

Episodic memory, self-perceived memory and mental health in older adults, by age, during the COVID-19 pandemic

Memoria episódica, memoria autopercebida y salud mental en adultos mayores, según la edad, durante la pandemia de COVID-19

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Abstract

Objective: To compare the functioning of episodic memory, self-perceived memory, and their association with emotional symptoms among people aged 60 and those over 70 during the COVID-19 pandemic. **Method:** Cross-sectional, descriptive, correlational study conducted remotely. Sociodemographic characteristics, self-perception and functioning of memory, and mental health data were collected from 100 older adults grouped into three age categories. Descriptive analysis, hypothesis testing χ^2 tests, Kruskal Wallis, ANOVA, and Spearman's correlation coefficient were performed. **Results:** An association was found between age and overall level of episodic memory performance. All three groups exhibited an inverse correlation between self-perception of memory functioning and self-perception of memory as problematic. Depression symptoms correlated with self-perception memory in all three groups. Additionally, depression and trait anxiety showed more correlations with episodic memory in the older age group. **Conclusions:** Emotional symptoms during the pandemic affected self-perceived memory and were related to episodic memory performance in the oldest group.

Keywords: Episodic memory. Self-perceived memory. Older adults. COVID-19 pandemic. Lockdown.

Resumen

Objetivo: Comparar el funcionamiento de la memoria episódica y la memoria autopercebida, y su asociación con síntomas emocionales, en personas de 60 años y mayores de 70 años durante la pandemia de COVID-19. **Método:** Estudio trasversal, descriptivo, correlacional, realizado a distancia. Se obtuvieron las características sociodemográficas, de funcionamiento y autopercepción de la memoria y de la salud mental de 100 adultos mayores distribuidos en tres grupos de edad. Se realizó análisis descriptivo, con pruebas χ^2 , Kruskal-Wallis y ANOVA, así como coeficiente de correlación de Spearman. **Resultados:** Se encontró asociación entre la edad y el nivel de desempeño global de la memoria episódica. Los tres grupos mostraron una correlación inversa entre la autopercepción del funcionamiento de la memoria y la autopercepción de la memoria como problemática. Los síntomas de depresión se correlacionaron con la autopercepción de la memoria en los tres grupos. Además, la depresión y la ansiedad rasgo presentaron más correlaciones con la memoria episódica en los más longevos. **Conclusiones:** Los síntomas emocionales durante la pandemia afectaron la autopercepción de la memoria y se relacionaron con el rendimiento de la memoria episódica en el grupo más longevo.

Palabras clave: Memoria episódica. Memoria autopercebida. Adultos mayores. Pandemia de COVID-19. Confinamiento.

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Introduction

The COVID-19 pandemic demonstrated the fragility of older adults, as they were part of the age group with the highest mortality rates worldwide¹⁻⁴. The high likelihood of becoming ill and even dying led to the implementation of strategies aimed at prevention and reduction of infections, such as physical and social distancing and lockdown⁵. As a population that showed significant vulnerability to COVID-19, older adults received more recommendations for isolation^{6,7}. This raised concerns about the potential effects of these measures on cognitive functions due to reduced stimulation⁸.

Memory is a process in which different brain functions participate in tasks of classification, encoding, storage, and retrieval of information⁹. It is based on experiences that modify brain structure and behavior¹⁰. It has been reported that performance declines with increasing age¹¹. The greatest vulnerability is observed in episodic, semantic, working, and prospective memory^{12,13}.

On the other hand, memory self-perception is a subjective estimate or judgment about one's own capacity or functioning. Previous studies conducted in older adults show two perspectives related to the self-perception of memory alterations: on the one hand, evidence of objective cognitive alterations in early stages or with a higher risk of developing cognitive impairment, and on the other hand, the presence of anxiety or depression symptoms^{14,15}.

The study of cognitive functions has shown that memory becomes substantially compromised with aging, and it has also been described that complaints and concerns related to memory tend to become more frequent as age increases^{16,17}. Studies on memory self-perception in older adults during the pandemic show perceived deterioration and poor functioning¹⁸⁻²².

Previously, other studies compared memory performance and perception across different age ranges. Lima-Silva et al.¹⁶ studied the relationship between age and the presence of memory complaints in two groups of older adults, one aged 56-74 years and the other aged 75-92 years, and reported that no significant difference was found in objective memory test performance and that age was not associated with memory complaints or performance. On the other hand, Commissaris et al.¹⁷ divided a sample into four age groups: 25-35, 40-50, 55-65, and 70-85 years, and found that in the oldest group, 50% described themselves as forgetful.

Based on the above, the aim of the present study was to compare episodic memory functioning and self-perceived memory, and their association with emotional symptoms, in individuals older than 60 years analyzed by age groups during lockdown due to the COVID-19 pandemic in Mexico.

Method

We conducted a cross-sectional, descriptive, and correlational study remotely. Following a social media call for participation, 145 individuals expressed interest in participating; 26 only requested information, 7 did not meet the selection criteria, and 12 did not complete the assessment. A participation rate of 69% was obtained, that is, 100 older adults. Three groups were created according to participants' age: Group A consisted of 39 participants aged 60-64 years, Group B of 31 participants aged 65-69 years, and Group C of 30 participants aged 70 years and older.

Data were collected from September 23rd, 2021 through May 23rd, 2022, while national social isolation recommendations remained active. The protocol was approved by the Comité Institucional de Investigación y Ética of Instituto Nacional de Rehabilitación Luis Guillermo Ibarra Ibarra (No. 32/21). Participants signed informed consent and authorized the use of anonymized data.

Inclusion criteria were being 60 years of age or older, minimum completion of primary education, Internet access, having an electronic device (smartphone, tablet, or computer), skills to participate in a video call, and a score ≥ 24 points on the Montreal Cognitive Assessment (MoCA)²³. Exclusion criteria included prior diagnosis of dementia, uncorrected hearing or visual problems, history of stroke, epilepsy, drug or alcohol abuse in the past 5 years, and use of antipsychotic, antiepileptic, hypnotic, or benzodiazepine medications.

Instruments

The MoCA was administered as a screening tool to rule out prior cognitive impairment, and the memory section of Neuropsi²⁴ was used to determine episodic memory functioning. Additionally, participants completed a questionnaire administered via a Google form designed to collect sociodemographic information, relevant medical history, and memory self-perception through two questions:

1. "From 1 to 10, how would you rate your memory during this lockdown period?", where 1 corresponded to "very poor" and 10 to "very good".
2. "From 1 to 10, do you consider that during this time your memory has become a problem for you?", where 1 corresponded to "not problematic at all" and 10 to "very problematic".

The Yesavage Geriatric Depression Scale²⁵. was also included to determine severity of depressive symptoms according to the obtained score (0-10 points: no depression; 11-20 points: mild depression; 21-30 points: moderate to severe depression), as well as the State-Trait Anxiety Inventory²⁶. in which severity was classified as ≤ 29 low anxiety, 30-44 moderate anxiety, and ≥ 45 high anxiety.

Procedure

Volunteers received an email containing the Google form link, which included the questionnaire and the depression and anxiety scales. Once their responses were registered in the system, a video call meeting was scheduled, beginning with administration of the MoCA and continuing with the Neuropsi memory section. It should be noted that the backward digit span subtest was excluded from Neuropsi due to difficulty administering it via video call.

Statistical analysis

We conducted a descriptive analysis, obtaining means and standard deviations for quantitative variables and frequencies and percentages for qualitative variables. To determine differences between groups, ANOVA was performed for the quantitative sociodemographic variables age and years of employment.

To establish associations between variables, the Kruskal-Wallis test was used for memory self-perception (functioning and problematic perception), and the χ^2 test for qualitative sociodemographic variables of episodic memory functioning and mental health. Spearman correlations were calculated to determine the association between episodic memory, self-perceived memory, and mental health. The analysis was conducted using SPSS Statistics version 26, with a significance level of $p < 0.05$.

Results

The sociodemographic characteristics of the sample, the obtained values, and the results of ANOVA

Table 1. Sociodemographic characteristics of the sample by age group

Characteristic	Group A (n = 39)	Group B (n = 31)	Group C (n = 30)	p*
Age, mean (years)	61.9	66.8	74.6	0.001
Years of employment, mean	33.2	35.2	41.8	0.029
Sex, n				
Women	30	24	21	0.751
Men	9	7	9	
Marital status, n				
Single	10	8	11	0.189
Married	22	19	11	
Divorced	5	1	7	
Common-law union	2	3	1	
Place of residence				
Mexico city	20	20	19	0.494
Morelos	7	3	3	
State of Mexico	6	1	4	
Other	6	7	4	
Educational level				
Basic education	9	13	18	0.008
Higher education	30	18	12	

*ANOVA was applied to age and years of employment (mean), and χ^2 test to sex, marital status, place of residence, and educational level.

and χ^2 are summarized in table 1. In all three groups, women's participation was higher. The most frequent marital status in Groups A and B was married, and in Group C it was single or married. The most common place of residence was Mexico City in all three groups. Regarding years of employment, the highest mean was observed in Group C, with 41.8 years. A significant difference was found between groups for age and years of employment, and a significant association was found between age and educational level; in this regard, higher education predominated in Group A and basic education in Group C.

Results for memory self-perception and performance on episodic memory subtests are presented in table 2. No significant difference was found between groups in memory self-perception. An association was observed between age and overall episodic memory functioning, digit span corresponding to working memory, memory curve, logical memory stories during encoding, spontaneous verbal memory, verbal memory with cues, and logical memory stories during recall. Group B showed a higher percentage of participants with high-normal and normal performance.

Inverse correlations were found between self-perception of memory functioning and perception of memory as problematic in all three groups. In Group A,

an association was found between self-perception of functioning and the Rey-Osterrieth figure during encoding, indicating that better perceived memory functioning was associated with better performance on this subtest. In Group C, a greater number of correlations were found. Self-perception of functioning was positively and moderately related to several recall subtests. Self-perception of memory as problematic was moderately and negatively related to faces during encoding and to verbal memory with cues during recall, indicating, on the one hand, that better perceived functioning was associated with better performance, and on the other hand, that greater perception of memory as problematic was associated with poorer performance on the mentioned subtests (Table 3).

Qualitatively, mental health analysis showed no significant associations between age and symptoms of depression or anxiety. Groups A and B included participants with moderate to severe depressive symptoms. Trait and state anxiety symptoms were reported similarly across the three groups, with Group A showing a higher percentage of participants with high state anxiety (Table 4).

Regarding correlations between mental health and episodic memory functioning, a greater number of associations were observed in Group C, which were negative and moderate between depressive symptoms and working memory subtests, encoding, and recall. Notably, depressive symptoms showed strong and negative correlations in Groups B and C with self-perception of memory functioning, and positive and moderate correlations were found with perception of memory as problematic. The strongest correlations between trait anxiety symptoms and memory performance were found in Group C, mainly in verbal memory subtests during recall (Table 5).

Discussion

The results obtained in the present study show that overall episodic memory functioning in most older adults was good; however, a significant association was found between age and overall performance. It is noteworthy that Group B, aged 65-69 years, showed the best performance, as Groups A and C had fewer participants with high-normal results, with Group A performing below Group C, composed of the oldest participants (70 years and older), who showed better performance in backward digit span (working memory) and memory curve encoding.

Table 2. Median of self-perceived memory and percentage of episodic memory functioning

Self-Perception and Functioning	Group A (n = 39)	Group B (n = 31)	Group C (n = 30)	p*
Self-perceived memory, median				
Functioning (0 = very poor, 10 = very good)	8	8	8	0.666
Problematic (0 = not problematic at all, 10 = very problematic)	5	6	2	0.082
Neuropsi (%)				
Overall episodic memory performance	17.9	51.6	26.7	0.035
High normal	76.9	48.4	70	
Normal	5.1	-	3.3	
Mild to moderate impairment				
Working memory				0.003
Backward digit span	-	16.1	30	
High normal	84.6	80.6	66.7	
Normal	15.4	3.2	3.3	
Mild to moderate impairment				0.008
Encoding				
Memory curve				
High normal	12.8	25.8	36.7	
Normal	71.8	74.2	63.3	0.673
Mild to moderate impairment	15.4	-	-	
Paired associates				
High normal	20.5	9.7	16.7	
Normal	76.9	87.1	76.7	0.042
Mild to moderate impairment	2.6	3.2	6.7	
Logical memory stories				
High normal	12.8	35.5	33.3	0.097
Normal	74.4	64.5	63.3	
Mild to moderate impairment	12.8	-	3.3	
Rey-Osterrieth figure				
High normal	2.6	-	-	0.203
Normal	87.2	83.9	90	
Mild to moderate impairment	7.7	16.1	-	
Severe impairment	2.6	-	10	
Faces				0.001
Normal	94.9	100	100	
Severe impairment	5.1	-	-	
Recall				
Spontaneous verbal memory	-	38.7	20	0.001
High normal	92.3	61.3	80	
Normal	7.7	-	-	
Mild to moderate impairment				
Verbal memory with cues				0.079
High normal	10.3	64.5	36.7	
Normal	84.6	32.3	63.3	
Mild to moderate impairment	5.1	3.2	-	
Verbal memory recognition				0.079
High normal	23.1	48.4	26.7	
Normal	71.8	51.6	73.3	
Mild to moderate impairment	5.1	-	-	

(Continues)

Table 2. Median of self-perceived memory and percentage of episodic memory functioning (continued)

Self-Perception and Functioning	Group A (n = 39)	Group B (n = 31)	Group C (n = 30)	p*
Neuropsi (%)				
Paired associates				0.341
High normal	23.1	48.4	33.3	
Normal	71.8	45.2	60	
Mild to moderate impairment	5.1	3.2	3.3	
Severe impairment	-	3.2	3.3	
Logical memory stories				0.001
High normal	15.4	58	40	
Normal	84.6	35.5	53.3	
Mild to moderate impairment	-	6.5	6.7	
Rey-Osterrieth figure				0.057
High normal	23.1	25.8	3.3	
Normal	61.5	71	93.3	
Mild to moderate impairment	12.8	3.2	3.3	
Severe impairment	2.6	-	-	
Face recognition				0.887
High normal	2.6	3.2	-	
Normal	89.7	90.3	90	
Mild to moderate impairment	7.7	6.5	10	

*p value calculated using the Kruskal-Wallis test for memory self-perception and the χ^2 test for Neuropsi in working memory, encoding, and recall.

These findings do not fully align with previous studies, as it would be expected that younger participants would perform better in all aspects of memory. As part of normal aging, a decline in performance in different cognitive tasks²⁷, including memory^{28,29}, is common, suggesting that increased age is associated with greater decline in functioning³⁰. However, it has also been documented that under stressful situations individuals may experience blocked access to information, and high stress levels may exert negative effects on memory self-perception¹⁹. In this case, the COVID-19 pandemic could be considered a significant stressful event.

Considering the impact of mental health on episodic memory, the presence of correlations between depression and performance on some subtests stands out, especially in Group C (oldest), indicating that greater severity of depressive symptoms was associated with poorer performance. Likewise, in all three groups a relationship was found between depressive symptoms and memory self-perception, indicating that higher depressive symptoms were associated with poorer perceived functioning and greater perception of memory as problematic.

In this regard, negative attitudes toward aging³¹, as well as the effect of depressive symptomatology

Table 3. Correlations between self-perceived memory and episodic memory subtests (only significant correlations are shown)

Variables	Group A (n = 39)	Group B (n = 31)	Group C (n = 30)
Perception of memory functioning			
Perception of memory as problematic	$\rho = -0.468$	$\rho = -0.726$	$\rho = -0.685$
Rey-Osterrieth figure (ENC)	$\rho = 0.368$	-	-
Paired associates (ENC)	-	-	$\rho = 0.466$
Faces (ENC)	-	-	$\rho = 0.483$
Spontaneous verbal memory (REC)	-	-	$\rho = 0.371$
Verbal memory with cues (REC)	-	-	$\rho = 0.456$
Paired associates (REC)	-	-	$\rho = 0.393$
Perception of memory as problematic			
Faces (ENC)	-	-	$\rho = -0.455$
Verbal memory with cues (REC)	-	-	$\rho = -0.430$

ENC: encoding; REC: recall.

Table 4. Percentages of depression, trait anxiety, and state anxiety in each group

Characteristics	Group A (n = 39)	Group B (n = 31)	Group C (n = 30)	p
Depression				0.118
No depression	82.1	64.5	80	
Mild	7.7	25.8	20	
Moderate to severe	10.3	9.7	-	
Trait anxiety				0.936
Moderate	46.2	41.9	43.3	
High	53.8	58.1	56.7	
State anxiety				0.396
Moderate	35.9	51.6	46.7	
High	64.1	48.4	53.3	

*p value calculated using the χ^2 test.

characterized by frequent negative perceptions toward oneself and one's abilities-may have been intensified by the perception of higher vulnerability of older adults due to COVID-19 mortality in this age group, which may have contributed to negative self-appraisal of cognitive performance. According to Aaron Beck's cognitive model of depression, a critical event (the COVID-19 pandemic) may activate dysfunctional schemas characterized by negative thoughts, promoting a negative self-view and leading, in this particular case, to poor self-perception of memory functioning³².

Trait anxiety symptoms were also significantly related in Group C, indicating that higher levels of trait anxiety symptoms were associated with poorer verbal memory

Table 5. Correlations between mental health, episodic memory, and self-perceived memory

Variables	Group A (n = 39)	Group B (n = 31)	Group C (n = 30)
Depression			
Backward digit span (WM)	-	-	$\rho = -0.463$
Faces (ENC)	-	-	$\rho = -0.423$
Spontaneous verbal memory (REC)	-	-	$\rho = -0.397$
Verbal memory with cues (REC)	-	-	$\rho = -0.484$
Paired associates (REC)	-	-	$\rho = -0.367$
Perception of memory functioning	$\rho = -0.455$	$\rho = -0.622$	$\rho = -0.735$
Perception of memory as problematic	$\rho = 0.525$	$\rho = 0.501$	$\rho = 0.539$
Trait anxiety			
Paired associates (ENC)	$\rho = -0.411$	-	-
Paired associates (REC)	$\rho = -0.343$	-	-
Logical memory (stories) (ENC)	-	$\rho = -0.370$	-
Rey-Osterrieth figure (ENC)	-	$\rho = 0.388$	-
Spontaneous verbal memory (REC)	-	-	$\rho = -0.492$
Verbal memory with cues (REC)	-	-	$\rho = -0.541$
Verbal memory recognition (REC)	-	-	$\rho = -0.517$
Global memory functioning	-	-	$\rho = -0.398$
Perception of memory functioning	-	$\rho = 0.369$	-
State anxiety			
Paired associates (ENC)	$\rho = -0.382$	-	-
Rey-Osterrieth figure (REC)	-	$\rho = 0.425$	-

ENC: encoding; REC: recall; WM: working memory.

performance during recall. In contrast, elevated state anxiety symptoms were more frequent in Group A (lower performance), suggesting that this type of anxiety, combined with how the participant felt at the time of evaluation, may have affected performance.

Sanz Blasco et al.³³ in a systematic theoretical review reported that in explicit memory tasks bias is frequently observed in individuals with panic disorder and, to a lesser extent, in those with post-traumatic stress disorder in free recall tasks, where acute anxiety states prevail.

A notable characteristic of participants was the higher frequency of older adults with undergraduate and graduate education, a factor proposed in the literature as an indicator of cognitive reserve, which may function as a positive modulator of memory performance and the frequency and severity of emotional symptoms^{34,35}.

Trait anxiety symptoms also showed a moderate and positive association with self-perceived memory functioning in Group B; that is, higher anxiety symptomatology was associated with better perceived functioning. This correlation might be considered inconsistent, since it would be expected that increased anxiety would be associated with a decreased perception of memory functioning.

However, in this case, trait anxiety is an affective state reflecting a stable disposition to interpret stimuli

as threatening, regardless of recent environmental events³⁶. This may have functioned as a factor favoring a positive perception of performance without increasing perceived threat despite confinement, and was consistent with the episodic memory performance observed in this group, which demonstrated the best results.

With regard to self-perception of memory as problematic, the trend observed in participants' responses was that they generally considered it moderately problematic, particularly in Groups A and B, whereas the oldest group perceived their memory as less problematic. Likewise, in all three groups a correlation was found between self-perceived memory functioning and perception of memory as problematic, indicating that better perceived functioning was associated with lower perception of memory as problematic during confinement.

The associations observed between mental health and episodic memory performance may be explained by the modifications reported in the central nervous system of patients with anxiety and depression. In depression, abnormalities have been reported in the amygdala and hippocampus, as well as functional alterations in the subgenual anterior cingulate cortex, dorsolateral prefrontal cortex, amygdala, and ventral striatum³⁷. Depression has also been associated with brain inflammation

leading to changes in neurotransmitter metabolism, neuroendocrine function, and neuronal plasticity³⁸. Additionally, some clinical symptoms associated with depression are cognitive in nature, including impairment of memory, concentration, and attention^{39,40}.

With respect to anxiety, structural alterations have been described in locus coeruleus function, serotonergic dysfunction, global functional alterations in the autonomic nervous system (responsible for involuntary physiological processes along the hypothalamic–pituitary–adrenal axis), and thyroid disorders⁴¹. Functional alterations of the amygdala and its connectivity with the cerebral cortex have also been described⁴².

These findings suggest that emotional factors present during the pandemic, together with those arising from COVID-19 public health contingency measures, affected the emotional domain and, along with intensified negative attitudes related to perceived age-associated risk and vulnerability, influenced older adults' self-appraisal of memory.

In this regard, Beck's proposal may be revisited, which posits that schemas are composed of positive and negative aspects that contribute to the determination of self-worth and may at times reach critical states in which a lack of flexibility triggers, in this case, a sense of vulnerability that affects self-esteem and self-evaluation. Thus, greater cognitive vulnerability leads to more negative perception and appraisal, influencing self-judgment³².

Moreover, it is worth considering the possibility that older adults may present metacognitive difficulties that hinder accurate estimation of their own memory functioning. McWilliams et al.⁴³ reported that confidence judgments regarding one's own performance tend to become more negative with advancing age. The authors emphasize that this age-related decrease in confidence is not usually accompanied by objective changes in performance, which tends to remain stable throughout life, suggesting that input from a close family member or caregiver may be necessary.

Overall, the results suggest that mental health played an important role in both performance and self-perception of memory in older adults during the pandemic, with differentiated effects according to trait or state anxiety symptoms and depressive symptoms.

Of note, at the onset of the health emergency, once confinement and physical and social distancing measures were implemented, international literature presented by experts and international organizations expressed the possibility that these measures, together with other factors such as economic instability, misinformation, and uncertainty, could contribute

to deterioration of functions or abilities, as well as to the development or worsening of mental health problems.^{8,44,45}

The limitations of the study lie in the fact that the sociodemographic characteristics of the sample are not representative of the Mexican older adult population, and 75% were women; therefore, the results are not generalizable to the rest of the Mexican population. Additionally, the sample was recruited virtually, and participants required knowledge of and access to digital media and devices, which does not reflect the reality of many older adults in Mexico. Furthermore, the majority had a high level of education, suggesting a potentially favorable sociocultural and economic background.

It is important to note that, during part of the data collection period, vaccination with the first dose for older adults had already begun (from February through May 2021), representing a different stage of the pandemic context in the country and potentially influencing participants' perspectives. In addition, we do not know the specific characteristics of confinement or whether participants had the company of others.

Memory assessment via video call may have limited the evaluator's ability to observe important details, such as in the Rey–Osterrieth figure subtest. It is also worth considering that what older adults report as memory alterations may in fact be attention problems, an aspect not evaluated in this study but that should be addressed in future research.

Conclusions

Lockdown and physical and social distancing during the COVID-19 pandemic favored the presence of moderate and high levels of trait and state anxiety symptoms, which significantly affected episodic memory performance, particularly in the younger group, who showed greater vulnerability to emotional symptoms during the health emergency. Greater age was associated with better emotional control and, consequently, better episodic memory performance and a less negative self-perception of memory.

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The authors declare that this work was carried out with their own resources.

Conflicts of interest

The authors declare no conflicts of interest.

Ethical considerations

Protection of human and animal subjects. The authors declare that the procedures followed were in accordance with the ethical standards of the responsible human (or animal) experimentation committee, in accordance with the World Medical Association and the Declaration of Helsinki. The procedures were authorized by the institution's Ethics Committee.

Confidentiality, informed consent, and ethical approval. The authors followed their healthcare center/institution protocols for accessing clinical record data. Informed consent was obtained from patients, and Ethics Committee approval was secured. SAGER guidelines were followed.

Declaration on the use of artificial intelligence (AI). The authors declare that no type of generative artificial intelligence was used in the drafting or creation of this manuscript.

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