .003$; confidence interval [CI] = 0.148-0.689). In the linear regression (Table 4), the model explained 40.9% of the irritability scores (adjusted $R^2 = .409$).

4 | DISCUSSION

This study focused on children with ASD during the COVID-19 outbreak and stay-at-home period. Our results showed that ASD

symptoms and irritability in the study participants were significantly worse during the COVID-19 outbreak and home confinement compared to normal conditions. A significant relationship was also found between irritability and ASD symptoms, especially in the social and self-help areas.

The results of the present study revealed important findings for children and adolescents with ASD; all AuBC subscale scores (sensory, relating, body and object use, language, and social and self-help) and ARI (irritability) scores increased significantly during COVID-19 home confinement. There may be a number of factors explaining these results. The COVID-19 stay-at-home period is generally understood to present a very difficult situation for children with ASD, as sudden changes to their daily routines are not easy for them to adjust to. In fact, the COVID-19 pandemic and home confinement constitute an even more challenging situation for these children than changes to their daily routines as they also lose access to the various training programs/services for their development during this period. While online learning programs have been arranged during this period in Turkey for children without ASD, no online special education programs have been prepared for children with ASD. In addition to these issues, children with ASD have irregular sleep patterns, are physically less active, lack personal space at home, and have much longer screen times compared to children without ASD.²³ Furthermore, the pandemic itself, a period in which parents are at increased risk for anxiety and depression, is yet another factor adversely affecting children.²⁴

According to our findings, irritability levels increased during the COVID-19 outbreak and stay-at-home period. Increased irritability should not be disregarded since it may be a sign that the behavioural, emotional and social functions of the child are deteriorating, affecting the family as well as the child.⁸ Irritability is even thought to often be present prior to the full manifestation of ASD symptoms and may be an early indicator of risk of ASD.²⁵ In a study evaluating adolescents with ASD, parent-reported mood dysregulation symptoms such as irritability were shown to be associated with a higher rate of comorbidity.²⁶ For example, irritability has strong genetic and phenotypic associations with depression.²¹ The data regarding the high rate of irritability in children and adolescents with a diagnosis of ASD have varied. Lecavalier²⁷ found parent-reported irritability in 19% of individuals with ASD, whereas a much higher percentage (55%) was revealed by Green et al.²⁸ In yet another study, this rate was 80%.²⁹ The finding that irritability, which may occur at a high rate even under normal conditions, increased during the pandemic is important in terms of managing ASD symptoms in the early stages.

Another significant finding of the present study was the association between the social and self-help subscale of AuBC and irritability. Regarding social challenges, poor awareness of one's own emotions, difficulty reading social/emotional cues, limited emotional language, and difficulty with sensory sensitivities and changes have all been shown to increase irritability, which is associated with poor flexibility, inhibitory control, problem-solving, and abstract reasoning in individuals with ASD.³⁰ There has been

insufficient study of the relationship between self-help skills and irritability in individuals with ASD, with the result that data on this relationship is also scant. Lack of self-help skills is a critical aspect of ASD as it increases the burden on both individuals with ASD and their primary caregivers.³¹ The relationship between self-help skills and irritability in individuals with ASD can be explained in several different ways. One explanation is that individuals with ASD may feel irritable towards family members and educators who cannot adequately understand their needs. Another is that mothers of children with ASD have been reported to have an increased risk of anxiety and depressive symptoms due to various problems such as the core symptoms of their autistic children, the heavy financial burden of treating the disorder, discrimination, stigma, and ineffective therapy,³² the mother's stress is related to the irritability of the child with ASD.³³ These reasons suggest that irritability may be a critical dimension of the ASD phenotype, and thus critical for the clinical evaluation of individuals with ASD.

4.1 | Limitations

Our study has several limitations. First, the causal relationship between ASD symptoms and related factors could not be confirmed. Second, data were obtained via online videos. Finally, the relationship between worsening behavioural symptoms in children with ASD and their medication status was not directly tested.

5 | CONCLUSION

In conclusion, the irritability levels and ASD symptoms of the study participants, all children with ASD, were significantly worse during the COVID-19 outbreak and stay-at-home period compared to normal conditions. The severity of the participants' ASD symptoms during home confinement was found to predict irritability. Although future studies are needed to confirm these results, our findings have alerted us to the importance of focusing on extremely vulnerable populations during disease outbreaks and of the necessity of developing new strategies to avoid such adverse outcomes in similar situations.

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DISCLOSURES

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

AUTHOR CONTRIBUTIONS

ST, HNU, and FHC conceived of the study, participated in its design and coordination. Data collection was completed by HAG, MET, and

FHC. Data analyses were performed by HNU. HNU participated in the interpretation of the data. The first draft of the manuscript was written by S.T and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

RESEARCH ETHICS AND PATIENT CONSENT

The study received approval from the Local Ethics Committee of Selcuk University. The parents or the participants, when appropriate, signed a written informed consent as required by the Helsinki committee.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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