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Mindfulness implemented through virtual reality in older Ecuadorian adults with symptoms of anxiety and depression.

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RESUMEN

La ansiedad y depresión son trastornos mentales comunes en adultos mayores. Existen investigaciones que respaldan el uso de atención plena para reducir los síntomas de estas patologías. Sin embargo, aunque en los últimos años se ha usado realidad virtual para practicar atención plena en diferentes poblaciones y condiciones de salud mental, muy poco se ha investigado en adultos mayores. En este trabajo a través de un ensayo controlado aleatorizado que incluye a adultos mayores de 60 años en adelante con síntomas de ansiedad y depresión, se busca examinar la aceptabilidad y eficacia de 10 sesiones de atención plena implementadas a través de gafas de realidad virtual en adultos mayores. Este estudio medirá los síntomas de ansiedad, depresión, depresión geriátrica, grado de estrés, nivel de funcionamiento, nivel de atención plena y nivel de mareo previo al tratamiento, posterior al tratamiento y un mes después. De esta manera, se quiere conocer qué beneficios se obtienen en la salud emocional y psicológica de los adultos mayores que practiquen esta intervención.

Palabras clave: atención plena, adultos mayores, realidad virtual, visores, ansiedad, depresión, estrés, funcionamiento diario.

ABSTRACT

Anxiety and depression are common mental disorders in older adults. Research supports the use of mindfulness to reduce symptoms of these pathologies. Although virtual reality has been used in recent years to practice mindfulness in different populations and mental health conditions, limited research has been done so far on older adults. Through a randomized controlled trial with older adults aged 60 years and older with symptoms of anxiety and depression, we seek to examine the acceptability and efficacy of 10 sessions of mindfulness implemented through virtual reality glasses in older adults. This study will measure symptoms of anxiety, depression, geriatric depression, degrees of stress, levels of functioning, mindfulness, dizziness at pre-treatment stage, post-treatment evaluation and an evaluation a month later. Our goal is to assess what benefits are obtained in the emotional and psychological health of older adults who practice this intervention.

Keywords: mindfulness, older adults, virtual reality, viewers, anxiety, depression, stress, daily functioning.

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INTRODUCTION

Background

The World Health Organization states that between 2015 and 2050, older adults aged 60 and over will almost double in demographic proportion from 12% to 22% (World Health Organization, 2022). Thus, the global elderly population is expected to reach 2.1 billion people (World Health Organization, 2022). The proportion of adults over 80 years of age will triple by the year 2050, reaching 456 billion. In the year 2020, it was observed around the world that the number of older adults above the age of 60 exceeded the number of children under the age of five (World Health Organization, 2022). Moreover, this phenomenon of increases in the ratio of the older population will be observed in high-income countries as well as in low- and middle-income countries (United Nations, 2017). In fact, by 2050, two-thirds of the older adult population will live in low- and middle-income countries (World Health Organization, 2022). The United Nations "World Aging" report, published in 2017, indicates that in Africa the population of older adults will increase by 229 percent, while in Latin American and the Caribbean region this population will increase by 161 percent, in Asia the increase will be of 132 percent (United Nations, 2017).

A global challenge for health systems around the world will be to provide services and opportunities to address the aforementioned demographic changes (World Health Organization, 2022). For this reason, it would become necessary to assess-the state of health and the presence of most common diseases in the geriatric populations in order to deliver appropriate interventions and/or treatments. Aging is a stage of physical and cognitive changes due to damage and decline in the molecular and cellular biology of the body. These changes result in an increased risk of disease and even death (Da Silva & Schumacher, 2021). In addition, this older stage of life experiences age-related social and family changes such as: retirement from

professional life, changes in daily routines or in family structure, death of contemporary people such as close friends and/or family, and other situations that may affect their mental health (Issalillah & Nur Aisyah, 2022). In this context, mental health in older adults possess one of the main challenges worldwide. It is known that over 15% of older adults aged 60 years and older suffer from some condition of mental health (World Health Organization, 2017). The lack of adequate treatment affects 6.6% of older adults, who may eventually develop some type of disability due to mental disorders and neurological diseases (Lu et al., 2023). It is known that for every four older adults, one may suffer from a mental illness such as: depression, anxiety, dementia, or psychosis (Mitchell, 2014). Moreover, it is estimated that across the world about 26% of the elderly population struggle with depression or anxiety symptoms (Boehlen et al., 2019).

In Ecuador, the latest statistics on mental health for older population were collected in 2009 in a survey known as “Health, Wellbeing and Aging Survey”. This survey focused on older adults of over 60 years of age from the Coast and Highlands regions. This collaborative project was carried out by the National Institute of Statistics, and Census, Social Inclusion Ministry, Public Health Ministry, Gerontology and Geriatric Ecuadorian Society and Universidad San Francisco de Quito. At the time of the survey, it was found that 39% of older adults have mild to moderate depression (Instituto Nacional de Estadística y Censos, 2009). Unfortunately, no updated statistics exist to understand the impact of depression or anxiety in Ecuadorian older adults. Nevertheless, it is known that depression is a condition that often occurs in comorbidity with anxiety in older age individuals and that multiple conditions have a higher impact on the body-functioning level and quality-of-life of older adults (Alomoto et al., 2018). It is critical to have updated information to develop interventions that address health difficulties and age-specific needs.

Justification

Available data indicate an increase in life expectancy. It is thus important to work in developing strategies to promote improvements in the quality of life in older adults. It is crucial that this strategy should focus on mental health issues. As mental and physical changes occur in old age, certain challenges arise as people going through this aging stage may feel like they are a burden to others (Reynolds et al., 2022). People may experience emotional discomfort when they reach old age (Reynolds et al., 2022). Two essential ailments of aging include: pain and suffering. Pain is inevitable, because certain problems or situations are beyond human control. On the other hand, suffering is optional, because it results from the ability to accept life circumstances and cope with them. Therefore, the circumstances of aging are experienced with less discomfort and seen as part of a process under human control, when they are accepted rather than resisted (Rejeski, 2008).

A method to coping with difficult life situations is mindfulness. Mindfulness is a strategy to generate acceptance, self-awareness and connection with the present. Mindfulness is a psychological practice of Buddhist origins. It is defined as the ability to consciously assess the present moment without judging it (Rejeski, 2008). This meditation-based strategy deems suffering and disconnection with the present moment a central point in the development of mental problems (Smith, 2004). People with pathologies such as anxiety or depression have a strong attachment to the past and/or the future. This causes higher levels of worry and anxiety (Eysenk et al., 2010). It is common for older people to suffer from the fear of dying, which can cause them to question their past or about their future, situations which are beyond the control domain of any individual (Rejeski, 2008).

Research indicates that mindfulness is an effective treatment for mental illness (Hoffman et al., 2010). It is easy to practice, is beneficial for one's health, and is

methodologically safe (Hoffman et al., 2010). Practicing mindfulness in older adults has multiple benefits for their well-being and mental health. Some of these include reduction in the symptoms of anxiety, depression, stress, sleeping problems, intrusive thoughts, and loneliness (Geiger et al., 2016). On the other hand, there is an increase in relaxation, feeling of well-being and reduction of mood changes (Geiger et al., 2016). All of these effects occur because mindfulness promotes the experience of feeling sensations and looking at situations without making judgments (Loucks et al., 2015; Cox et al., 2018). Studies have shown that high levels of mindfulness are associated with a reduced reactive response (Ulmer et al., 2010), increased daily physical activity, greater psychological well-being, and reduced risk of cardiovascular disease (Edelman et al., 2006).

A potential drawback of mindfulness interventions may be observed at the outset of their practice, when some people may have difficulty being fully attentive and aware of bodily sensations without being distracted from this exercise. This factor may hinder adherence to treatment (Olano et al., 2015). In this context, technology may be an important resource in implementing mindfulness while preserving its benefits and foundations. The use of virtual reality in the mental health of older adults has been accepted and positively acknowledged as an intervention, even in those with cognitive impairment (Huygelier et al., 2019; Manera et al., 2016).

Study purpose

This dissertation attempts to provide a literature review based on a research project titled "Mindfulness intervention using virtual reality in older adults with symptoms of anxiety and depression in Ecuador 2022- 2024". This project is being carried out by the Department of Psychology at Universidad San Francisco de Quito and it was designed by researchers from the Laboratory of Technology and Aging at McLean Psychiatric Hospital.

The use of virtual-reality goggles (VRGs) is investigated in the practice of mindfulness. The use of these goggles is applied over ten sessions with patients 60-year-old and older with anxiety and/or depression symptoms. The Laboratory of Technology and Aging has conducted research using VRGs with geriatric patients. Their use showed to be useful as a resource in training cognitive skills, evaluating cognitive impairment (Mathias, 2019), promoting adherence to therapy, and creating the opportunity of using low-cost technology in psychotherapy (Stone et al., 2021). This research aims to assess whether the use of VRG's could be an affordable, effective, and most importantly, acceptable intervention to practice mindfulness in older adults. The use of virtual reality goggles facilitates the experience of immersive 360-degree real-world landscapes and can be used to practice mindfulness (Slater & Sanchez-Vives, 2016), because it allows the user to meditate and fully observe different parts of the scene in front of the user. Thus, the main purpose of this research is to follow a mindfulness protocol for the use VRG's created for this study with the aim of evaluating this use as an effective option for therapeutic purposes among the Ecuadorian population.

Research question

The aim of this project is to evaluate the acceptability and efficacy of mindfulness-based virtual reality, in general, and VRG's, in particular, as an affordable intervention tool for adults over the age of 60 with symptoms of anxiety and depression in Ecuador.

Hypothesis

The hypotheses projected in this study are the following:

- First Hypothesis: Older adults who receive mindfulness implemented through virtual reality goggles intervention will have lower-level symptoms of depression, anxiety, and stress.

- Second Hypothesis: Participants who receive mindfulness treatment implemented using virtual reality glasses will have an increased level of activity or functioning in their daily lives.
- Third hypothesis: The use of mindfulness implemented through virtual reality glasses will increase mindfulness ability.
- Fourth hypothesis: Participants with greater treatment acceptance will be those who have participated in a higher number of completed mindfulness-based virtual reality sessions.

The following paragraphs summarize important concepts introduced in this research in order to better understand its purpose of mindfulness and the impact that its use seeks to achieve in older adults. In addition, this dissertation outlines the method of VRG-mindfulness implementation and suggests future opportunities to be investigated.

LITERATURE REVIEW

Aging from a developmental psychology perspective

Aging is a natural and gradual stage in the human life cycle (Stefanacci, 2022). In individuals over 60-years of age (focus of this research), this involves a transition process that starts with a decrease and/or damage of cellular functions which cause some changes over time (Alvarado & Salazar, 2014). Aging leads to functional, biological, morphological, physiological, and psychological changes (Alvarado & Salazar, 2014). Thus, aging is a process that connects early adulthood and old age (Alvarado & Salazar, 2014). According to the United Nations, old age is understood as the period of life beyond 60 years of age (2023).

People between the ages of 60 and 64 are in the last years of "middle adulthood" (Infurna et al., 2020). This stage has specific physical, cognitive, and psychosocial characteristics (Infurna et al., 2020). On the physical side, there is a progressive decline in health, particularly in sensory and endurance capacity (Papalia, et al., 2012). In some cases, adults can experience the effects of their earlier-age habits and, consequently, certain adults may begin to struggle with chronic illnesses (Infurna, 2020), mainly metabolic diseases (Masters et al., 2018). On the cognitive level, this group exhibits a greater capacity to solve problems in a practical way (Papalia, et al., 2012). This group of adults may be in their last years of active work, which may induce great physical fatigue (Papalia, et al., 2012). Oftentimes, this group of this 60-to-64 years of age face other types of responsibilities like caring for grandchildren (Meyer & Kandic, 2017), or their own parents, who require more care due to their advanced age (Huo et al., 2019). During the early sixties, anxiety and depression become somewhat prevalent (Brody et al., 2018), especially among women of lower socioeconomic status and those who are in the LGBT group (Fredriksen-Goldsen et al., 2018). Use of antidepressants and visits to mental

practitioners grow during these years in comparison to previous stages of life (Blanchflower & Oswald, 2016).

Adults aged 65 and over are in the "late adulthood" stage, this phase is the last of the developmental cycles and exhibit varying individual characteristics during this aging phase (Von Humbolt & Leal, 2014). This aging phase is characterized by physical, cognitive, and psychosocial characteristics described below (Szcześniak et al., 2020). On the physical side, older adults in this aging group may exhibit a significant decline in physical abilities and overall health (Błachnio & Buliński, 2013). Also, they may have slower reaction times that affect their daily functioning (Papalia, et al., 2012). However, some studies have shown that older adults who continue to look after themselves and stay physically active can enjoy good health and longevity (McPhee et al., 2016). At a cognitive level, some older adults will remain alert, but others will begin to experience memory and intellectual decline (Salthouse, 2019). For instance, studies have shown a relationship between feelings of loneliness and cognitive decline in this group. (Zhou et al., 2019). Some researchers agree that regular physical exercise is related to better cerebral functioning in prefrontal and hippocampal areas (Kirk et al., 2013). On the psychosocial level, older adults face retirement from active work , which requires a process of adjustment to different aspirations, desires and goals (Von Humbolt & Leal, 2014). Some people in this aging group may be able to confront the loss of their peers in a much more intimate way and reflect on the deeper meanings of life (Stangor & Walinga, 2010; Von Humbolt & Leal, 2014).

Anxiety and depression affect about a quarter of adults over the age of 60 (Stangor & Walinga, 2010). Both anxiety and depression have been observed to be common mental disorders of the elderly population (Kim, 2018). Therefore, just as medical care addresses physical health changes of the aging population, other disciplines should anticipate and cope

with social, psychological, and emotional changes that impact mental health (Issalillah &Nur Aisyah, 2022). Especially, when anxiety and depression are strongly associated with an increased risk of cognitive deterioration, dementia (Byers & Yaffe, 2011) or early mortality (Kazmi et al., 2021).

Depression in older adults

Depression is a mood disorder that includes cognitive, behavioral, physical, motivational, and emotional symptoms that affect a person's daily life (Davey, 2014). The causes of depression or its etiology are multifactorial; in some cases, biological or genetic changes affect the brain. These changes could affect the neural circuits, which, in turn affect the mood of persons and induce depression. In other cases, this depression could be the result of a stressful event such as having to live with a medical condition or facing the death of a loved one (National Institutes of Healh, 2021). Depression causes may also be genetic, biological, psychological or external (Davey, 2014).

According to the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), major-depression diagnosis consider five or more of the following symptoms which must be present almost every day for a period of two weeks (American Psychiatric Association, 2013):

- Mood changes, depressed mood usually exhibited the whole day or most of the time, characterized by a feeling of deep sadness, emptiness, hopelessness, low-energy mood, and/or irritability.
- Reduced interest or enjoyment in activities that previously used to be pleasurable. This sensation is exhibited the whole day or most of the day.
- Loss of body weight without dieting or dietary changes.
- Appetite increases or decreases.

- Sleep changes, difficulty in sleeping is called "insomnia" or a state of excessive sleepiness during the day is called “hypersomnia”.
- Changes in mobility, such as restlessness or psychomotor slowing.
- Tiredness or diminished energy.
- Feelings of insignificance, worthlessness or extreme guilt.
- Difficulty focusing, thinking, or feeling indecisive most of the day.
- Persistent death thoughts, suicidal ideas, contemplating a plan to commit suicide or any previous suicide attempt.

It is important to consider that between 10 to 15% of older adults suffer from clinical depressive symptoms, even in the absence of major depressive disorder (Kok & Reynolds, 2017). Nevertheless, for an accurate diagnosis, a minimum of one of the depressive symptoms must result in a depressed mood or in lack of pleasure and interest in activities that were previously considered gratifying (American Psychiatric Association, 2013). The degree of depression (mild, moderate, or severe) is assessed based on the gravity of the symptoms and the level of functioning in occupational, social, personal, and additional areas of daily life (Kok & Reynolds, 2017).

There are diverse types of depressive disorders and the most common among the elderly are the following:

- "Persistent Depressive Disorder" is a type of depressive disorder characterized by a chronic depressed mood for at least 2 years.
- "Major depressive disorder due to a medical condition" happens when depressive symptoms appear as a consequence of a pathology or medical condition, which can be very common in older adults (American Psychiatric Association, 2013).

- "Major depressive disorder due to a medication or substances" is caused when depression is associated with substance consumption such as analgesics or alcohol (National Institutes of Health, 2021).

The disorders listed above are the most common depressive disorders found in older adults, while the following depressive disorders are less common: Psychotic depression, seasonal affective disorder, and postmenopausal disorder are other categories of depressive disorders that can be present at a minimal rate (National Institutes of Health, 2021).

Depression and anxiety in old age are associated with certain characteristics such as being female, having chronic diseases or cognitive impairment (Fernandez & Granados, 2015), functional disability, lack of social contact, problematic personality traits, witnessing stressful events or having a history of depression (Lu et al., 2023). In old age, depression seriously affects wellbeing, because it is often presented in comorbidity with cognitive decline and medical conditions. Some co-occurring health conditions include diabetes (Park & Reynolds, 2015), cardiovascular disease (Zhang et al., 2018), arthritis (Matcham et al., 2013), obstructive pulmonary disease (Jaul & Barron, 2017) and asthma (Ghaemi et al., 2019). Concurrent presence of multiple conditions can be a complicating factor in the diagnosis of depression (American Psychiatric Association, 2013). Many older adults initially seek medical attention related to such symptoms as fatigue, pain, weight loss, memory-loss problems, social isolation, low interest in eating, or recent or increased alcohol use (Preston et al., 2017). Although these indicators are easily considered part of a medical diagnosis, they are also part of depressive and anxiety symptomatology, and not always can be explained by a medicine-based criteria (Jaul & Barron, 2017).

Anxiety in older adults

Anxiety is not a disorder per se, it is an adaptive emotion that occurs when people find themselves in situations that are perceived as threatening (Günther et al., 2023). It works by activating the body into a state of alertness to focus attention and resolve a complex problem or even to survive from any kind of danger (Kenwood et al., 2022). When facing these types of circumstances, the body physiologically creates a sense of apprehension, uncertainty, and anticipation (Castro & Alberdi, 2015; Fernández & Granados, 2015). Although anxiety is a natural emotion, sometimes it can feel overwhelming and it creates high levels of discomfort (Pine et al., 2021). When anxiety is disproportionate to the situation at hand, it turns from being an adaptive emotion and becomes a maladaptive emotion which results in significant suffering and impairs the daily functioning of the individual affected by anxiety (Kenwood et al., 2022). At intense levels, anxiety can become immobilizing and interfere with an individual's normal functioning (Pine et al., 2021). Anxiety becomes pathological when the cognitive processing of information is abnormal and few coping strategies are used to resolve problematic situations for a period of time (Fernández & Granados, 2015). Approximately 17.2% of older adults between the ages of 55 and 84 are affected by an anxiety disorder over a 12-month period (Canuto et al., 2018). Anxiety patients may experience more than one anxiety disorder (Canuto et al., 2018). Anxiety disorders have two predominant characteristics: extreme fear, and worry about future situations (American Psychiatric Association, 2013). Extreme fear is an excessive emotive reaction to real or imagined stimuli perceived as threatening (American Association for Geriatric Psychiatry, 2022). It produces a quick and automatic physiological response to a dangerous situation that alerts the person of the incoming danger (American Psychiatric Association, 2013). Physiological sensations that could be experienced are muscle tension, dry mouth, sweating, increased heartbeat, trembling, limb padding, difficulty in swallowing,

accelerated breathing, dizziness, chronic fatigue, difficulty in falling asleep, and having nightmares, among other symptoms triggered by overactivation of the sympathetic nervous system (Preston, 2017). On the other hand, elevated worry is caused by the anticipation of future threats (David, 2014). This characteristic presents negative intrusive thoughts or flashbacks of past situations related to the threat (Günther et al., 2023).

The most frequent anxiety disorders in the elderly are listed below:

- Specific phobias. A specific phobia is described as a severe and exorbitant fear of a specific object or situation, resulting in total avoidance of the feared stimuli or a change in lifestyle (Davey, 2014). Common phobias in the older population group are fear of flying, changes in the routine environmental conditions, injuries resulting from falling, or health problems in general. These changes lead them to become less active, isolate themselves, remain at home, and limit social contact. Fifty percent of the older population have faced or experienced a fall or other event that has affected their health or endangered their life (Pary et al., 2019).
- Generalized anxiety disorder. This is a pathology characterized by persistent and overwhelming fear, worry, and anxiety related to a gamut of situations or activities (Association for Geriatric Psychiatry, 2022). This anxious state may be present during a large part of the day and may be triggered by different stimuli. Generalized anxiety disorder interferes with the individual's normal functioning, causes difficulty in relaxing, and triggers an inability to fall asleep due to continuous worrying (Pary et al., 2019).
- Panic disorder. This is a disorder that arises with repeated anxiety or panic attacks. This disorder has strong physiological symptoms, severe fear without an identified stimulus and a feeling of not being connected to the body. The latter is known as

"depersonalization" (Davey, 2014). Panic disorder happens when more than one panic attack has occurred unexpectedly, and these attacks unpredictably continue (Preston, 2017).

Risk factors associated with the presence of anxiety include: being female, having a chronic medical or mental diagnosis, experiencing cognitive decline, or facing stressful situations (Zhang et al., 2015). For example, experiencing the death of a loved one is a factor associated with the onset or persistence of anxiety symptoms (Welzel et al., 2019). Evidence shows that anxiety etiology is diverse. Some causes of anxiety are linked to biochemical alterations while others have a psychogenic source (Preston et al., 2017).

Anxiety in elderly individuals often manifests itself in more pronounced physiological symptoms compared to those experienced by younger patients. These physiological symptoms pose a challenge in the process of differentiating anxiety from other medical conditions or physiological symptoms (Fernandez & Granados, 2015). Older adults with pre-existing mental or physical conditions are four times more likely to suffer from anxiety or clinical depression. (Ni Mhaolain et al., 2012). Elderly population experience greater sensitivity to anxiety symptoms, which, in turn, creates fear or aversion to the physiological responses produced (Kraemer et al., 2020). Sensations such as rapid heartbeat, agitated breathing, trembling, sweating. These symptoms activated by the human sympathetic system create fear of active movement or physical exercise. This fear leads to significant limitations in physical activity among older adults (Preston et al., 2017). As a result, the aforementioned sensations may lead some elderly population to a reduction in daily physical activity in order to avoid the sensations of physiological changes (Kraemer et al., 2020). Sedentary lifestyles are common in the elderly population. A study found that older adults spend an average of at least 9.4 hours per day sitting;

therefore, fear of physiological activation may increase the level of sedentary lifestyles and disease risk (Copeland et al., 2017).

Treatments for anxiety and depression in older adults

The risk of untreated anxiety and depression can lead to worsening physical or mental illnesses, endanger lives, and increase healthcare costs. Untreated anxiety may lead older adults to contemplate suicidal thoughts and/or plans (Chen et al., 2022). Mental disorders represent a significant percentage of the healthcare system expenditures (Vasiliadis et al., 2013). These health care costs of elderly population must be taken seriously since elderly population represents an increasing percentage of the world population (World Health Organization, 2022). Unfortunately, data indicates that 50% of elderly adults do not receive appropriate treatment for anxiety and/or depression (Duhoux et al., 2012; Weisberg et al., 2013). In many cases, psychopharmacology is used as a first-line treatment for anxiety and depression (Parish et al., 2023). It is important to take into account that elderly patients have an increased sensitivity to drugs that affect the cardiovascular and central nervous systems (Lau et al., 2022). For example, the use of benzodiazepines (medication used to treat anxiety disorders) in older age can lead to adverse outcomes such as falls, fractures, and driving accidents (Gerlach et al., 2018). Studies suggest a possible link between benzodiazepine use and an increased risk of developing Alzheimer's disease (Billioti de Gage et al., 2014), and a variety of dementias (Islam et al., 2016), respiratory inadequacies, and inclusive cause death (FDA, 2017). Considering the low tolerance to antidepressants in the elderly population, other lines of treatment should be considered for this age group (Kok & Reynolds, 2017). The fact that older adults are often also medicated for other medical diagnoses, polypharmaceutical effects may bring additional risks and adverse outcomes in the health of this older population (Crocco et al, 2017).

Another significant treatment for anxiety and depression is psychotherapy (Thomas et al., 2020). Studies have shown that psychotherapy is as effective as antidepressants (Kok & Reynolds, 2017). Taking into account that symptoms of anxiety and/or depression can occur before or after the onset of comorbid medical conditions, psychological therapies can effectively treat anxiety and depression regardless of the sequence of their occurrence (Fava et al., 2016). Evidence suggests that patients prefer psychological therapies to pharmaceutical medication, because these interventions provide coping strategies to manage emotional distress (McHugh et al., 2013). One psychological intervention that has received significant scientific attention as a treatment for anxiety, depression, and other conditions is discussed below in more detail.

Mindfulness

Mindfulness is the cognitive ability to be consciously present, aware of where you are, and of what you are doing, without judging the moment (Rejeski, 2008). The Buddhist term for mindfulness comes from the Buddhist word "sati" which means being aware of situations one finds oneself in from one moment to the next and in the process to generate a compilation of memories (Sun, 2014). Mindfulness is about becoming an observer of what is happening inside, outside, and around you (sean-Oliver et al., 2020). The goal is to live life to the fullest (Sun, 2014). For example, if one is driving, one should focus one's attention only on driving. If you are eating, eat. If you are walking, walk with your mind wholly focused on walking.

The practice of mindfulness has two important components: self-regulation of attention and orientation to an experience (Keng et al., 2011). Self-regulation of attention is the ability to regulate attention by consciously observing things, situations or oneself in an unreflective way (Schuman-Oliver et al., 2020) and taking note of sensations, emotions, or thoughts that arise at a particular moment during as one goes through an specific activity (Schuman-Oliver

et al., 2020). By contrast, orientation to experience is an attitude of curiosity and openness to what surrounds us (Keng et al., 2011). Mindfulness uses these two components (self-regulation of attention and orientation to an experience) through meditation, which allows mindfulness practitioners to explore the moment as it is, without controlling or changing the situation (Bauer-Wu et al., 2022). The goal of this practice is to develop a mind free from constant judgmental thoughts and to awaken one's curiosity about the present. Awareness of the moment gets enhanced from compassion and acceptance (Bauer-Wu et al., 2022).

In recent decades, mindfulness has attracted a significant interest in clinical research (Karl et al., 2022) and has been tested on different mental health conditions (Fischer et al., 2020). Mindfulness is particularly beneficial to treat anxiety, depression, and chronic pain. Its benefit has been demonstrated in well-designed studies with representative samples (Powell, 2018). There are also studies that support the benefits of mindfulness in improving the immune system by reducing stress, building mindful habits, facilitating sleep regulation, and lowering blood pressure within eight weeks of starting mindfulness practice (Bauer-Wu et al., 2022). Research with smaller samples has shown benefits for irritable bowel syndrome, fibromyalgia, post-traumatic stress disorder, and psoriasis (Powell, 2018).

It is important to point out that novice practitioners of mindfulness practice may experience momentary discomfort due to their lack of unfamiliarity in maintaining focused attention on the present moment (Aizik-Reebs et al., 2021). It is common for novice mindfulness practitioners to experience avoidance reactions when confronted with present sensations, and dissociative reactions such as derealization or depersonalization (Zaman et al., 2015). It has been shown that these reactions seem to be especially prevalent in people with elevated levels of stress and/or chronic pain (Zaman et al., 2015). Evidence suggests the importance of developing specific skills to deal with discomfort by being mindfully aware of

internal sensations. One skill that leads to interoceptive awareness is body literacy, which involves recognizing bodily sensations and expressing them (Price & Hooven, 2018). Mindfulness practice facilitates developing this skill, by enhancing awareness of internal states to recognize sensations, thoughts, and feelings (Aizik-Reebs et al., 2021). Additionally, research has shown that mindfulness practices promote distress tolerance to deal with discomfort and cope with it (Carpenter et al., 2019).

Research of the use of mindfulness in older adults

Some studies have found that the practice of mindfulness has a positive impact on the mental, emotional and physical well-being in older adults. (Parra et al., 2019). Research also shows that mindfulness-based interventions are feasible and acceptable for older adults as it develops emotional benefits such as reduced anxiety (Ketut et al., 2018), depression (Javanmardi et al., 2020; Reangsing et al., 2020), stress (Wetherell et al., 2017) and worry (Parra et al., 2019).

Additionally, there are cognitive benefits which include: increased self-reflection and awareness, development of a more self-accepting attitude, greater awareness of the present moment, and reduced self-judgment (Parra et al., 2019; Smart et al., 2016). These benefits promote better mental health, self-efficacy, cognitive activity, and psychological well-being (Ernst et al., 2008; Creswell et al., 2012; Rosenkranz et al., 2013; Fountain-Zaragoza & Prakash, 2017). Similarly, on a physical level, old adults experience calm, relaxation, serenity, and improved sleep (Parra et al., 2019). By practicing mindfulness daily, older adults also develop self-care habits and improve their relationships with family or friends (Schuman-Oliver et al., 2020).

The use of virtual reality in mental health

Virtual reality refers to the immersive experience of observing a 360-degree real-world environment through virtual reality goggles (or viewers), developed by advanced technology (Anderson et al., 2013; Slater & Sanchez-Vives, 2016). A person observing through virtual reality goggles has the sensation of being inside the observed environment (Anderson et al., 2013; Slater & Sanchez-Vives, 2016). Many goggles or headsets hold a cellular phone within their compartments to project the virtual environment through the cellular phone screen. However, this variation depends on the specific model of virtual reality goggles. Other virtual reality goggles feature integrated screens for the viewers and do not need the incorporation of cellular phones (Cipresso et al., 2018). There are additional accessories that help to interact with the virtual environment, such as shoes, controllers, or gloves. These accessories help create more realistic movements within visual space (Cipresso et al., 2018). The illusion of being inside the observed landscape is created by motion sensors that detect the rotation of the user's head, creating natural movements and making the immersive experience almost real (Zhang et al., 2020).

This new virtual reality technology has been incorporated into various professional fields. In architecture, virtual reality goggles project designed environments in three-dimensional vision. In medical and/or military procedures, virtual reality goggles can simulate training for novice workers or students. In tourism, virtual reality goggles can provide realistic sightseeing tours and art exhibitions. In marketing, virtual reality goggles allow an individual to view the design and launch of immersive advertisements. In psychology, VRGs can be used as a psychological tool in psychotherapy (Mancini, 2021). For example, VRGs make it possible to bring different landscapes of the world into the therapy room for psychoeducational and treatment purposes, transforming the traditional clinical environment into an interactive one (Torous et al., 2021). Evidence has shown the benefits of using virtual reality for therapeutic

purposes in some pathological conditions such as social anxiety disorder (Anderson et al., 2013), high functioning autism spectrum disorder (Kandalaft et al., 2012; Didehbani, 2016), depression (Falconer et al., 2016), paranoia (Geraets et al., 2020), and Parkinson's disease (Pazzaglia et al., 2020), improving people's symptoms, functionality, and emotional well-being (Pazzaglia et al., 2020). Virtual reality technology use in mental health treatments is also effective in improving cognitive functions, even in older adults with mild cognitive impairment (Manera et al.; 2016; Torpil et al., 2021) as well in restoring cognitive functions in Chronic stroke patients.(Manuli et al., 2020). Virtual reality can also serve as a psychoeducational tool, providing people with these pathologies the opportunity to experience normal daily life, aiming to reduce stigma (Yuen & Mak, 2021). Finally, virtual reality environments can be used to train cognitive, psychomotor, or emotional skills (Jensen & Konradsen, 2018).

Mindfulness implemented through virtual reality

Studies have shown that mindfulness practice using virtual reality goggles presents a greater acceptance to this practice when compared to practicing mindfulness alone (Failla, 2022). The combination of mindfulness practice and virtual reality technology facilitates mindfulness training to focus attention on interactive environments and learning how to concentrate in the here and now (Seabrook et al., 2020). Mindfulness with virtual reality goggles was used in different populations to understand its effects on mental health.

Virtual reality goggles were used by hemodialysis patients, enrolled in a program called Joviality, to practice mindfulness while receiving dialysis treatment (Hernandez et al., 2021). The results showed a reduction in symptom severity. The use of virtually goggles actually provided an overall pleasant experience (Hernandez et al, 2021).

For university students, mindfulness with virtual reality goggles was an effective treatment to reduce stress, generate self-empathy, and increase emotional control (Modrego-

Alarcón et al., 2021). Among adolescent patients in hospital emergency units, mindfulness treatment with virtual reality goggles was an effective strategy to mitigate stress and anxiety associated with hospitalization and related procedures (Butt et al., 2022). This kind of virtual-technology mindfulness intervention has been accepted also by meditation experts, who reported lower levels of anxiety, sadness, and anger, as well as increased relaxation (Navarro-Haro, 2017).

It should be noted that mindfulness practiced with these virtual reality technological devices may at times cause some discomfort, dizziness, or nausea as a result of the immersive experience and the lack of a real movement (Chang, 2018). However, mindfulness can help develop the strategies necessary to stay in touch with the sensations of the moment and to cope with this discomfort (Carpenter et al., 2019). In some cases, virtual reality goggle treatment improves distress tolerance by moving oneself away from avoidance or fear of the unknown to observing things without personal judgment (Reangsing et al., 2020).

As presented in the preceding analysis, it can be said that the use of virtual reality technology in psychotherapeutic fields is still under research. Thus far, its implementation has been limited to specific populations. Therefore, further research is required to substantiate the use of mindfulness practice with virtual reality goggles in diverse conditions and among individuals with varying characteristics. Previous research has been conducted primarily on adolescents or adults under the age of 60, there is ample opportunity to investigate the effect of mindfulness practice with virtual reality among people outside the aforementioned age groups (Huygelier et al., 2019). As already stated, research of the use of virtual reality technology in older adults resulted in positive attitudes toward its usage (Huygelier et al., 2019). After examining the existing preliminary literature about mindfulness implemented through virtual reality in older adults, it was found to be an accessible, accepted and innovative option in

Geron-technology. However, this topic remains understudied, and clinically-controlled studies are needed to reach more solid evidence (Sadowski & Khoury, 2022).

METHODOLOGY AND DESIGN OF THE INVESTIGATION

Type of research:

A randomized controlled trial was designed to evaluate the efficacy of ten mindfulness-based virtual reality sessions in a sample of older adults with symptoms of anxiety and depression in Ecuador. The intervention is evaluated in an experimental group and compared to a wait-list control group. Through this study, we aim to assess the efficacy and acceptability of the intervention in older adults in Ecuador. The Institutional Review Board of Universidad of San Francisco de Quito approved this research.

- Experimental Group: For ten weeks, participants randomized in this group receive weekly virtual reality mindfulness sessions.
- Control Group: Participants randomly assigned to this group receive weekly phone calls to check emotional status and maintain contact during the ten-week wait period. After the wait period, participants receive ten mindfulness sessions implemented through virtual reality.

Thus, this study assesses symptoms of anxiety and depression, stress level, mindfulness level and behavioral activation in older adults aged 60 years old and above at three points of time: pre-treatment, post-treatment and a follow-up measure.

Participants and recruitment

The sample group is being recruited through outreach messages distributed through social networks, geriatric offices, foundations, and recreational programs for the elderly. The

study planned to recruit 50 participants randomly divided into two groups, 25 participants in the experimental group and 25 participants in the waiting list control group. The study requires a total of 75 participants to complete the interventions, including both phases. Considering that clinical trials report a dropout rate of 16% to 18%, it was planned to recruit 40 participants in each group, as there may be participants who drop out of the study (Wood et al., 2004). Therefore, the goal is to include 25 participants who complete the intervention in each group to assess the acceptability and effectiveness of the intervention.

Inclusion criteria

- Institutionalized and non-institutionalized older adults capable of giving consent.
- Adults 60 years of age or older.
- Normal cognitive functioning or mild cognitive impairment, capable of giving informed consent on their own.
- Moderate depressive and anxious symptoms.

Exclusion criteria

- Older adults unable to give consent on their own will not be considered.
- Diagnosis of acute psychosis.
- Moderate or severe dementia.
- Physical disabilities that prevent movement.
- Blindness or severe vision problems.
- Deafness or severe hearing problems.
- Presence of current psychiatric or cognitive symptoms that affect understanding of informed consent or comprehension of the study.
- Patients receiving mindfulness-based therapy prior to or at the time of this study.
- Older adults with a history of moderate to severe dizziness.

Variables to be analyzed during the research

- Depression: Indicator of a person's mood that reports the frequency and presence of various depressive symptoms. These symptoms include feelings of guilt, low self-esteem, mood characterized by sadness, feelings of hopelessness, worthlessness, lack of energy, sleep and appetite problems (Ros et al., 2011).
- Geriatric depression: Depression in older adult population related to greater difficulties in physical, functional, social, and cognitive areas (Erazo et al., 2020).
- Anxiety: Generalized anxiety disorder is a mental disorder characterized by a psychological reaction of excessive worry and stress for different reasons (Camargo et al., 2021).
- Perceived stress: The perception of an event as stressful (Remor, 2006).
- Functioning in daily life: Refers to the level of a person’s activity, from the contextual approach. Behavioral activity is related to the presence or absence of a mental illness, such as depression. Mental disorders can affect a person’s work, training, or social functioning, leading to reduced activity or functioning in daily life (Sanchez et al., 2018).
- Cognitive functioning: It encompasses various cognitive functions such as attention, memory, visual abilities, abstraction, executive functions, orientation, and calculation (Delgado et al., 2017).
- Mindfulness: The capacity to experience being mindful on daily life, avoiding judgments and observing characteristics as they are (Soler et al., 2012).
- Dizziness: This symptom is characterized by bodily sensation of movement with relation to objects in the environment or vice versa (Caldara et al., 2012).

Instruments

- **Depression:** Depressive symptoms are assessed using the Center for Epidemiological Studies Depression Scale (CES-D). This is a 20-item self-report instrument answered on a 4-point Likert scale. This scale is used in adults to measure the frequency of depressive mood symptoms during the previous week. CES-D is currently used in research and in clinical settings. Total score ranges from 0 to 60 points. Depression is indicated by a score of 16 and above. CES-D is considered a valid and reliable instrument for the elderly population due to its psychometric properties. It presents Cronbach's alpha coefficient of (α=0.88), which is considered acceptable and shows a significant correlation between its items. Likewise, through the structural evaluation the scale measures four factors, which are: depressive affect, positive affect, interpersonal relationships, and reduced somatic activity, These factors allow measuring the general construct of depression. Estimated CES-D administration time is five minutes (Ros et al., 2011).
- **Geriatric depression:** The Geriatric Depression Scale (GDS-15) is used to assess the behavioral and affective symptoms of depression in older adults. It excludes symptoms that may be very similar to somatic or neurodegenerative diseases such as dementia. This instrument was validated in the Ecuadorian population and the following psychometric results were obtained, indicating a high internal consistency through the Kuder-Richardson-20 coefficient of (0.73). The validation of the GDS-15 instrument in Spanish, reflects a Cronbach's alpha of (α=0.82), demonstrating its internal consistency (Erazo et al., 2020). The estimated administration time of GDS-15 is five minutes (Erazo et al., 2020).
- **Anxiety:** Generalized Anxiety Scale (GAD-7) detects anxiety through a quick, practical and reliable application. It is a self-report instrument consisting of 7 items focused on measuring symptoms of generalized anxiety disorder over the previous two weeks. It uses a Likert scale ranging from 0 to 3 points to measure the frequency of anxiety. The total

score of the instrument ranges from 0 to 21, and generalized anxiety disorder can be identified with a score greater than or equal to 10. The psychometric properties of this instrument show that it is a reliable and valid scale. This scale presented only one factor when evaluating its factorial structure. In addition, it presents Cronbach's alpha coefficient of (α=0.92), which demonstrates internal consistency and high reliability (Camargo et al., 2021). The estimated administration time is 2 minutes.

- **Perceived stress:** Perceived stress is measured with the Stress Perception Scale (PSS) (Remor; 2006). PSS is a self-report measure that presents 10 items and has a 5-point Likert scale response mode. PSS assesses the frequency of perceived stress over the previous month. A higher score reflects a higher level of perceived stress in the life of the respondent. The assessment has demonstrated relevant psychometric characteristics that highlight the reliability of the tool by showing internal consistency with a Cronbach's alpha of (α=0.82) and a test-retest r=0.77. This scale presents concurrent validity and the psychometric qualities reported have been measured in the same way with the more complete 14-item version of the test. The latter had confidentiality of Cronbach's alpha (α =.81 and the test-retest reported r=.73. The latter test also has adequate concurrent validity. The estimated administration time of the test is three minutes (Remor et al., 2006).
- **Functioning in daily life:** The Spanish version of the Behavioral Activation Scale for Depression (BADS) is used in this test. BADS assesses four factors: activation, avoidance-rumination, educational-work impairment, and social behavioral impairment. The maximum score is 25. This survey allows researchers to measure the general functioning in daily life of the person evaluated. The score of the four factors provides information about the impact of depression on work, academic, and social areas. An important feature of this scale is the subscale or factor scores, which assess changes in various important areas of the

respondent's daily life, allowing assessment of improvement in depressive symptoms. The psychometric evaluation (BADS) showed internal consistency with Cronbach's alpha (α = 0.89) for the whole scale. BADS presents discriminant and criterion validity. The estimated administration time is 6 minutes (Sánchez et al., 2018).

- **Cognitive Functioning:** The Montreal Cognitive Assessment (MoCA) is used to assess the presence of cognitive impairment in older adults. The maximum score is 30 points, and the scores obtained indicate mild, moderate, and severe cognitive impairment. The internal consistency of the assessment indicates a Cronbach's alpha (α=0.77) considered good and a retest (r=0.92) identified as very good (Delgado et al., 2017). This tool has been recognized as valid for the assessment of mild cognitive impairment and mild dementia, which is an inclusive objective of this study. The estimated administration time is ten minutes.
- **Mindfulness:** The Mindfulness Attention Awareness Scale (MAAS) is a 15-item self-test that measures mindfulness as a single factor. MAAS has practical advantages in identifying the presence or absence of mindfulness in clinical and research settings. The questionnaire uses a 6-point Likert scale, where one is “almost always” and six is “almost never” to assess the frequency of mindfulness in daily life. Mindfulness is evaluated as a single factor composed by 5 sub-factors: observation, description, acting with awareness, non-reactivity to inner experience, and non-judgment. MAAS has good psychometric properties, which make it a reliable and valid instrument. The Spanish-adapted version has 15 items in the test. MAAS also shows good reliability with a Cronbach's alpha (α=0.89), similar to the reliability reported in the original non-Spanish version. MAAS has a Cronbach's alpha coefficients between 0.75 and 0.91 (Baer; et al., 2006). The estimated administration time of the test is five minutes.

- **Dizziness**: The Dizziness Disability Inventory (DHI) developed by Jacobson and Newman (1991) is used to assess participants' dizziness and vertigo after each intervention. This is a self-report instrument that measures the sensation of dizziness, vertigo, or lightheadedness and their impact on daily activities. Given that dizziness and vertigo are common causes of medical visits, it is used to quantify the effects of treatments or interventions. The Spanish adaptation (Pérez et al., 2000) has undergone several cultural validations that have allowed the acquisition of reliable and valid versions for the Latin American population (Caldara et al., 2012). DHI consists of 25 items divided into 3 subscales: functional, emotional, and physical. The functional scale measures the impact of dizziness, vertigo or unsteadiness in daily activities. The emotional scale assesses the impact of dizziness, lightheadedness and vertigo on health in the emotional domain, and the physical scale assesses the impact of the feeling of instability on motor performance. Thus, DHI provides insight into the etiology of dizziness. Maximum score is 100, made up of 36 points for the emotional subscale of 9 items, 36 points for the functional subscale of 9 items, and the remaining 38 points for the physical subscale of 7 items. The scores are obtained as follows: in the emotional and functional subscales (no disability ranges from zero to 14 points, moderate disability ranges from 15 to 24 points, and severe disability ranges from 25 points and above). In the physical subscale the scores are as follows (no disability ranges from zero to nine points, moderate disability ranges from ten to 16 points and severe disability ranges from 17 points and above). The psychometric properties of DHI highlight its internal consistency with a Cronbach's alpha (α=0.87) and in the subscales: physical subscale (α=0.79), emotional subscale (α=0.85) and functional subscale (α=0.83), all considering a $p < .001$. Similarly, the test-retest reliability of the total DHI score and the 3 subscales, is indicated by the

intraclass correlation coefficient, with values above 0.94. (Caldara et al., 2012). The estimated administration time of the test is eight minutes.

Ethical aspects of research

Application of bioethical criteria in the selection of participants

It is important to mention that the following criteria of the Code of Ethics of the American Psychological Association was adopted in this research (Fisher, 2016):

- Beneficence Criterion: This research seeks to test the effectiveness of using mindfulness-based virtual reality technology to provide an adequate intervention in older adults with symptoms of depression and anxiety. The intervention is a low-cost treatment option that may have a positive impact on the quality of life and overall functioning of older adults. Equally important, the results will be a contribution to the currently scarce information on the mental health of older adults in Ecuador.
- Equity Criteria: The research will target the population of older adults with symptoms of anxiety and depression. Individuals in the tested population will be included regardless of ethnicity, culture, or identity. Also, the benefits of the intervention will be shared equitably among all participants.
- Respect and Dignity Criteria: Researchers will respect the value, dignity, participant rights, confidentiality, privacy, and self-determination of all participants. They will also respect cultural, individual, gender, religion, gender identity, ethnicity, race, and other factors that identify each participant. Moreover, participants will be able to give informed consent for their participation and will be able to withdraw from the research at any time. In this way,

older adults have the right to choose to participate in the research, exercising their right to free choice. Throughout the study, they are free to express any doubts they may have.

Privacy and confidentiality

Information will be provided to older adults at the beginning of the research to explain their rights to confidentiality as participants. In addition, these rights will be clearly detailed in the informed-consent form to reinforce the message. Similarly, throughout the research process data collected will be strictly controlled and only the research team will have access to it.

Additionally, the information collected will only be used for research purposes and will not be shared with third parties. There will also be an emphasis on the fact that group data, not individual data, will be the basis for the publication of the data.

Contributions/benefits for society or community

The application of this intervention will analyze the efficacy of virtual reality based on mindfulness as an intervention for adults over 60 years old with symptoms of anxiety and depression. This low-cost intervention could provide therapy alternatives to be applied in the clinical field for the benefit of the quality of life of older adults. Besides, the results obtained will allow to know the effect of the use of technology by using virtual reality with mindfulness as a resource to clinically intervene in older adults.

DATA ANALYSIS

Computer tools and statistical packages that will be used for processing data analysis are Excel, Statistical Software SPSS and Statistical Package R. The type of statistical analysis that will be employed are T-test and regression. At the moment, the data are still being collected, therefore a description of the results found in the research is not included.

CONCLUSIONS

Aging is a process of physical, social and emotional changes which presents specific challenges like other stages of life. Anxiety and depression are common disorders that older adults often face, causing distress and impairment in their lives. Inadequate management of emotions and thoughts in anxiety, and depression symptoms increases discomfort, thus it is essential to treat them. Particularly, because aging can cause multiple medical conditions, which can complicate accurate diagnosis and appropriate treatment. In many cases, coexisting conditions can lead to a polypharmacy effect that can trigger adverse consequences and jeopardize the health and lives of older adults. These factors underscore the importance of appropriate treatments that help to improve the daily quality of life for older adults.

Mindfulness aims to cultivate an individual's ability to be present, reduce judgment, foster self-compassion and improve coping mechanisms with emotions and thoughts to bring a wellbeing sensation. An essential point is the available new research on innovative mindfulness practice methods that integrate technology as a resource that can be beneficial in supporting mental health treatment. In addition, leveraging technological advancements and integrating them into healthcare can offer the user a friendly resource to bridge the gap between technology and older adults. Specifically, virtual reality can retain the benefits and fundamentals from practicing mindfulness alone. Virtual reality goggles engage viewers in curious observation and

enable visual interaction with natural landscapes environments to be mindful. Besides, exploring the integration of mindfulness training with immersive technology may help to facilitate mindfulness practice in diverse settings without requiring individuals to move outside of the clinical context or their homes, especially considering that older adults may have mobility issues.

Moreover, virtual reality in mental health has been implemented in certain populations and the results have shown benefits to people's health. Nevertheless, further research is needed to provide evidence and strong results to support the use of virtual reality in older adults. Therefore, this study is designed to test the effects of 10 sessions of mindfulness using virtual reality goggles for older adults with anxiety and depression symptoms. Aiming to understand if the intervention has an effect on self-awareness, mood, stress levels or behavioral activity in older adults. These findings may be known at the end of this research to provide empirical information on the possible benefits, limitations, and opportunities when applied to older adults in a developing country such as Ecuador.

So far, future research points out the opportunity to analyze the intervention in representative samples including the Ecuadorian older adults of the 24 provinces. Also, it can be necessary to include a larger number of trained psychologists in implementing the weekly sessions of mindfulness with virtual reality goggles to a bigger sample. Another research opportunity is to study mindfulness-based virtual reality intervention on common elderly problems, such as the bereavement of a spouse, having a disability or chronic illness, loss of cognitive or physical abilities that occur with age, leaving the workforce after retirement or other mental health pathologies. Probably it can be a tool that facilitates coping and enjoying day to day in this new stage of life. Additionally, another potential research approach in this area is to implement the study in a hospital or clinic to control the environment for all

participants, minimize distractions and contribute to treatment adherence. Finally, technological applications or programs are constantly evolving and an application can be created with the option of a Spanish recorded voice to standardize the process to facilitate replication in a greater number of people.

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APPENDICES

APPENDICE A: ESCALA DE DEPRESIÓN DEL CENTRO DE ESTUDIOS EPIDEMIOLÓGICOS (CES- D)

Leeré algunos enunciados e indique cuántas veces se ha sentido así la semana pasada. Usando la siguiente escala.

0 = Menos de un día
1 = 1 a 2 días
2 = 3 a 4 días
3 = 5 a 7 días

Durante la semana pasada...

1. Me molestaron cosas que usualmente no me molestan
   - o Menos de un día
   - o 1 a 2 días
   - o 3 a 4 días
   - o 5 a 7 días

2. No me sentía con ganas de comer, tenía mal apetito
   - o Menos de un día
   - o 1 a 2 días
   - o 3 a 4 días
   - o 5 a 7 días

3. Sentía que no podía quitarme de encima la tristeza, ni con ayuda de familiares y amigos
   - o Menos de un día
   - o 1 a 2 días
   - o 3 a 4 días
   - o 5 a 7 días

4. Me sentí tan bueno/a persona como cualquier otra
   - o Menos de un día
   - o 1 a 2 días
   - o 3 a 4 días
   - o 5 a 7 días

5. Tenía dificultad para mantener mi mente en lo que estaba haciendo
   - o Menos de un día
   - o 1 a 2 días
   - o 3 a 4 días
   - o 5 a 7 días

6. Me sentí deprimido/a

- Menos de un día
- 1 a 2 días
- 3 a 4 días
- 5 a 7 días

7. Sentí que todo lo que hacía era un esfuerzo
   - Menos de un día
   - 1 a 2 días
   - 3 a 4 días
   - 5 a 7 días

8. Me sentía optimista sobre el futuro
   - Menos de un día
   - 1 a 2 días
   - 3 a 4 días
   - 5 a 7 días

9. Pensé que mi vida era un fracaso
   - Menos de un día
   - 1 a 2 días
   - 3 a 4 días
   - 5 a 7 días

10. Me sentí con miedo
    - Menos de un día
    - 1 a 2 días
    - 3 a 4 días
    - 5 a 7 días

11. Mi sueño era inquieto
    - Menos de un día
    - 1 a 2 días
    - 3 a 4 días
    - 5 a 7 días

12. Estaba contenta/o
    - Menos de un día
    - 1 a 2 días
    - 3 a 4 días
    - 5 a 7 días

13. Hablé menos de lo normal
    - Menos de un día
    - 1 a 2 días
    - 3 a 4 días
    - 5 a 7 días

14. Me sentí solo/a
    - Menos de un día
    - 1 a 2 días
    - 3 a 4 días
    - 5 a 7 días

15. Sentí que la gente no era amigable
    - Menos de un día
    - 1 a 2 días
    - 3 a 4 días
    - 5 a 7 días

16. Disfruté de la vida
    - Menos de un día
    - 1 a 2 días
    - 3 a 4 días
    - 5 a 7 días

17. Pasé ratos llorando
    - Menos de un día
    - 1 a 2 días
    - 3 a 4 días
    - 5 a 7 días

18. Me sentí triste
    - Menos de un día
    - 1 a 2 días
    - 3 a 4 días
    - 5 a 7 días

19. Sentí que no le caía bien a la gente
    - Menos de un día
    - 1 a 2 días
    - 3 a 4 días
    - 5 a 7 días

20. No tenía ganas de hacer nada
    - Menos de un día
    - 1 a 2 días
    - 3 a 4 días
    - 5 a 7 días

APPENDICE B: ESCALA DE DEPRESIÓN GERIÁTRICA (GDS-15)

Instrucciones: Le voy a hacer algunas preguntas para evaluar su estado emocional, tome en cuenta únicamente como se ha sentido durante la última semana, por favor responda con Sí o No.

1. ¿En general, está satisfecho(a) con su vida?
   - o Si
   - o No

2. ¿Ha abandonado muchas de sus tareas habituales y aficiones?
   - o Si
   - o No

3. ¿Siente que su vida está vacía?
   - o Si
   - o No

4. ¿Se siente con frecuencia aburrido(a)?
   - o Si
   - o No

5. ¿Se encuentra de buen humor la mayor parte del tiempo?
   - o Si
   - o No

6. ¿Teme que algo malo pueda ocurrirle?
   - o Si
   - o No

7. ¿Se siente feliz la mayor parte del tiempo?
   - o Si
   - o No

8. ¿Con frecuencia se siente desamparado(a), desprotegido(a)?
   - o Si
   - o No

9. ¿Prefiere usted quedarse en casa, más que salir y hacer cosas nuevas?
   - o Si
   - o No

10. ¿Cree que tiene más problemas de memoria que la mayoría de la gente?
    - o Si
    - o No

11. ¿En estos momentos, piensa que es estupendo estar vivo(a)?
    - o Si
    - o No

12. ¿Actualmente se siente un(a) inútil?
    - o Si
    - o No

13. ¿Se siente lleno(a) de energía?
    - o Si
    - o No

14. ¿Se siente sin esperanza en este momento?
    - o Si
    - o No

15. ¿Piensa que la mayoría de la gente está en mejor situación que usted?
    - o Si
    - o No

APPENDICE C: ESCALA DE ANSIEDAD GENERALIZADA (GAD-7)

Señale con qué frecuencia ha sufrido los siguientes problemas en los últimos 15 días:

1. Se ha sentido nervioso, ansioso o muy alterado
   - o Nunca
   - o Menos de la mitad de los días
   - o Más de la mitad de los días
   - o Casi todos los días

2. No ha podido dejar de preocuparse
   - o Nunca
   - o Menos de la mitad de los días
   - o Más de la mitad de los días
   - o Casi todos los días

3. Se ha preocupado excesivamente por diferentes cosas
   - o Nunca
   - o Menos de la mitad de los días
   - o Más de la mitad de los días
   - o Casi todos los días

4. Ha tenido dificultad para relajarse
   - o Nunca
   - o Menos de la mitad de los días
   - o Más de la mitad de los días
   - o Casi todos los días

5. Se ha sentido tan intranquilo que no podía estarse quieto
   - o Nunca
   - o Menos de la mitad de los días
   - o Más de la mitad de los días
   - o Casi todos los días

6. Se ha irritado o enfadado con facilidad
   - o Nunca
   - o Menos de la mitad de los días
   - o Más de la mitad de los días
   - o Casi todos los días

7. Ha sentido miedo, como si fuera a suceder algo terrible
   - o Nunca
   - o Menos de la mitad de los días
   - o Más de la mitad de los días

- Casi todos los días

APPENDICE D: ESCALA DE PERCEPCIÓN DEL ESTRÉS (PSS)

Las preguntas en esta escala hacen referencia a sus sentimientos y pensamientos durante el último mes. Indique cómo usted se ha sentido o ha pensado en cada situación.

0 = Nunca
1 = Casi nunca
2 = De vez en cuando
3 = A menudo
4 = Muy a menudo

1. En el último mes, ¿con qué frecuencia ha estado afectado por algo que ha ocurrido inesperadamente?
   - Nunca
   - Casi nunca
   - De vez en cuando
   - A menudo
   - Muy a menudo

2. En el último mes, ¿con qué frecuencia se ha sentido incapaz de controlar las cosas importantes en su vida?
   - Nunca
   - Casi nunca
   - De vez en cuando
   - A menudo
   - Muy a menudo

3. En el último mes, ¿con qué frecuencia se ha sentido nervioso o estresado?
   - Nunca
   - Casi nunca
   - De vez en cuando
   - A menudo
   - Muy a menudo

4. En el último mes, ¿con qué frecuencia ha manejado con éxito los pequeños problemas irritantes de la vida?
   - Nunca
   - Casi nunca
   - De vez en cuando
   - A menudo
   - Muy a menudo

5. En el último mes, ¿con qué frecuencia ha sentido que ha afrontado efectivamente los cambios importantes que han estado ocurriendo en su vida?
   - Nunca

- Casi nunca
- De vez en cuando
- A menudo
- Muy a menudo

6. En el último mes, ¿con qué frecuencia ha estado seguro sobre su capacidad para manejar sus problemas personales?
   - Nunca
   - Casi nunca
   - De vez en cuando
   - A menudo
   - Muy a menudo

7. En el último mes, ¿con qué frecuencia ha sentido que las cosas le van bien?
   - Nunca
   - Casi nunca
   - De vez en cuando
   - A menudo
   - Muy a menudo

8. En el último mes, ¿con qué frecuencia ha sentido que no podía afrontar todas las cosas que tenía que hacer?
   - Nunca
   - Casi nunca
   - De vez en cuando
   - A menudo
   - Muy a menudo

9. En el último mes, ¿con qué frecuencia ha podido controlar las dificultades de su vida?
   - Nunca
   - Casi nunca
   - De vez en cuando
   - A menudo
   - Muy a menudo

10. En el ultimo mes, ¿con qué frecuencia se ha sentido que tenia todo bajo control?
    - Nunca
    - Casi nunca
    - De vez en cuando
    - A menudo
    - Muy a menudo

11. En el último mes, ¿con qué frecuencia ha estado enfadado porque las cosas que le han ocurrido estaban fuera de su control?
    - Nunca
    - Casi nunca
    - De vez en cuando

- A menudo
- Muy a menudo

12. En el último mes, ¿con qué frecuencia ha pensado sobre las cosas que le quedan por hacer?
    - Nunca
    - Casi nunca
    - De vez en cuando
    - A menudo
    - Muy a menudo

13. En el último mes, ¿con qué frecuencia ha podido controlar la forma de pasar el tiempo?
    - Nunca
    - Casi nunca
    - De vez en cuando
    - A menudo
    - Muy a menudo

14. En el último mes, ¿con qué frecuencia ha sentido que las dificultades se acumulan tanto que no puede superarlas?
    - Nunca
    - Casi nunca
    - De vez en cuando
    - A menudo
    - Muy a menudo

APPENDICE E: ESCALA DE ACTIVACIÓN CONDUCTUAL PARA LA DEPRESIÓN (BADS)

Elija el número que mejor refleje su situación durante la semana pasada, incluyendo el día de hoy. 0 siendo Nunca en lo absoluto y 6 siendo Completamente cierto.

1. Me quedé en la cama demasiado tiempo, aunque sabía que tenía cosas pendientes (0 siendo Nunca en lo absoluto y 6 siendo Completamente cierto).
   - o 0
   - o 1
   - o 2
   - o 3
   - o 4
   - o 5
   - o 6

2. Había ciertas cosas que tenía que hacer y no hice (0 siendo Nunca en lo absoluto y 6 siendo Completamente cierto).
   - o 0
   - o 1
   - o 2
   - o 3
   - o 4
   - o 5
   - o 6

3. Estoy contento por el tipo y la cantidad de cosas que hice. (0 siendo Nunca en lo absoluto y 6 siendo Completamente cierto).
   - o 0
   - o 1
   - o 2
   - o 3
   - o 4
   - o 5
   - o 6

4. Me comprometí con una amplia y variada cantidad de actividades. (0 siendo Nunca en lo absoluto y 6 siendo Completamente cierto).
   - o 0
   - o 1
   - o 2
   - o 3
   - o 4
   - o 5
   - o 6

5. Acerté en mis decisiones sobre el tipo de actividades y situaciones en las que me metí.
(0 siendo Nunca en lo absoluto y 6 siendo Completamente cierto).

- o 0
- o 1
- o 2
- o 3
- o 4
- o 5
- o 6

6. No paré, pero no cumplí con ninguna de las metas que me había puesto para cada día.
(0 siendo Nunca en lo absoluto y 6 siendo Completamente cierto).

- o 0
- o 1
- o 2
- o 3
- o 4
- o 5
- o 6

7. Me moví y cumplí las metas que me había fijado.
(0 siendo Nunca en lo absoluto y 6 siendo Completamente cierto).

- o 0
- o 1
- o 2
- o 3
- o 4
- o 5
- o 6

8. La mayor parte de lo que hice fue para escaparme o evitar lo que me fastidiaba.
(0 siendo Nunca en lo absoluto y 6 siendo Completamente cierto).

- o 0
- o 1
- o 2
- o 3
- o 4
- o 5
- o 6

9. Hice cosas para evitar la tristeza y otras emociones dolorosas.
(0 siendo Nunca en lo absoluto y 6 siendo Completamente cierto).

- o 0
- o 1
- o 2

- o 3
- o 4
- o 5
- o 6

10. Traté de no pensar en ciertas cosas.
(0 siendo Nunca en lo absoluto y 6 siendo Completamente cierto).

- o 0
- o 1
- o 2
- o 3
- o 4
- o 5
- o 6

11. Hice cosas incluso a pesar de lo que costaba hacerlas porque tenían que ver con mis objetivos a largo plazo.
(0 siendo Nunca en lo absoluto y 6 siendo Completamente cierto).

- o 0
- o 1
- o 2
- o 3
- o 4
- o 5
- o 6

12. Llevé a cabo una tarea ardua pero que merecía la pena.
(0 siendo Nunca en lo absoluto y 6 siendo Completamente cierto).

- o 0
- o 1
- o 2
- o 3
- o 4
- o 5
- o 6

13. Perdí mucho tiempo dando vueltas a mis problemas.
(0 siendo Nunca en lo absoluto y 6 siendo Completamente cierto).

- o 0
- o 1
- o 2
- o 3
- o 4
- o 5

- 6

14. Pasé tiempo tratando de encontrar algún modo de resolver cierto problema, pero no llegué a poner en práctica ninguna de las posibles soluciones.
(0 siendo Nunca en lo absoluto y 6 siendo Completamente cierto).
- 0
- 1
- 2
- 3
- 4
- 5
- 6

15. Con frecuencia perdí el tiempo pensando en mi pasado, en gente que me había herido, en errores que había cometido, y en lo malo de mi vida.
(0 siendo Nunca en lo absoluto y 6 siendo Completamente cierto).
- 0
- 1
- 2
- 3
- 4
- 5
- 6

16. No vi a ninguno de mis amigos.
(0 siendo Nunca en lo absoluto y 6 siendo Completamente cierto).
- 0
- 1
- 2
- 3
- 4
- 5
- 6

17. Estuve encerrado en mí mismo y callado, incluso entre gente a la que conozco bien.
- 0
- 1
- 2
- 3
- 4
- 5
- 6

18. No estuve nada sociable, a pesar de las oportunidades que tuve.
- 0
- 1

- o 2
- o 3
- o 4
- o 5
- o 6

19. Ahuyenté a la gente con mi negatividad.
(0 siendo Nunca en lo absoluto y 6 siendo Completamente cierto).

- o 0
- o 1
- o 2
- o 3
- o 4
- o 5
- o 6

20. Hice cosas para aislarme del resto de la gente.
(0 siendo Nunca en lo absoluto y 6 siendo Completamente cierto).

- o 0
- o 1
- o 2
- o 3
- o 4
- o 5
- o 6

21. Robé tiempo a las clases / al trabajo / actividades sencillamente porque estaba muy cansado o no me sentía con ganas de ir.
(0 siendo Nunca en lo absoluto y 6 siendo Completamente cierto).

- o 0
- o 1
- o 2
- o 3
- o 4
- o 5
- o 6

22. Mi trabajo / deberes / obligaciones / responsabilidades se resintieron porque me faltó la energía que necesitaba.
(0 siendo Nunca en lo absoluto y 6 siendo Completamente cierto).

- o 0
- o 1
- o 2
- o 3
- o 4
- o 5

- o 6

23. Organicé mis actividades diarias.
(0 siendo Nunca en lo absoluto y 6 siendo Completamente cierto).

- o 0
- o 1
- o 2
- o 3
- o 4
- o 5
- o 6

24. Me ocupé solo de actividades que me distrajeran lo bastante como para no sentirme mal.
(0 siendo Nunca en lo absoluto y 6 siendo Completamente cierto).

- o 0
- o 1
- o 2
- o 3
- o 4
- o 5
- o 6

25. Me empecé a encontrar mal cuando otros de alrededor hablaron de sentimientos y experiencias negativas.
(0 siendo Nunca en lo absoluto y 6 siendo Completamente cierto).

- o 0
- o 1
- o 2
- o 3
- o 4
- o 5
- o 6

APPENDICE F: MINDFULNESS ATTENTION AWARENESS SCALE (MAAS)

Por favor, indique su grado de acuerdo con cada uno de los ítems, usando la siguiente escala.
1 = Casi siempre
2 = Muy frecuentemente
3 = Algo frecuente
4 = Algo infrecuente
5 = Muy infrecuente
6 = Casi nunca

1. Podría sentir una emoción y no ser consciente de ella hasta más tarde.
   - o Casi siempre
   - o Muy frecuentemente
   - o Algo frecuente
   - o Algo infrecuente
   - o Muy infrecuente
   - o Casi nunca

2. Rompo o derramo cosas por descuido, por no poner atención, o por estar pensando en otra cosa.
   - o Casi siempre
   - o Muy frecuentemente
   - o Algo frecuente
   - o Algo infrecuente
   - o Muy infrecuente
   - o Casi nunca

3. Encuentro difícil estar centrado en lo que está pasando en el presente.
   - o Casi siempre
   - o Muy frecuentemente
   - o Algo frecuente
   - o Algo infrecuente
   - o Muy infrecuente
   - o Casi nunca

4. Tiendo a caminar rápido para llegar a donde voy sin prestar atención a lo que experimento durante el camino.
   - o Casi siempre
   - o Muy frecuentemente
   - o Algo frecuente
   - o Algo infrecuente
   - o Muy infrecuente
   - o Casi nunca

5. Tiendo a no darme cuenta de sensaciones de tensión física o incomodidad hasta que realmente captan mi atención.
   - o Casi siempre

- Muy frecuentemente
- Algo frecuente
- Algo infrecuente
- Muy infrecuente
- Casi nunca

6. Me olvido del nombre de una persona tan pronto me lo dicen por primera vez.
   - Casi siempre
   - Muy frecuentemente
   - Algo frecuente
   - Algo infrecuente
   - Muy infrecuente
   - Casi nunca

7. Parece como si "funcionara en automático" sin demasiada consciencia de lo que estoy haciendo.
   - Casi siempre
   - Muy frecuentemente
   - Algo frecuente
   - Algo infrecuente
   - Muy infrecuente
   - Casi nunca

8. Hago las actividades con prisas, sin estar realmente atento a ellas.
   - Casi siempre
   - Muy frecuentemente
   - Algo frecuente
   - Algo infrecuente
   - Muy infrecuente
   - Casi nunca

9. Me concentro tanto en la meta que deseo alcanzar que pierdo contacto con lo que estoy haciendo ahora para alcanzarla.
   - Casi siempre
   - Muy frecuentemente
   - Algo frecuente
   - Algo infrecuente
   - Muy infrecuente
   - Casi nunca

10. Hago trabajos o tareas automáticamente, sin darme cuenta de lo que estoy haciendo.
    - Casi siempre
    - Muy frecuentemente
    - Algo frecuente
    - Algo infrecuente
    - Muy infrecuente
    - Casi nunca

11. Me encuentro a mí mismo escuchando a alguien por una oreja y haciendo otra cosa al mismo tiempo.
    - o Casi siempre
    - o Muy frecuentemente
    - o Algo frecuente
    - o Algo infrecuente
    - o Muy infrecuente
    - o Casi nunca

12. Conduzco en “piloto automático” y luego me pregunto por qué fui allí.
    - o Casi siempre
    - o Muy frecuentemente
    - o Algo frecuente
    - o Algo infrecuente
    - o Muy infrecuente
    - o Casi nunca

13. Me encuentro absorto acerca del futuro o el pasado.
    - o Casi siempre
    - o Muy frecuentemente
    - o Algo frecuente
    - o Algo infrecuente
    - o Muy infrecuente
    - o Casi nunca

14. Me descubro haciendo cosas sin prestar atención.
    - o Casi siempre
    - o Muy frecuentemente
    - o Algo frecuente
    - o Algo infrecuente
    - o Muy infrecuente
    - o Casi nunca

15. Pico sin ser consciente de que estoy comiendo.
    - o Casi siempre
    - o Muy frecuentemente
    - o Algo frecuente
    - o Algo infrecuente
    - o Muy infrecuente
    - o Casi nunca

APPENDICE G: INVENTARIO DE DISCAPACIDAD DEL MAREO (DHI)

¿Siente mareo?
- o SI
- o NO

En caso de haber respondido "SI" a la anterior pregunta. Por favor conteste cada una de las preguntas, con la opción que mejor le identifique.

1. ¿Mirar hacia arriba aumenta el mareo?
   - o Siempre
   - o A veces
   - o No

2. ¿Debido al mareo, se siente frustrado?
   - o Siempre
   - o A veces
   - o No

3. ¿Debido al mareo, limita sus viajes para negocios o de recreación?
   - o Siempre
   - o A veces
   - o No

4. ¿Caminar por el pasillo de un supermercado aumenta el mareo?
   - o Siempre
   - o A veces
   - o No

5. ¿Debido al mareo, tiene dificultades para levantarse o acostarse en la cama?
   - o Siempre
   - o A veces
   - o No

6. ¿Limita significativamente el mareo su participación en actividades sociales como salir para cenar, ir al cine, bailar, o ir a fiestas?
   - o Siempre
   - o A veces
   - o No

7. ¿Debido al mareo, tiene dificultad para leer?
   - o Siempre
   - o A veces
   - o No

8. ¿Realizar actividades más ambiciosas como deportes, bailar, tareas domésticas (barrer o guardar los platos) aumenta el mareo?
   - o Siempre
   - o A veces

- o No

9. ¿Debido al mareo, tiene miedo de salir de su casa sin nadie que le acompañe?
   - o Siempre
   - o A veces
   - o No

10. ¿Debido al mareo, se ha sentido avergonzado delante de otras personas?
    - o Siempre
    - o A veces
    - o No

11. ¿Hacer movimientos rápidos con su cabeza aumenta su problema?
    - o Siempre
    - o A veces
    - o No

12. ¿Debido al mareo, evita alturas?
    - o Siempre
    - o A veces
    - o No

13. ¿El voltearse en la cama aumenta el mareo?
    - o Siempre
    - o A veces
    - o No

14. ¿Debido al mareo, es difícil hacer tarea ardua o trabajo de jardinería?
    - o Siempre
    - o A veces
    - o No

15. ¿Debido al mareo, tiene miedo de que otras personas piensen que está embriagado?
    - o Siempre
    - o A veces
    - o No

16. ¿Debido al mareo, es difícil salir a caminar por su cuenta?
    - o Siempre
    - o A veces
    - o No

17. ¿Caminar por una acera aumenta el mareo?
    - o Siempre
    - o A veces
    - o No

18. ¿Debido al mareo, es difícil concentrarse?

- o Siempre
- o A veces
- o No

19. ¿Debido al mareo, es difícil caminar por su casa en la oscuridad?
    - o Siempre
    - o A veces
    - o No

20. ¿Debido al mareo, tiene miedo de quedarse en la casa sólo?
    - o Siempre
    - o A veces
    - o No

21. ¿Debido al mareo, se siente discapacitado?
    - o Siempre
    - o A veces
    - o No

22. ¿El mareo ha estresado sus relaciones con familiares o amigos?
    - o Siempre
    - o A veces
    - o No

23. ¿Debido al mareo, está deprimido?
    - o Siempre
    - o A veces
    - o No

24. ¿Interfiere el mareo con su trabajo o sus responsabilidades domésticas?
    - o Siempre
    - o A veces
    - o No

25. ¿Inclinarse aumenta el mareo?
    - o Siempre
    - o A veces
    - o No