COVID-19 RELATED CHANGES IN SIGNS OF ANXIETY AND ELECTRONIC

CIGARETTE USE AMONG ADOLESCENTS IN GREECE

by

ELENI BASAI

A thesis submitted in partial fulfillment of the requirements for the degree of

MASTER OF ARTS

in

Applied Educational Psychology

DEREE- The American College of Greece

2023

Thesis Approval

"COVID-19 Related Changes In Signs Of Anxiety And Electronic Cigarette Use Among Adolescents In Greece", a thesis prepared by Eleni Basai in partial fulfillment of the requirements of the Master of Arts degree in Applied Educational Psychology was presented July 21st, 2023, and was approved and accepted by the thesis advisor, internal examiner and the School of Graduate and Professional Education.

APPROVALS:

Dr. Remos Armaos, Thesis Advisor

Dr. Athena Stefanatou, Committee Member

APPROVED BY: _____

Dr. Areti Krepapa

Dean, School of Graduate and Professional Education

An Abstract of the Thesis of

Eleni Basai for the degree of Master of Arts

in Applied Educational Psychology to be awarded in July 2023

Title: COVID-19 RELATED CHANGES IN SIGNS OF ANXIETY AND

ELECTRONIC CIGARETTE USE IN ADOLESCENTS IN GREECE

Approved: _____

Dr. Remos Armaos

Thesis Advisor

Abstract

The COVID-19 pandemic has significantly altered many aspects of daily life,

including mental health and substance use. This study focuses specifically on anxiety

symptoms and e-cigarette use, as these are two crucial areas of concern for the well-

being of adolescents. This study employed a descriptive cross-sectional design and

applied validated measures to collect data from a sample of Greek adolescents. Furthermore, potential demographic factors related to these results were investigated. Preliminary findings indicate that COVID-19 pandemic had had a major effect on adolescents anxiety symptoms, but research is limited among adolescents living in Greece. Social isolation, routine disruption, academic uncertainty, and fear of the virus may all contribute to elevated anxiety levels. In addition, there is a growing concern that adolescents seeking coping mechanisms or engagement during stressful situations may turn to e-cigarette use. The study also examined potential associations between anxiety symptoms and electronic cigarette use. It investigated whether increased e-cigarette use as a form of self-medication or stress relief is associated with elevated anxiety levels. The study's hypothesis were not supported by the findings; however anxiety and vaping scores were significantly elevated among adolescents. The implications of the study's findings in the context of public health and policy considerations are discussed. The results are intended to shed light on the effects of the COVID-19 pandemic on the mental health and substance use behaviors of adolescents, specifically in relation to anxiety symptoms and e-cigarette use.

Keywords: COVID-19, sings of anxiety, electronic cigarette use, adolescents, Greece, pandemic,

Eleni Basai

Address:

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Mobile:

Email:

EDUCATION

Deree- The American College of Greece, Athens-Greece   01/2022-06/2023

MA in Applied Educational Psychology

GPA: 3.70/4.00

Capstone: *"COVID-19 Related Changes In Signs Of Anxiety And Electronic Cigarette Use Among Adolescents In Greece"*

Significant Projects: *"Psychoeducational Report & Individualized Education Program (IEP)"*

University of Ioannina, Ioannina-Greece   10/2015-06/2021

BA in Social Sciences. Department of Education and Care in Early Childhood

GPA: 7.9/10.0

Capstone: *"The contribution of Art in the Development of Preschool Children"*

2nd General Lyceum of Kalyvia-Lagonisi, Saronic-Greece   06/2015

GPA: 16.0/20.0

PROFESSIONAL EXPERIENCE

Training, Dynamai, Pallini & Koropi   Ongoing

Early intervention for children with autism and ADHD based on ABA principles.

(Supervisor-Dr. Pelios L., BCBA psychologist)

Fieldwork, Dynamai, Pallini & Koropi   01/2023-04/2023

Early intervention for children with autism and ADHD based on ABA principles.

(Supervisor- Dr. Pelios L., BCBA psychologist)

Service-Supervisor, Blends Mix & Match (PGT), Glyfada   2018-2021

Performed general management duties related to costumers, service team, and coordination between different professions/ Service.

Teacher-Baby-Sitting, Private House, Kaisariani   2020-2021

All-day care and creative activities, creation of lesson plans, organization of everyday schedule.

Assistant Teacher-Trainee, New Generation nursery school, Lagonisi   2018-2019

Performed daily activities and lesson plans in English, developed schedules and routines, implementation of curriculum-based activities and lessons, assess for emotional and developmental difficulties and discuss with parents.

SEMINARS & TRAINING

AUTISM: UNDERSTANDING, EDUCATION AND INTERVENTION, University of

Patras & Educational Center for Lifelong Learning (450 hours)   Ongoing

Understanding the spectrum of autism and education in intervention communication (PECS)

techniques.

APPLIED SCHOOL PSYCHOLOGY, Supplementary Distance Education Program (E-

Learning) of the Center for Education and Lifelong Learning (KE.ΔI.BI. M) of the National

and Kapodistrian University of Athens (EKPA) (410 hours)   Ongoing

Understanding of the profession of the school psychologist, the socioemotional difficulties of

children and adolescents. Training in assessment techniques and tools for learning disabilities

and developmental/ emotional difficulties. Training in behavioral management and effective

interventions.

A WHOLE SCHOOL APPROACH TO SOCIAL AND EMOTIONAL LEARNING,

Carmel Cefai PhD (Lond.), CPsychol BPsS, Professor Department of Psychology, Director

Center for Resilience and Socio-Emotional Health, Coordinator MA Transdisciplinary

Childhood Studies, University of Malta   2021

PLAY THERAPY-THE POWER OF PLAY- Nellie Boukouvala, PC Counsellor, Play

Therapist, Supervisor, Course Director (PTI, Leeds Becket University), EFT Couple Therapist

2021

FROM THE STEPS OF LIFE FOR THE CHILD WITH DISABILITY…AT THE

SUPPORTIVE LIVING SHELTERS, ELEPAP   2016

MODERN PEDAGOGICAL APPROACHES IN THE IMPEMENTATION OF THE

PEDAGOGICAL PRACTICE, Association of nurses of Greece   2016

PERSONAL SKILLS

Language skills: Greek (native language), Albanian (fluent), English (fluent).

Technical skills: SPSS IBM Software, MS Word, Excel, PowerPoint, Outlook.

Professional skills: Communication with people from diverse backgrounds, problem-solving abilities, adaptability, communication skills, management, multitasking, creativity.

ACKNOWLEDGMENTS

During the development of this research paper, my thesis advisor, Dr. Armaos, provided me with invaluable assistance, guidance, support, and encouragement, for which I am extremely grateful. Even during difficult times, late hours, and short notices, he consistently provided me with feedback, inspired me, and helped me develop my ideas. In addition, I would like to thank Dr. Stefanatou for serving on my committee and devoting time and effort to supervise my work and offer invaluable advice. In addition, I would like to thank the graduate students who assisted me with the distribution of the survey (Eleni Siani, Electra Kourgiantaki, and Areti Skavantzou), as well as the private schools and vocational centers that accepted the distribution of the survey and supported this study. Also appreciated are the familied and adolescents who participated in my research. Without your help, this journey would not have been the same. The completion of this research would not have been possible without the affection, encouragement, understanding, and inspiration of my family and friends. It has been a delight to work with everyone.

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I. Literature Review

The impact of COVID-19 pandemic

In December 2019, the corona virus disease 2019 (also known as COVID-19) pandemic first appeared in Wuhan, China and rapidly spread throughout the rest of the world. Covid-19 pandemic has had a global impact with 317.26 million infections and approximately 6.739 million deaths as of January 2023 (John Hopkins University, 2023). The coronavirus 2 version of Severe Acute Respiratory Syndrome (SARS-CoV-2) can induce respiratory symptoms, fever, coughing, pneumonia, kidney failure, and even death in severe cases (Bera et al., 2022). In January 2020, the World Health Organization (WHO) asserted a Public Health Emergency of International Concern in order to accelerate a response against the rapidly spreading coronavirus. According to the guidelines, numerous countries implicated strict lockdown measures to prevent the spread of the virus (World Health Organization, 2020). Schools, businesses, other non-essential facilities, and in extreme cases public parks were also closed. People were not permitted to leave their homes and even in-person medical and dental visits were only available in cases of high emergency (Ellis et al., 2020). The physical isolation, coupled with financial insecurity, fear of infection, and stress about the future, has had a significant impact on global mental health.

According to UNICEF, approximately 16% of the world's population is comprised of people between the ages of 10 and 19 (UNICEF,2020). Research has shown that children appear to suffer from less severe symptoms. The children who tested positive for COVID exhibited 45% of the typical symptoms and 42% of the mild respiratory symptoms. According to Ravens-Sieberer et al., (2020) only 13% of the children exhibited symptoms, while none of the children exhibited symptoms that were life-threatening. The lives of people all over the world, including the lives of children and adolescents, were profoundly altered as a result of COVID-19. According to research done by Ravens-Sieberer et al. in 2020, children and adolescents are more likely to experience detrimental long-term effects on their mental health as a direct result of this pandemic. This is in comparison to adults. A pandemic such as COVID-19 has negative effects on the physical, mental, educational, social, and nutritional health of children and adolescents. These negative effects are compounded by the fact that these negative effects occur simultaneously. These negative effects were caused by the increased risk of illness, protective confinement, social isolation, school closures, and a decrease in family income. The level of stress experienced by parents and caregivers has also increased as a result of COVID-19, which has had an effect on the mental health of children and adolescents.

Family and school context during the COVID-19 pandemic

Families have been under a tremendous amount of stress as a result of the COVID-19 pandemic resulting from factors such as seclusion within households, social isolation, concern about the health of family and friends, disruptions to school and childcare, and the necessity to make new decisions regarding health in the context of uncertainty. To begin with, issues with mental health and conflict within the family can make it difficult for parents to implement and maintain measures that protect their

children and other family members (Feinberg et al., 2021). Second, there is evidence that indicate that parents' ability to monitor and guide their children's behavior is hindered when they are unable to resolve the conflict that arises from coparenting (Feinberg, 2003 as cited in Feinberg et al., 2021). The susceptibility to infection and the severity of the illness that results from exposure to the virus may be increased by psychosocial stress, depression, and interpersonal conflict. This is in addition to the fact that exposure to the virus may influence these factors. There is also, mounting evidence that exposure to high levels of stress, depression, and conflict can have a detrimental effect on a healthy immune response to viral infections (Cohen, 2020).

The lockdown drew attention not only to the psychological impact the quarantine had on families lives but also to the various financial differences across the globe. During the period that they were required to remain in quarantine, those individuals who lived in better conditions, such as houses that were larger or had their own gardens, experienced a higher quality of life. Low-income families and households with multiple members living in close quarters appeared to be more vulnerable in this scenario as a result of the disparity in the financial resources, living spaces, access to technologies, and educational support. These factors all contributed to an uneven distribution of risk. For instance, the government decided to keep school programs that included online instruction; however, in order for students to participate in distance learning, they needed to access to the internet, which some households did not have. Even though economically disadvantaged children in many developing nations couldn't afford online educational equipment, there was still a risk that students would spend too much time in front of screens (Feinberg et al., 2021).

Since students spent more time engaging in unstructured online learning, they were more likely to encounter content that could be harmful or violent in nature.

Because schools were required to close and strict containment measures were implemented, an increased number of households turned to technology and digital solutions in order to keep their children active in learning, amused, and linked to the outside world. However, not all children were equipped with the information, capabilities, and resources necessary to use the internet in a secure manner. For the same reason, low-income families, whose already precarious financial situations were made worse by the pandemic, and who are at greater risk for the development of psychological distress, did not have the benefit of online mental health support and telepsychiatry for the same reason (Hoekstra, 2020; Ramalho et al., 2020; Witt et al., 2020). Such challenges were not only limited to the home and family context, but also to the school and the online education. The research brings to light a number of issues, including the inadequacy of the infrastructure for online testing, the inadequate exposure of teachers to online teaching, the information discrepancy, an environment that is not conductive to acquiring knowledge at home, equity in higher education, and academic excellence (Preeti Tarkar, 2020).

Children and adolescents have fun at school, but they also develop their social skills and their awareness during their time there. When students were removed from the typical routine of attending school, their lives were disrupted in a variety of ways including economically, socially, and psychologically. Accessibility, affordability, adaptability, learning pedagogy, lifelong learning, and educational policy were broadly recognized as being among the difficulties associated with e-learning (Pokhrel & Chhetri, 2021; Preeti Tarkar, 2020). Both the students and the instructors were completely unprepared for the transition from the more conventional method of learning, which involves physical contact, to more modern method of learning that takes place online. However, in order to survive, they needed to become accustomed

to this new setting, as there was no other alternative available. The term "Education in Emergency" was adopted by the education system, and teachers were forced to adopt an approach for which they had not been adequately prepared. Importantly, teachers reported that more than half of their students had a lower level of knowledge, a diminished ability to concentrate, a lessened determination, and a lower level of motivation than they had before the COVID-19 pandemic (Senft et al., 2022). Self-responsibility and self-organization were considered to be problematic for more than half of the students, and it was estimated that their well-being was lower than before (Pokhrel & Chhetri, 2021; Preeti Tarkar, 2020).

Anxiety in children and adolescents

Adolescence is characterized by an increased motivation for peer connection as well as a desire for autonomy (Brown & Larson, 2009). Peer groups provide an essential framework for social and emotional support and have a strong influence on a broad range of interpersonal behaviors (Ellis & Zarbatany, 2017). Moreover, adolescents are very productive in their daily lives through school and extracurricular activities, which aid in maintaining physical activity, regulate sleep cycles, and provide social interactions, all of which are important protective factors for their mental health (Xie et al., 2020). In terms of psychological problems and psychiatric disorders, the strict lockdown, school closures, attending online curriculums, conducting daily activities indoors, and the decreased social relationship introduced greater challenges for children and adolescents than they did on other populations.(Liu et al., 2021). Public health crises, such as pandemics, can have a detrimental effect not only on a person's physical health but also on their mental well-being.

In a cross-section study of Orgilés et al. (2021) three European counties (Italy, Portugal, and Spain) were examined to detect which variables were associated with a lower level of well-being as a result of the COVID-19 constrain among children and adolescents. Parents of 515 children, aged 3-18 years old completed the online survey. According to the findings of this research, the prevalence of anxiety was significantly higher than expected. The findings revealed that 38% of children and adolescents displayed depressive symptoms, and 38% displayed anxiety symptoms. Specifically, 56% of Spanish parents reported that their children displayed symptoms of anxiety. Focusing on the Italian sample, 34.1% of the parents reported that their children had anxiety symptoms, a higher prevalence than previous research (7.3%). The prevalence of anxiety of in the sample of Portuguese children was 26.5%, which is higher than the prevalence of anxiety found in previous studies (20.64%) (Costa et al., 2020). The relationship between parents' stress and their children's emotional state was also identified as one of the study's most intriguing findings. According to the findings of the current study, children whose parents perceived a higher level of stress as a consequence of the COVID-19 situation were more inclined to indicate symptoms of anxiety. This was the case even though the children themselves were not directly affected by the COVID-19 situation.

In a study of 451 adolescents and young adults in New York, researchers aimed to determine whether depression and anxiety symptoms changed from before the pandemic to shortly after its peak. The results of the study indicated that the COVID-19 pandemic contributed to the development of increased symptoms of generalized and social anxiety in young people. In addition to this, females reported higher levels of depression, panic and somatic symptoms, and nearly sixty percent of the females met the clinical threshold for at least one disorder (Hawes et al., 2021). In

19

another study an online survey that was constructed by Duan et al. (2020) to investigate the anxiety of 3.613 Chinese adolescents, which revealed a significant increase in anxiety scores (29.27%) particularly among female adolescents (33.09%).

Rogers et al. (2021) investigated how adolescents perceived their socio-emotional status in association to changes in mental health caused by the pandemic. Six hundred participants aged from 14 to 17 years reported changes in their friendships and family relations and increase in negative effects. The participants perceived this social and emotional changes to be associated with elevated anxiety and depressive symptoms. A study of Giannopoulou et al. (2020) examined the impact of Covid-19 to the stress levels of 442 senior high school students in Greece. The students, who were in the preparation of the Panhellenic exams for the university entrance, demonstrated high levels of anxiety and stress with anxiety scores of 27%, which was significantly higher than those prior to the pandemic (10%).

Potential risk factors for signs of anxiety

Children and adolescents are especially susceptible to harm because of the limited understanding of the situation. Because they do not possess a sufficient number of coping mechanisms, they are unable to protect themselves from the mental and physical consequences of the situation. It is possible that they won't be able to convey their emotions as effectively as adults. Children are more likely to experience stress and anxiety when their schools are closed, and they are separated from their friends. Mental anguish can be made worse by being exposed to the coverage of a crisis event in the mainstream media or unverified information that is circulating on social media (Dalton et al., 2020; Imran et al., 2020).

Young people, who are more susceptible than adults to develop mental health issues, were especially more vulnerable to the negative consequences of the Covid-19 related quarantine (Brooks et al., 2020; Jiloha, 2020). Physical interpersonal interactions were invariably removed during that time, and adolescents were forced to remain at home, giving up on their daily routines. Concerns about maintaining friendships, as well as the implications of exclusion and peer affiliation, arose (Ellis et al., 2020). Abdulah et al. (2020) studied the well-being of children aged 6 to 13 years-old throughout the COVID-19 and concluded that children who expressed fear of the coronavirus, isolation, and sadness had high levels of stress. During the COVID-19 pandemic, worry about infection was a predictive factor for symptoms of depression in elementary school students (Xie et al.,2020) and anxiety symptoms in children and adolescents (Tang et al., 2020).

During the pandemic, teenagers were more likely to encounter the same stress factors as adults, including being worried about their own and loved ones' safety, financial concerns, and uncertainty, which may result in heightened feelings of anxiety and depression (Wang et al., 2020). Additionally, academic underachievement was an added stress factor as a result of the online lectures provided to the students (Tang et al., 2020). Moreover, despite the existence of evidence that virtual connections were beneficial for mental health outcomes during the Covid-19 quarantine, it is also well established that excessive media consumption during times of crisis can heighten feelings of stress and anxiety (Garfin et al., 2020). It was uncertain how adolescents used technology as a coping mechanism, how closely they followed the latest news on the virus, and to what extent this information overload impacted their mental health and increased anxiety (Ellis et al., 2020).

An aspect that contributed to stress is a theory that explains how the more people "consume" the world mass media, the more they accept that social reality as credible, and as a result, experience more feelings of fear and anxiety. This theory explains how the more people "consume" the world mass media, the more it contributes to the perception that the media cultivates fear and anxiety (Livazović & Bojčić, 2021). In the study of Livazovic (2021), a total of 246 adolescents it was found that there is a correlation, which was statistically significant, between exposure to COVID-19 media and feelings of anxiety, depression, fear, and risky behavior.

Ellis et al. (2020) examined the relationship between the psychological adjustment and stress associated with Covid-19 in a total of 1.316 high school students. According to the findings, 43% of the participants stated that they were very concerned about the pandemic as well as worried about their relationships with their peers. Chen et al. (2020), highlighted that 18.9% of participants encountered anxiety, with female adolescents being at greater risk. Furthermore, it was discovered that adolescents were more anxious than younger children. Francisco et al. (2020) performed a study in three European countries (Italy, Spain, Portugal) with the participation of 1.480 parents of children and adolescents. The purpose of this study was to describe the psychological impact that the pandemic had on adolescents. According to the findings, approximately one third of the children displayed increased levels of restlessness, nervousness, anxiousness, and wariness in comparison to the time period before the quarantine. Forty percent of the children were also found to be more irritable.

In the research carried out by Liu et al. (2021) it was discovered that a variety of demographic characteristics and events that took place during the COVID-19 pandemic lockdown period were linked to feelings of depression and anxiety after the

lockdown when children and adolescents returned to school. Additionally, anxiousness and depression were found to have a positive association with one another. There was found to be a correlation between feeling anxious and depressed, having suicidal thoughts, arguing with one's parents, having trouble sleeping, and not paying attention while online learning.

In the aftermath of the lockdown, avoiding school has been linked to a number of problems, including anxiety, feeling isolated, and having trouble sleeping. It has been found that children who refuse to attend school may suffer from significant overt anxiety symptoms such as fear of being alone, of performing poorly on tests, or of making the transition between activities (Sewell, 2008 as cited in Okajima et al., 2022). After the COVID-19 pandemic, a recent survey revealed that approximately 12% of Japanese students skipped school due to anxiety about contracting the coronavirus disease. In addition, individuals who had more COVID-19 related anxiety were shown to have a strong association between sleep problems and feelings of isolation (Okajima et al., 2022). Recent research has shown that anxiety related COVID-19 may play a role in the development of increased levels of insomnia, depression, and anxiety (Grossman et al., 2021). Additionally, there is evidence that suggest that issues relating to sleep can have a major effect not only on emotional and cognitive levels, but also on a person's capacity to learn. It is not irrational to believe that cognitive processes, along with emotional difficulties and sleep disturbances, can be impacted when people are confined in certain situations (Lavigne-Cerván et al., 2021).

According to a variety of studies, the relationship between anxiety and insomnia, as well as depression and insomnia, are bidirectional. Insomnia is a factor in the development of symptoms of depression and anxiety, and vice versa, symptoms

of depression and anxiety disrupt sleep (Mason & Harvey, 2014). Suicidal behavior is associated with sleep disturbances, which can also be a risk factor on their own. Uncertainty, particularly economic, has been linked to stress-related disorders as well as the act of taking one's own life. Social isolation, anxiety, concern about contagion, unpredictability, prolonged stress, and financial challenges may lead to the development of or an exacerbating of stress-related disorders and suicidality in vulnerable populations including those with pre-existing psychiatric disorders, low-resilient individuals, young people, individuals who resided in high COVID-19 prevalence regions, and people who have relatives or close acquaintances who died of COVID-19 (Bernert & Nadorff, 2015; Sher, 2020). In particular, the role of adverse life circumstances as a risk factor for suicidal thoughts and behaviors in children and adolescents is supported by psychosocial risk factors (Sher, 2020; Hoekstra, 2020).

There has never been anything like the restrictions placed on families as a result of the COVID-19 pandemic. The question of whether or not they have an effect on the suicide rates of children and adolescents is an important one. It is possible that a spike in the number of people who commit suicide occurred as a result of the higher probability of being subjected to physical and/or sexual violence at home alongside the financial consequences caused by the crisis. The crisis by COVID-19 is likely to have mental health repercussions, including suicidal behavior, that will reach their peak much later than the actual pandemic (Sher, 2020; Hoekstra, 2020).

Prevalence of anxiety in children and adolescents

Symptoms of generalized anxiety disorder in young people can include worry, fear, and irritability that cannot be controlled. Unpredictability, modifications in everyday routine, and worries about the health and well-being of relatives and close

friends are the variables that are most likely to be responsible for the increase in generalized anxiety in young people during the COVID-19 pandemic (Courtney et al., 2020). According to research done by Tiirikainen et al. in 2019, large youth populations had instances of clinically significant generalized anxiety symptoms that averaged around 11.6% prior the COVID-19 pandemic. A timely estimate of the number of young people all over the world who experienced clinically elevated levels of generalized anxiety symptoms could be derived from a meta-analysis of the anxiety prevalence after the COVID-19 pandemic. A total number of 80.879 young people across all 29 samples exhibited signs of anxiety, which was 25% of the total. As a result, 1 in 5 young people are experiencing what are considered to be clinically significant levels of anxiety. When compared to the estimates that were used before the COVID-19 pandemic (11.6% for anxiety), these findings suggest that the prevalence of mental health issues among young people has likely increased by an order of magnitude during the course of the COVID-19 pandemic (Racine et al., 2021).

In terms of demographic factors, prevalence rates of mental illness prior to and during the Covid-19 pandemic differ by child age and gender, with girls and older children being more vulnerable to internalizing disorders (Xie et al., 2020; Zhou et al., 2020). Subgroup analysis by age reported that prevalence of anxiety in adolescents aged 13 to 18 years (41.1%) was significantly higher than that in children younger than 12 years-old (22.3%). Furthermore, subgroup analysis by gender showed that the anxiety prevalence in females (34.6%) was higher than that of males (30.4%) (Ma et al., 2021). In addition, the research conducted by Ravens-Sieberer et al. (2021) with participants consisting of 1.647 German families with children and adolescents aged 7-17 years found that there was a notable change in the prevalence of mental health

difficulties following the pandemic. Prior to this study, the prevalence of mental health in young individuals was 9.9%, whereas after the pandemic the prevalence notably increased to 17.8%. The prevalence of anxiety, as defined by the Generalized Anxiety Disorder (GAD-7) scale with a cutoff point of 5, was reported as 37.4%, during the COVID-19 pandemic lockdown in a study of 8.079 Chinese high school students (Zhou et al.,2020).

Overview of electronic cigarette types and history

Electronic cigarettes (e-cigarettes-EC) are a broad category that include a variety of different products, whereas vaping refers to the use of the products. Both terms are used interchangeably in the literature, thus will be both used interchangeably in the current study. These products are battery-powered devices that heat a liquid that is primarily composed of vegetables glycerol, propylene glycol, distilled water, and flavorings and may or may not contain nicotine. The user inhales the aerosol produced by heating the e-liquid, a process known as "vaping". Presently, there are three main EC models: (1) disposable products, (2) reusable, refillable devices that the user refills the e-liquid, and (3) reusable devices that attach to prefilled e-liquid cartridges ("carts" or "pods"). Current EC devices are designed to operate at temperatures below 300 degrees Celsius. These aerosols contain less harmful chemicals because they are produced at much lower temperatures (Leatherdale et al., 2022; Polosa et al., 2022). Electronic nicotine delivery systems can be made to look like pipes, hookahs, cigars, or cigarettes, but e-cigarettes are by far the most popular option in this category (National Center for Chronic Disease Prevention and Health Promotion (US) Office on Smoking and Health, 2016).

Since the introduction of e-cigarettes onto the global market in 2007, which marked the beginning of their commercialization, numerous iterations of the product have been developed and made available to consumers (National Center for Chronic Disease Prevention and Health Promotion (US) Office on Smoking and Health, 2016). E-cigarettes have steadily improved in their ability to deliver nicotine, and now depending on the device and the characteristics of the user, users can achieve plasma nicotine levels that are comparable to those achieved by smokers who use traditional cigarettes. E-liquids that have a high nicotine content but are in the form of a salt rather than free-base nicotine are contained in these devices, which frequently resemble USB drives. This enables users of pod mod devices to compensate for the lower power and aerosol generation, which led to a shift in the market in 2017, with an increased popularity of electronic cigarettes among adolescents (National Academies of Sciences, 2018; St.Helen et al., 2019).

Despite the fact that the United States Food and Drug Administration (FDA) has not approved e-cigarettes as a smoking cessation aid, the industry has at times positioned those products in that way. The effectiveness of the early generations of electronic devices was lacking, and even the effectiveness of the most recent types of electronic devices is debatable (Wold et al., 2022). In addition, it is important to make a distinction between giving up nicotine and giving up tobacco. There is some evidence that electronic cigarettes are effective at the former, but it is unclear whether they are equal with or superior to other nicotine replacement therapies that are already established and approved by the FDA for the treatment of nicotine addiction. It is very concerning that there are no federal laws in place to guarantee that the labels on e-cigarettes are accurate. The companies were not even obliged to disclose the nicotine concentration on labels until August 2018. E-cigarettes have been found to contain a

variety of carcinogens, including aldehydes, metals, and polycyclic aromatic hydrocarbons (Morean et al., 2019). It is estimated that 4.7 million children and adolescents are vapers, putting their physical and mental health in jeopardy, this is despite the fact that both the federal government and states have imposed age restrictions on the legal purchase of e-cigarette and other vaping products (Neczypor et al., 2022).

Potential risk factors for vaping

In the United States of America (US), smoking is the leading cause of death that can be prevented. Adolescents who have never smoked conventional cigarettes have shown a tendency to start using electronic cigarettes, or vaping, at a young age (Aleyan et al., 2018). Vaping has been linked to an increased risk of conditions affecting the respiratory system (such as coughing 42% of the time, having shortness of breath 14% of the time, and chest tightness 6% of the time), the circulatory system (such as having a stroke 71% of the time, having a myocardial infraction 59% of the time, and having heart disease 40% of the time), and the nervous system (such as having headaches 25% of the time). A lot attention has also been drawn to issues at an alarming rate with electronic cigarette product use associated with lung injury (EVALI) (Burt & Li, 2020; King et al., 2020; Rohde et al., 2022; Stratton et al., 2018). According to one recent study, vaping comprising cinnamaldehyde for cinnamon flavor was linked to impaired mucociliary function in bronchial epithelial cells. Biopsies form chronic cigarette smokers show structural changes in lung tissue which is very alarming and warrants attention (Selekman 2019 as cited in Jones & Salzman, 2020). Notably, research has shown that smoking and using electronic cigarettes are connected with a higher probability of COVID-19 as we all as an intensification of its symptoms. This information may be an explanation for the

leveling off of e-cigarette use in addition to the decline in cigarette use among adolescents and young adults during the period of the pandemic (Simons et al., 2020; Stokes, 2020). Studies have shown that initiating and enhancing smoking and vaping behaviors is associated with a lower level of mental wellness, and this association is particularly resilient when it comes to the use of traditional cigarettes and electronic cigarettes (e-cigarettes) (Primack et al., 2013; Stokes, 2020).

Adolescents users of e-cigarettes fail to make a significant connection between vaping and the consumption of nicotine because they are frequently unaware of the probability of nicotine to cause addiction by activating the dopamine reward pathways (East et al., 2018; Morean et al., 2019a). Even occasional use can result in addiction to nicotine, which has been shown to have negative effects on the development of the brain (East et al., 2018). When a person is using substances that are addictive when they are adolescents, it fundamentally changes the set points for addictive behaviors when they are adults. This is a major cause for concern in regard to vaping as it may result in addictions that last a person's entire life in term of psychopathology as well as dysfunction in both social and occupational settings (Wold et al., 2022). In addition, the oxidative stress that occurs as a result of vaping can lead to social maladjustment, learning deficits, poor impulse control, sleep disruption, depression, and even suicidal ideations.

When compared to nonusers, vapers have a significantly higher prevalence of depression and suicidality. Furthermore, the formative years of adolescence, which include both middle and high school, are times of intense activity for the maturation of the brain. All of these negative effects, including behavioral impairment, memory disruption, attention deficit, and decreased motor function, have been observed alongside prolonged use of vapes (Lee & Lee, 2019; Wiernik et al., 2019). Stunted

cognitive maturation is one of the negative side effects that can result from prolonged vaping. In conclusion, research has shown that vaping may be a gateway to other, more dangerous forms of substance abuse, such as smoking cigarettes and drinking alcohol (Chan et al., 2020).

Characteristics associated with electronic cigarette use among adolescents.

These products may appear more appealing to adolescents for a number of reasons, including the peer influence, the belief that electronic cigarettes are less harmful than traditional cigarettes, the potential for a reduction in stress, and the possibility of using them in places where smoking traditional cigarettes is forbidden. Additionally, the legal smoking age in the United States is 21, but underage youth frequently report obtaining e-cigarettes from peers (Tsai et al., 2018). According to the findings of Dumas et al. (2020), adolescents who are feeling more depressed, anxious, and concerned about their safety as a result of the COVID-19 pandemic may turn to substance use as a form of coping, which can have a negative effect on their mental health. In addition, the use of substances as a form of coping may lead to a greater risk of suicide.

According to Rotermann and Gilmour (2022) in a study 2,495 respondents aged 12 to 17 years, having a lot of close friends who engaged in negative behaviors, such as skipping school frequently, having a reputation for causing trouble, drinking, or believing that it was okay to not work hard at school, was related to vaping. Specifically, 35.5% of adolescents aged 15 to 17 reported using e-cigarettes if many of their friends frequently engaged in one or more of the preceding four behaviors, whereas only 8.8% of those whose friends weren't involved in these behaviors reported using e-cigarettes themselves. Vaping was also related to students' academic

performance; students who did not receive primarily A grades were approximately twice as likely to vape as those who did (27.3% versus 15.4% respectively). The prevalence of using electronic cigarettes was higher among adolescents aged 12 to 14 who had been diagnosed with ADHD, compared to adolescents who did not have ADHD (12.6% versus 4,7% respectively).

Parental influence is also essential to adolescents who exhibit substance use and vaping behaviors. Jeong Choi et al. (2022) examined the role of parental knowledge in shaping the perception of adolescents vaping behaviors. There were 639 participants aged 12-17 years who participated in this research and reported high levels of parental knowledge associated with consumption of more harmful vaping products. On the contrary, having parents who were aware who they were hanging out with when they were not at home as well as having a greater relatedness scores (indicating a greater sense of being a part of something) were both considered protective factors and associated with a lower rate of vaping. It appears that an increased likelihood of vaping was associated with having a mood or anxiety diagnosis as well as having a family member who smoked (Rotermann and Gilmour 2022; Williams et al. 2021). Furthermore, adolescents who had worked for money were more likely to have used e-cigarettes than their peers who had not held paid employment. It's possible that the wages make vaping more affordable for adolescents, and it's also possible that adolescents who are employed have a greater chance of being exposed to (often older) coworkers who vape. Finally, a correlation between increased spending money and increased vaping risk among adolescents has been reported according to Williams et al. (2021).

For a variety of reasons, the restrictions that have been linked to the COVID-19 pandemic may have an effect on young people who vape. For instance, many

young people hide their vaping from their parents, thus they vaped less during the outbreak because restrictions forced them to spend more time at home, making vaping difficult to do so without drawing attention to themselves (Hopkins & Al-Hamdani, 2021). Additionally, most youth used to obtain vaping supplies from their peers or local brick-and-mortar shops; however, during the pandemic this was no longer an option, and youth were forced to online sources (Braak et al., 2020; Gaiha et al., 2020). Furthermore, because vaping is frequently done in a social context, and for social reasons, they were less likely to do so alone during the quarantine (Evans-Polce et al., 2018). Dumas et al. (2020) examined the substance use of 1.054 Canadian adolescents during the lockdown, which revealed a decrease in vaping, from 16.6% to 11.5%. There is a high possibility that vaping during the lockdown was decreased because such materials are obtained through peer networks and shops that were closed due to the pandemic. On the contrary, a study of Clendennen et al. (2021) who examined the stress and dependence of 709 adolescent participants in marijuana, electronic cigarette, and cigarette use during the pandemic, revealed that 75% of the participants sustained or increased the use due to the pandemic.

E-cigarettes use among adolescents is something that significantly concerns the public health. A study of Dumas et al., (2020), who researched how adolescents' substance use had changed since the Covid-19 pandemic, reported a decrease from 16.6% to 11.5%. Whereas a more recent study of Bennett et al., (2022) with young adults (15-24 years-old) as participants, reported that 37.9% of the participants increased vaping, while 28.9% reported decreasing use, and 33.1% reported no change. Although, the corona virus disease pandemic is likely to have had an impact on current adolescent substance use rates there is little evidence about current rates among adolescents and young adults (Bennett et al., 2022). In their study Gaiha et al.

(2020) examined the access to e-cigarettes products before and during the pandemic to 2.167 US young individuals. This study demonstrated that 56.4% of the participants changed their use (32.4% quit, 35.3% reduced the amount of nicotine, and 17.6% increased the amount of nicotine), and the reason for this change was due to the inability to access the vaping shops due to the lockdown. On the contrary, Clendennen et al. (2021) investigated patterns in mental health manifestations as well as smoking and vaping behaviors among young individuals over the course of a period of one year, beginning before the COVID-19 pandemic and continuing through the first year of the pandemic, with participants ($n = 2148$) 16–24-year-olds adolescents. Results of this study reported that the participants who had ever used cigarettes, electronic cigarettes, or marijuana had significantly increased. This finding, in particular, demonstrated that young people aged 16-24 years from the biggest cities of Texas had begun smoking and vaping regardless of being in the midst of a pandemic of respiratory disease. This is an important finding that lends credence to the hypothesis that young people are motivated to experiment with smoking and vaping in the context of COVID-19, despite the possibility that there were still significant and increased risks associated with doing so.

Electronic cigarette prevalence in adolescents

While there is a reduction in traditional cigarette consumption, young people are now using more e-cigarette products (Bennett et al., 2022). According to the Monitoring the Future (MTF) study, nearly 28% of 12th graders reported past-month vaping in 2020, nearly doubled the rate reported in 2015, and nearly 19% of 10th graders reported particularly using nicotine-contained e-cigarettes, with vaping nicotine increasing by 0.9% even among 8th graders (Johnston et al., 2021). These rates are concerning because most e-cigarettes contain nicotine, which can have long-

term negative effects on brain development and behavior, as well as it increases the risk of drug dependence (Jeong Choi et al., 2022). According to a *New England Journal of Medicine* article, there was a 10% in e-cigarette use among adolescents between 2017 and 2018, totaling approximately 1.3 million teenagers (Farzal et al., 2019).

In October 2022, the Food and Drug Administration (FDA) and the Centers for Disease Control and Prevention (CDC) published federal data on e-cigarettes use among U.S youth from the 2022 National Youth Tobacco Survey (NYTS). The FDA maintains its concern regarding the use of electronic cigarettes among minors because by the year 2022, approximately more than 1 in 10 or more than 2.5 million middle and high-school students would have used e-cigarettes in the past 30 days. Results revealed that 14.1% of high school students (2.14 million) and 3.3% (380,000) of middle school students reported current e-cigarette use, of which approximately 85% preferred flavored e-cigarettes, with fruit flavors, candy, desserts, or other sweets. Disposables were the most commonly used device among current users (55.3%), followed by prefilled/refillable pods or cartridges (25.2%) (Products, 2022). A cross sectional study of Soteriades et al. (2020), carried out in 2013, examined the e-cigarette habits of students aged 13 to 15 years in Greece. Results indicated that in 2013, 2.8% of students were current e-cigarette users, and 12.3% had experimented with e-cigarettes. However, there is little evidence regarding how Greek adolescents have changed their vaping behavior after the Covid-19 pandemic which was a highly stressful crisis.

The purpose of this study

The purpose of this study was to investigate, among adolescents, how the post-COVID-19 pandemic effects manifested themselves in terms of signs of anxiety and the use of electronic cigarettes. The research that has been done so far is limited, and it warrants attention in English speaking adolescents leaving in Greece regarding vaping behaviors and signs of anxiety. The findings of this study on the rates of anxiety and the use of electronic cigarettes after the COVID-19 pandemic were analyzed in relation to the findings that have been reported in the previous research on the rates that existed before the pandemic. The following research objectives served as the basis for the study's design:

1. Conduct research on the signs of anxiety symptoms that were observed among adolescents following the COVID-19 pandemic.

2. Investigate whether or not signs of anxiety are correlated with the levels of e-cigarette use among adolescents following the COVID-19 pandemic.

3. Conduct research into the differences in anxiety signs that occur based on age and gender.

4. Determine whether or not there was a significant difference in vaping scores based on age or gender.

The data analysis was directed by two primary hypotheses areas. At the outset, it was hypothesized that the COVID-19 pandemic has a significant connection to the increased signs of anxiety observed in adolescents. Second, young people who were afflicted by the pandemic and who were showing signs of post-COVID-19 anxiety have started vaping for the first time or have increased their vaping intensity. In essence, it was anticipated that the target population would report higher levels of anxiety signs as a consequence of the COVID-19 pandemic, and that the use of e-

cigarettes would be a potential correlation to higher levels of anxiety signs and the impact of the COVID-19 pandemic.

II. Method

Participants

Participants of this study were 105 typically developed adolescents ranging from 13 to 19 years old, from the northern and southern districts of Athens, Greece. The participants were mostly English-speaking adolescents or fluent in the English language and registered in English-speaking educational settings and vocational centers "Frontistiria".

Two inclusion criteria were prerequisite for the present study which encompassed of the participants living in the northern and southern suburban areas of Athens, who had experienced the Covid-19 related quarantine. The second inclusion criteria included the participants using electronic cigarette products or having previously tried, but no other kinds of cigarettes. The second inclusion criteria was not applied to 10 of the participants that answered "No" to the question "Are you an e-cigarette user or have you ever tried e-cigarette products?"; however, they were not excluded from the study as their answers were considered important by the researcher. These answers also concerned the first criterion and hypothesis of the study which included the signs of anxiety in adolescents after the Covid-19 pandemic.

Materials

The questionnaires used for this study included a Demographic Self-Report Questionnaire, the Pandemic Fatigue Scale (PFS; Lilleholt et al., 2020), the Generalized Anxiety Disorder-7 *(*GAD-7*;* Spitzer et al.,2006), and the Hooked-on Nicotine Checklist *(*HONC; DiFranza et al., 2002). All materials were administered in English.

Demographics Self-Report Questionnaire. Participants' demographics and characteristics will be collected through this questionnaire, including their age, biological gender, nationality, grade level, socioeconomic status, and use of e-cigarette products.

Pandemic Fatigue Scale

The Pandemic Fatigue Scale (Appendix A) was developed and validated by Lilleholt et al. in 2020. The conceptualization of the Pandemic Fatigue Scale was to develop a measure which would evaluate people's experience of the pandemic fatigue indicating that the pandemic fatigue cultivates over time both within and between individuals. It is also associated with other constructs, and it would provide evidence to people's propensity to adhere to suggested health-protective behaviors which were crucial at the time of the scales development. In order for the developers to accomplish their goal, they first developed a 15-item self-report measure rated on a 7-point Likert type scale (1=strongly disagree to 7=strongly agree) and then used it to investigate its evolution over time, as well as to critically examine the connection between the pandemic fatigue and people's tendency to comply to the four different health-protective behavior, including the physical distancing, hygienic practices, mask wearing, and information seeking.

This scale was constructed to monitor the Pandemic Fatigue (PF) for the remainder of the Covid-19 pandemic, as well as from the start of future pandemics and for future systematic monitoring of the PF. The scale included two distinct, yet correlated components referred to as "information fatigue" and "behavioral fatigue". The first referred to the feeling of being exhausted from the effort required to stay informed about the pandemic, while the second, refers to the feeling of being exhausted from the effort required to follow recommended health protective behaviors.. The measure was first assessed across two large cross-sectional surveys in Denmark (15,985 participants) and Germany (17,946 participants) measuring the development of the pandemic fatigue over time and other correlates of the pandemic fatigue including sociodemographic characteristics and personality, perceptions and emotions, and recommended health-protective factors. Additionally, in order to obtain the most accurate picture possible of people's thoughts, feelings, and behaviors in response to the Covid-19 pandemic, each survey was specifically tailored to the country being conducted.

After conducting exploratory and confirmatory factor analysis, the number of items were reduced from 15 to 10. During this process, the developers made certain that the items would be able to capture not only a state of weariness and exhaustion but also a general demotivation towards the situation. After the repeated cross-sectional survey, the number of items on the scale was whittled down until it consisted of only three items for each factor. The summary of the responses for all six final items reports a measure of the participants' overall pandemic fatigue. The higher the overall PFS score, the grater the pandemic fatigue provided by the participants.

In terms of reliability, the final scale indicated acceptable internal consistency (Cronbach's a=.83/.88, respectively). In a cross-sectional study 1.018 participants

Rodriguez-Blazquez et al. (2022) examined the psychometric properties of the scale, reporting moderate internal consistency (a=0.74). Moreover, the Exploratory Factor Analysis found two factors that each had a correlation coefficient of .70, which together explained 62,2% of the variance in the data. This relates to the structural validity of the measure. The scale has also been translated into Greek and its validity and reliability has been tested to 334 student population in Cyprus. Results indicated good reliability of the measure (a=.88), and good concurrent validity as assessed in relation to the Greek version of Generalized Anxiety Disorder Assessment-GAD-7 (r=0.1.96; *p*<0.0001) and the Patient Health Questionnaire-PHQ-9 (e=0.173; *p*=0.002) (Asimakopoulou et al., 2022).

Generalized Anxiety Disorder-7 (GAD-7)

The initial scale consisted of 9 questions that accurately reflected all of the symptom criteria for generalized anxiety disorder as outlined in the Diagnostic and Statistical Manual of Mental Disorders IV (DSM-IV), as well as 4 questions based on a review of previously developed anxiety scales. Individuals (n=2.740) were asked to answer a questionnaire consisting of 14 questions how frequently, on average, each symptom had bothered them over the course of the previous two weeks. The responses "not at all", "several days", "more than half the days", and "nearly every day", which received scores of zero, one, and two, respectively, were available as response options. Seven out of thirteen questions had the highest rank correlations not only in the developmental sample, but also in the two replication samples. The Generalized Anxiety Disorder-7 scale is now a 7-item questionnaire with high reliability and validity (Spitzer et al.,2006) (Appendix B).

On GAD-7, a score of 10 or higher represents a reasonable cut point for identifying cases of generalized anxiety disorder (GAD). In this scale, the cut points of 5, 10 and 15 could be interpreted as representing mild, moderate, and severe levels of anxiety respectively, in a manner that is analogous to the levels of depression measured by the PHQ-9 (Kroenke et al., 2001 as cited in Spitzer et al.,2006). The GAD-7 may be especially helpful in determining the severity of symptoms and monitoring change over time (Spitzer et al.,2006).

Validity and reliability of the instrument were first assessed by Spitzer et al. in 2006. The researchers compared the self-reported questionnaire with independent diagnosis made by mental health professionals, and results indicated good reliability (a=.92), as well as test-retest reliability (intraclass correlation= 0.83). Good convergent validity was found in the GAD-7, as shown by its correlations with two different anxiety scales, the Beck Anxiety Inventory, and the anxiety subscale of the Symptom Checklist-90 (r=0.72, and r=0.74, respectively). Findings consistent with earlier research on anxiety and depression (Wittchen, 1994; Carter et al., 2001). Additionally, the scale reported a strong criterion validity for identifying cases of generalized anxiety disorder. The fact that increasing scores on the GAD-7 scale were strongly associated with multiple domains of functional impairment was evidence that was used to demonstrate that the construct was valid (Spitzer et al.,2006).

The psychometric properties of GAD-7 were also assessed in a large sample of adolescents (67,821) aged 10-17 years in a study of Sun et al. (2021). Results demonstrated a good internal consistency and an acceptable criterion validity as compared to other self-reported questionnaires. The Generalized Anxiety Disorder (GAD-7) questionnaire has been previously used as a screening tool for signs of anxiety to Greek adolescents after the pandemic, indicating that it is an appropriate

tool for examining signs of anxiety and not assessment of anxiety (Giannopoulou et al.,2020). This screening tool was exclusively used to screen signs of anxiety among the adolescents and no further conclusions were made regarding the participants' mental health or other related symptoms.

Hooked on Nicotine Checklist (HONC)

Hooked on Nicotine is a 10-item, self-administered instrument adopted by DiFranza et al., (2002) (Appendix C). It was integrated for adolescents aged 12 to 15 years old, however it has been used to older populations as well. The HONC has been used in studies to identify nicotine-dependent in adolescent smokers and provide information on the onset and extent of dependence. Hooked on Nicotine Checklist has previously been adapted to be an adolescent vaping questionnaire (DiFranza et al., 2007). In the present research study, the adapted form of the instrument was used to determine the participants' levels of dependence on vaping. The instrument requires minimal time to administer and afterwards the total score is determined by adding the number of positive responses.

According to DiFranza et al. (2002) and Wellman et al (2005), the HONC has proven to be an effective instrument for determining the level of nicotine dependence present in smokers of all different intensities. The strength of the instrument across the spectrum of smoking habits enables it to be more easily applied to the population of adolescents. This is because the majority of adolescents are not users of nicotine for extended periods of time. there a lot of positive aspects associated with using the HONC to assess nicotine addiction. First and foremost, in 2005 Wellman et al. examined the instrument's reliability and validity in 1,130 adult smokers. Internal consistency was found to be significant (a=.82). in terms of the instrument's validity,

each and every item on the HONC demonstrated face validity, which is an essential component of the sensitization-homeostasis theory model of nicotine addiction. According to DiFranza, Huag, and King (2012), the sensitization-homeostasis theory proposes that nicotine possesses the capacity to circumvent the autonomous support craving circuit, thereby inducing withdrawal-induced cravings after the effect of nicotine has worn off.

A comparison of the two instruments in terms of their psychometric properties has been carried out as nicotine dependence has typically been measured using two instruments: the Fagerstrom and the Hooked-on Nicotine Chekclist (HONC). According to R. Wellman and colleagues' research from 2005, the Fragestrom Test of Nicotine Dependence (FTND) has inferior psychometric properties when compared to the HONC. The HONC and the FTND were found to share a single factor after undertaking factor analysis. The correlation between the two measures was r=.44 with the mean HONC score being 7.0 and the mean FTND score being 4.6. The HONC had a higher level of internal consistency (a=.82.), whereas the FTND only had a level of internal consistency (a=.61). the measures had comparable correlations with age at smoking onset and number of days smoked per month. Wellman et al. (2005) conducted an investigation into the validity of the FTND and found that it was more highly correlated with the consumption of cigarettes than with the prime variable of nicotine dependence that was intended. A prior study of O'Loughlin, (2002) examined the psychometric properties of HONC in 233 grade 7 students. Results demonstrated acceptable internal and test-retest reliability, and correlations between indicators ranged between .716 to .824. This studies reveal trustworthiness of the instrument to be used in the targeted for this study population.

The HONC has a number of benefits, including the following: (a) it measures a well-defined construct, and each item has face validity; (b) it has better psychometric properties; (c) it has a logical cut point (zero symptoms); (d) it has greater sensitivity on the onset and low levels of dependence; and (e) it has easily interpretable score results, all of which make this measurement a strong case for this study.

Design

This study employed a quantitative non-experimental, descriptive cross-sectional research design. The study plan included the gathering of data about the post COVID-19 effects to young individuals on signs of anxiety and use of e-cigarette products through an online, unsupervised, self-administered questionnaire completed by the adolescents. The final questionnaire entailed questions regarding the pandemic fatigue, signs of anxiety and the frequency of vaping. Items measuring the pandemic fatigue had 7 possible responses on a Likert scale (1=strongly agree to 7= strongly disagree); the items measuring signs of anxiety had 4 possible responses on a Likert scale (0=Not At All, to 3= Nearly Every Day), and the items measuring the frequency of vaping had a dichotomous "Yes" or "No" response (Appendix D).

The independent variable of this study was the COVID-19 pandemic which we expected to have influenced the dependent variables which were the signs of anxiety and the vaping scores in adolescents. All statistical analysis were performed via IBM SPSS.

Ethical Approval

To start with, in order to guarantee the high ethical standard of this research, the Institutional Review Board (IRB) of the American College of Greece (Appendix E) examined this study, and it was only performed after its approval. All participants

who took part in the study received ethical and evidence-based procedures and materials. To continue, all participants were treated with respect and courtesy, confidentiality and anonymity of the participants was maintained throughout the data collection process. No name or identifying information was provided from the participants. Last but not least, the aims and the methodology of the research were explained to both the participants and their parents before the initiation of the survey. More details concerning the procedure are explained later on.

Procedure

Participants were initially recruited from the researcher's social network, private schools, and vocational centers. The preliminary sample obtained was later on expanded through the snowball sampling technique. The researcher asked colleagues and other individuals of her social network to forward the survey link to similar subjects, in order to compile a sample that was representative of a sizeable population. In order to maintain the participants' anonymity, no other personal contact was established. The responses to this survey were kept confidential, and participation was entirely voluntary. Social media advertisement through social media pages (i.e., public Facebook posts) took place for recruitment of participants.

An online survey was integrated through Qualtrics and made available to the participants in an electronic form (link) for the purpose of this study. The link was distributed from the schools and the vocational centers via students' academic email, and also through email and SMS through the social network. Prior the initiation of the survey, the participants were informed about the purpose of the study and that their anonymity was guaranteed. The message was as follows:

"Thank you for agreeing to take part in the research study being conducted by Eleni Basai. I am a graduate student at the American College of Greece-Deree and the interest of my research is "Covid-19 related Changes in Signs of Anxiety and Electronic Cigarette Use Among Adolescents in Greece". Adolescents are especially more vulnerable to the negative consequences of Covid-19 pandemic, and thus I want to investigate if the pandemic has affected adolescents in Greece.

The aim of this study was to provide information about the ways in which Covid-19 pandemic has impacted and continues to affect the life's of adolescents regarding sings of anxiety and the utilization of e-cigarette products.

The research objectives included the investigation of the post Covid-19 pandemic related signs of anxiety among adolescents and the percentage of e-cigarette use among adolescents post Covid-19 pandemic. Additionally, this research aimed to investigate the difference of both anxiety signs and vaping scores across age and gender."

Continuing on the survey, the next page included the parental consent (Appendix F) on a PDF document, as well as a "Signature" box indicating that the parent was aware of and consented to the terms outlined in the preceding form. The survey could be continued only after the signature of the parent or else the participant was excluded from the process. Due to the participants' age, it was considered appropriate to provide their own consent as well in order to participate in the study. The next page of the survey encompassed of the participant's assent form (Appendix G). The participants were asked to read the PDF document presented in this page and agree with the terms before they continue.

The participants were asked to read the instructions written at the beginning of the survey and proceed with its completion. The survey consisted of a total of 28

items, and it was expected to take approximately 15 to 20 minutes to complete. After the completion of the survey, a Debriefing from (Appendix G) was presented to the participants expressing the gratitude for their participation, as well as restating the aims of this research study. The participants at the end had to provide permission to the researcher to include their data in the final study, with a simple "Yes" or "No" answer. Contact information of the researcher and the thesis advisor were included to all forms (parental permission, assent, and debriefing form) in case of any questions or concerns regarding the study.

Data Analysis Plan

Data were analyzed in terms of their normality and homogeneity of variance. For the continuous measures, descriptive statistics were computed and presented as the mean and standard deviation (M, SD), while for the categorical variables, absolute and relative frequencies (%) were used. For the purpose of reporting the demographic characteristics of the participants, both descriptive statistics and frequency analysis were performed with a level of confidence ranging from 95% to 99% and a level of significance ranging from 1% to 5% of the total value. In order to report the anxiety scores (Table 1) and the vaping scores (Table 2), two frequency tables are integrated.

Internal consistency was determined using Cronbach's alpha coefficients, and the level of significance was tested through the Pearson correlation coefficients in order to evaluate the reliability of the materials that were utilized in the study of English-speaking adolescents living in Greece.

In order to identify the underlying factors that are responsible for the observed common variance in variables pertaining to signs of anxiety, an exploratory factor analysis (EFA) was performed. For the purpose of determining the relationships

between demographic factors and anxiety and vaping scores, parametric testing,

analysis of variance (ANOVA), and t-tests were carried out. In addition, in order to

provide a concise summary of the relationship between the use of vaping products and

the age and gender of the participants, the binary outcome was regressed on age (a

continuous variable) and gender (a categorical variable). Last but not least, a Chi-

Square test was carried out in order to determine whether or not there was a

correlation between the participants' grade level and their use of electronic cigarette.

II. Results

Data were collected by the adolescents themselves attending middle and high school. There were two missing data from the survey, which were considered important and were not deleted from the survey. Normality of all variables was assessed from the Kolmogorov-Smirnov's test which indicated that electronic cigarette use was not normally distributed ($p<.05$). Scores on pandemic fatigue were normally distributed for both males and females ($p<.05$). Lastly, anxiety scores were normally distributed for both males and females ($p>.05$). Histogram figures from 1 to 6 in the figure section depict how the data were distributed.

Demographics

The recruited sample of the study comprised of 105 adolescents, consisting of 49 males (46.5%), 54 females (51.4%), and 2 who preferred not to share their biological gender (1.9%). The age of the participants ranged from 13 to 19 years old with 10.5% of the participants being 13-14 years old; 13.3% reporting 14-15 years old; 30.5% being 15-16 years old; 26.7% reporting 17-18 years old and 19% reporting the age of 18-19 years old. Regarding the nationality the majority of the participants ($N=76$) were European (72.4%), 18 were American (17.1%), and 11 participants reported "Other" (10.5%). In terms of grade level 9.5% reported participating in middle school and 90.5% participating in high school. In the question "Are you an e-

cigarette user of have you ever tried e-cigarette products?" 90.5% of the adolescents answered "Yes", while the 9.5% answered "No". More detailed participants' demographics are presented in Figure 7.

The questionnaire was employed to measure different underlying constructs. One construct, Pandemic Fatigue consisted of six items, the Generalized Anxiety Disorder-7 (GAD-7) consisted of seven items, and the Hooked-on Nicotine Checklist (HONC) consisted of ten items. In terms of reliability all scales reported high levels of internal consistency, as determined by a Cronbach's alpha of 0.846, 0.877, and 0.913 respectively (see Table 1).

Generalized Anxiety Disorder-7

Individuals' signs of anxiety were measured through the Generalized Anxiety Disorder-7 scale. Data on signs of anxiety were examined for possible interactions between the variables of gender, grade level and nationality, as well as an investigation of the post Covid-19 pandemic signs of anxiety symptoms among adolescents was run.

An EFA was performed using principal component analysis and varimax rotation. The minimum factor loading criteria was set to 0.40. the communality of the scale, which indicates the amount of variance in each dimension, was also assessed to ensure acceptable levels of explanation. The results show that all communalities were over 0.40. an important step involved weighting the overall significance of the correlation matrix through Bartlett's Test of Sphericity, which provides a measure of the statistical probability that the correlation matrix has significant correlations among some of its components. The results were significant, $\chi^2 = 358.656$ (p<0.001), which indicates its suitability for factor analysis. The Kaiser-Meyer-Olkin measure of

sampling adequacy (MSA), which indicates the appropriateness of the data for factor analysis, was 0.858. in this regard, data with MSA values above 0.800 are considered appropriate for factor analysis.

An independent sample t-test was run to determine if there were differences in the scores of signs of anxiety between male and female adolescents. There were no outliers in the data, as assessed by inspection of a boxplot. Anxiety scores for each level of gender were normally distributed, as assessed by Shapiro-Wilk's test ($p > 0.5$), and there was homogeneity of variances, as assessed by Levene's test for equality of variances ($p = .419$). The scores of signs of anxiety were higher to females (*M=2.80, SD= 0.87*) than males (*M=2.77, SD=0.87*), a statistically significant difference, $M = 0.039$, 95% CI [0.36, 0.28], $t(24) = 0.246$, $p=0.031$.

An independent-samples t-test was run to determine if there were differences in signs of anxiety between the grade levels of the participants. There were no outliers in the data, as assessed by inspection of a boxplot. Signs of anxiety scores for each level of grade were normally distributed, as assessed by Shapiro-Wilk's test ($p > .05$), and there was homogeneity of variances, as assessed by Levene's test for equality of variances ($p=.450$). Signs of anxiety were higher to middle school students (*M=2.84, S=0.94*) than high school students (*M=2.76, S=0.82*), a statistically significant difference, *M*=0.27, 95% CI [0.46 to 0.63], *t*= (103) =0.296, *p*=.384.

A one-way ANOVA was conducted to determine if the anxiety scores were different for groups from different nationalities. Participants were classified into three groups: European (*n*=76), American (*n*=18), and Other (*n*=11). There were no outliers, as assessed by inspection of boxplot; data were normally distributed for each group, as assessed by Shapiro-Wilk test ($p>0.5$); there was homogeneity of variances, as

assessed by Levene's test of equality of variances ($p=.759$). The anxiety scores increased form the American ($M=2.5$, $SD=0.8$) to Other ($M=2.7$, $SD=0.9$) to European ($M=2.8$, $SD=0.8$) ethnicity group, in that order, but the differences between these nationality groups were not statistically significant, F (2,10) $=1.072$, $p=.346$ (Table 2).

Hooked on Nicotine

The adolescents' electronic cigarette use was measured through the Hooked-on Nicotine scale. Data on e-cigarette use was examined for possible interactions between the variables of gender, nationality, and age group.

An independent-samples t-test was run to determine if there were differences in vaping scores between males and females. There were no outliers in the data as assessed by inspection of a boxplot. Electronic cigarette use was not normally distributed, as assessed by Shapiro-Wilk's test ($p<.05$). Vaping scores were higher to females ($M=1.62$, $SD=0.32$) than males ($M=1.52$, $SD=0.39$). There was homogeneity of variances as assessed by Levene's test for equality of variances ($p=.025$). There was a statistically significant difference in mean vaping scores between males and females, t (101) $=$ -1.402, $p=.164$.

An independent-samples t-test was run to determine if there were differences in vaping scores between nationality. There were no outliers in the data as assessed by inspection of a boxplot. Electronic cigarette use was normally distributed for the "American" and "Other" ethnicities ($p>.05$) and not for the "European" ethnicity ($p<.05$), as assessed by Shapiro-Wilk's test, however, there was homogeneity of variances, as assessed by Levene's test for equality of variances ($p=.110$). Electronic cigarette use was higher to American participants ($M=1.65$, $SD=0.30$) than European

participants (M=1.58, SD=0.37), a statistically significant difference, M =.072, 95% CI [-0.26 to 0.11], t (92) = -.751, p=.454.

A one-way ANOVA was conducted to determine if vaping scores were different for groups of different ages. Participants were classified into five categories: 13-14 (n=11), 14-15 (n=14), 15-16 (n=32), 17-18 (n=28), and 18-19 (n=20). There were no outliers, as assessed by inspection of boxplot; data were normally distributed for the groups of 13-14, 14-15, and 18,19, as assessed by Shapiro-Wilk test (p>0.5); there was homogeneity of variances, as assessed by Levene's test of equality of variances (p=.637). The vaping scores increased from 14-15 (M=1.5, SD=0.3) to 15-16 (M= 1.57, SD= 0.4), to 18-19 (M=1.6, SD= 0.4), to 13-14 (M=1.6, SD=0.3), to 17-18 (M=1.6, SD=0.4) age group, in that order, but the differences between these age groups were not statistically significant, F (4.10) =0.094, p=.984 (See Table 2).

Regression and Correlation

A regression and a chi-square test were run to predict possible associations between vaping behavior and gender, and vaping behavior and grade level. Pearson correlations were run in order to determine if the scores of e-cigarette use among adolescents after the COVID-19 pandemic were related to the signs of anxiety, and if the signs of anxiety were related to the pandemic fatigue of the participants.

A multiple linear regression was run to predict vaping usage from gender and age. There was independence of residuals as assessed by Durbin-Watson statistic of 1.010. there was homoscedasticity, as assessed by visual inspection of a plot of studentized rituals versus unstandardized predicted values. There was no evidence of multicollinearity, as assessed by tolerance values greater than 0.1. there were no studentized deleted residuals greater than ±3 standard deviations, no leverage values

greater than 0.2, and values for Cook's distance above 1. The assumption of normality was met as assessed by a Q-Q Plot. The multiple regression model was not statistically significant F (2,10) =1,470, p <0.235, adj. R^2 = .009. Regression coefficients and standard errors can be found in Table 3.

A chi-square test for association was conducted between grade level and usage of vaping products. All expected cells were greater than five. There was a statistically significant association between grade level and vaping χ^2 (1) = .912, p= .340. There was a strong association between high school students and vaping as assessed by inspection of the bar graph (Table 4).

Pearson product correlation of pandemic fatigue and signs of anxiety was found to be low positive and statistically significant (r =.446, p<.001). Hence the H1 was not supported. This shows that an increase in the pandemic fatigue is not associated with the increase in signs of anxiety in adolescents (See Figure 8).

Pearson product correlation of signs of anxiety and vaping usage was found to be negative low and statistically significant (r = .460, p<.001). Hence the H2 was not supported. This shows that an increase in signs of anxiety is not associated with the increase in vaping in adolescents (See Figure 9).

IV. Discussion

The purpose of this research was to investigate the effects of the COVID-19 pandemic on signs of anxiety and the use of electronic cigarettes among adolescents. The research that has been conducted up to this point is limited but is does merit attention among English-speaking adolescents living in Greece regarding behaviors associated with vaping and the signs of anxiety. The research was conducted using a quantitative, non-experimental, descriptive, cross-sectional design. Additionally, two hypotheses and four research objectives were developed. The hypotheses anticipated that the COVID-19 pandemic is strongly linked to the increased signs of anxiety seen in adolescents and that adolescents who were afflicted by the pandemic and who were showing signs of post COVID-19 anxiety have either started vaping for the first time or have increased the intensity of their vaping behavior. Both of these predictions were based on the assumption that the pandemic has a strong connection to the increased signs of anxiety observed among adolescents. In addition to this, it was anticipated that participants would report high levels of anxiety as well as high levels of electronic cigarette use. Furthermore, one of the goals of this study was to investigate whether or not there were any disparities between the participants' ages and genders with regards to the manifestations of anxiety or their vaping behaviors.

No significant correlations were found between the pandemic fatigue and signs of anxiety, and similarly, no significant correlations were reported between signs of anxiety and vaping behaviors among adolescents living in Greece. Neither of these findings supported the hypotheses that were investigated. When the demographic factors of the participants' gender, grade level, ethnicity, and age were taken into consideration, the results of the ANOVA and the independent samples T-test showed that there was no significant difference in the mean scores of signs of anxiety and vaping. Nevertheless, a key finding of this study, which is in line with what it was anticipated and what is supported by the research, the adolescent who participated in this study reported very high levels of anxiety signs in addition to their use of electronic cigarettes. This is demonstrated by the frequencies of the two scales (Appendix I).

The crisis caused by COVID-19 had been felt on a global scale, and adolescents are no exception. Participants of this study (35.2%) reported as being "Sick of hearing about COVID-19", as well as 26.7% reported that "I am tired of all the COVID-19 discussions on TV shows, newspapers, and radio programs, etc.". This study encountered high levels of both anxiety signs and pandemic fatigue, which is consistent with previous research on the effects of the COVID-19 pandemic on signs of anxiety in adolescents (Bera et al., 2022; Hawes et al., 2021; Lavigne-Cerván et al., 2021; Ma et al., 2021; Racine et al., 2021; Rogers et al., 2021). In accordance with the results of the study that was performed by Giannopoulou et al. (2021) on Greek adolescent students, the prevalence of positive screening for anxiety significantly increased to 50% during the period of lockdown. These rates were comparable to those that have been identified for senior level students in China during the COVID-19 outbreak, where the anxiety rate was 53% (Zhou et al.,2020). During the period in

which there was nationwide lockdown, the prevalence rates of severe anxiety symptoms skyrocketed, going from 3.8% prior COVID-19 to 20.5% to during COVID-19. This was a staggering increase. Similar to the previous research, the current study identified that adolescents continue to report high levels of anxiety, with participants reporting 45.5% "Becoming easily annoyed or irritable" and 45% "Feeling nervous, anxious, or on edge".

Worldwide, clinically elevated levels of depression are being experienced by 1 in 4 young people (25.2%), and clinically elevated levels of anxiety are being experienced by 1 in 5 (20.5%) young people. When compared to the estimates that were employed before the COVID-19 pandemic (12.9% for depression and 11.6% for anxiety) indicate that the prevalence of mental health issues among young people has likely increased by an order of magnitude during the COVID-19 pandemic (Racine et al.,2021). In another research project conducted by Lavigne-Cervan et al. (2021), the researchers looked at the differences that were discovered between the answers given by adolescents who were confined at the time of the research and the answers given by adolescents who were not confined, and the results obtained by those samples. In the State-Anxiety survey, adolescents who were not confined reported 31.2% of anxiety signs, while adolescents who were confined reported 34.7% of anxiety signs. There was a correlation between exposure to pandemic experiences and an increase in psychiatric symptoms across all domains. Having more concerns about contracting COVID-19 and having problems with regard to school were specifically associated with a rise in the severity of anxiety symptoms. On the other hand, having experienced a greater number of life changes and having a greater concern about staying at home and satisfying basic needs have been linked to increases in depressive symptoms, panic/somatic symptoms, and generalized anxiety (Hawe et al.,2021).

According to these findings, there is no room for debate regarding the fact that the confined population that was a part of the sample that was studies displayed, in comparison with samples that were not confined, a greater deterioration in anxiety.

Concerning the issues of gender, the vast majority of studies have concluded that adolescent girls seem to be at a higher risk that adolescent boys for the development of symptoms of anxiety. It would appear that women are more susceptible than men to experiencing an increase in the severity of mental health issues as a result of COVID-19 (Bera et al., 2022; Giannopoulou et al.,2021; Hawes et al., 2021; Liu et al.,2021; Ma et al.,2021; Racine et al.,2021; Zhou et al.,2020). Only females in the study by Hawes et al. (2021) experienced an increase in symptoms of depression, generalized anxiety, and social anxiety, and during COVID-19 nearly 60% of females met clinical cut-off for at least one disorder. Males did not experience any of these symptoms. These differences between the sexes could be the result of females having a more intense reaction to stress or having been subjected to greater stress during the pandemic. Even when taking into account the particular stressful or traumatic event, a large body of research reports that females are more likely to develop internalizing symptoms as a result of being exposed to stress and trauma.

On the contrary, the research conducted by Costa et al. (2020) suggested that the boys have a tendency to display more instances of anxious and depressive symptoms than girls. According to the findings of a study that was carried out in Iran by Ahmadpanah et al.,2018, it has additionally been suggested that this is the case. This study discovered that boys were more likely to experience common mental health problems. On the opposite, this study did not report any significant differences between males and females in the scores of anxiety signs. There was a slight, almost non-existent increase in the scores of female participants, but it was regarded as being

insignificant and no further conclusions could be made. As demonstrated by the results of the analysis, this finding is in line with those of earlier studies which found that the presence of more or fewer anxiety symptoms was not determined by whether or not the participants were male or female (Lavigne-Cervan et al.,2021).

Concerning the age-related differences in the symptoms of anxiety differences between grade levels were insignificant, with middle school (11-13 years old) participants scoring slightly higher that high school (13-18 years old) participants. This was not supported by the literature, as it is reported that older adolescents tend to demonstrate higher levels of anxiety. Older adolescents experience puberty and changes in hormone levels that could be the reason for increased anxiety signs. Additionally, social isolation and physical distance of older children, who especially depend on socialization with peers, might have an essential part in the development of anxiety in older children. On the other hand, it does not appear that age plays a significant role in the occurrence rates of anxiety signs. Younger children may be able to recognize shifts in their regularity, whereas older children might be more precisely aware of the stress that their parents undergo and the repercussions of this global pandemic. Although, it is possible that both of these variables result in similar rates of anxiety, it is likely that the fundamental processes that cause it are different (Racine et al.,2021). The frequency of mental health conditions such as depression and anxiety was found to be significantly higher among female adolescents than it was among male adolescents, according to the findings of a study that was conducted by Ma et al. (2021). Similarly in a study of Zhou et al. (2020), students in senior grade three had the highest rate of anxiety and depression among all students, and their levels were higher than those of students in senior grade one. It would appear that the COVID019

pandemic, along with its associated restrictions and consequences, has exacted a significant toll on young people and the psychological well-being of these individuals.

Since electronic cigarette devices were first advertised, there has been a rise in popularity of vaping, which is more prevalent among young people than among adults. The current study investigated the levels of e-cigarette use among adolescents after the COVID-19 pandemic, the differences in vaping scores in relation to gender, the differences in vaping behavior between the nationalities of the participants, and the possibility that there is a correlation between sigs of anxiety and vaping behavior among adolescents. According to the results of this research, a sizeable percentage of the adolescents who took part in the study used electronic cigarettes. These findings did not appear to be consistent with previous research, which pointed to a decline in the use of electronic cigarettes either during or after the pandemic (Leatherdale et al., 2022; Gaiha et al., 2020; Hopkins & Al-Hamdani, 2021). There were two studies that were found to report a rise in the use of electronic cigarettes in connection with COVID-19. According to the outcomes of a study that was carried out by Clendennen et al.,2021, the vast majority of youth and young adults who were using marijuana, electronic cigarettes, or cigarettes reported either maintaining or increasing their use as a result of COVID-19. In addition, the research that was performed by Bennett et al. (2022) revealed that the majority of people who used e-cigarettes altered their behavior, with almost one third of users stating that they did not change. However, while earlier research found that a greater number of participants decreased their use, the current study discovered that a greater number of participants increased their use.

These seemingly contradictory results might be associated to the particular time of the data gathering. In contrast to previous studies, which were carried out during the initial months of the pandemic or immediately after it, the present research relied

on data collected roughly two years after the beginning of the pandemic. During the early months of the pandemic, there were likely increased levels of fear regarding lung health, as well as limited inadequate opportunities for socializing, a lack of access to shops, disruptions in the supply network, increased monitoring by parents due to at-home schooling, and limited access to retailers. On the other hand, participants in the present research indicated high rates of their e-cigarette use, which may have been explained by the return at schools and the reopening of the retailers as well as the exhaustion brought on by the ongoing pandemic. Despite the fact that certain findings suggested that the severely disruptive circumstances surrounding the COVID-19 early pandemic period may have inadvertently contributed to preventing or limiting vaping onset, additional ongoing prospective verification is required in order to determine whether or not this decreased behavior is still present globally.

The primary implications of the research conducted by Soteriades et al. (2020) were that in 2013, 2.8% of all students attending middle school in Greek schools were current users of electronic cigarettes and that 12.3% of students had tried out electronic cigarettes at least once. E-cigarette users in this study were significantly more likely to be male, older (15 vs 13 years old), users of combustible tobacco products, or members of families also used e-cigarettes; the latter two variables were the strongest predictors. In addition, the study found that users of e-cigarettes were significantly more likely to use combustible tobacco products. In the current study of 105 participants it was reported that 90.5% of adolescents answered positively in the question "Are you an e-cigarette user or have you ever tried e-cigarette products?" while only 9.5% answered negatively. In addition, in the questions "Have you ever tried to quit vaping but couldn't?" and "Have you ever felt like you were addicted to vaping?" 62.5% and 66.7% respectively, answered positively, as well as in the

question "Do you vape now because it is really hard to quit?" the majority of the participants (73.3%) answered "Yes". These findings cause concern regarding the likelihood of Greek adolescents developing an addiction to nicotine or any number of other substances, in addition to other potential physical and psychological risk factors that are associated with vaping. Even though there was not found a correlation between signs of anxiety and vaping among these participants, the high levels of vaping behavior that were found in this study are noteworthy and should be given attention, as well as to the potential contributing factors of this increase.

There were no statistically significant differences found between the sexes in this study; however, the female participants in this study showed a slightly higher rate of using electronic cigarettes than the male participants did. The results of previous studies have also suggested that the prevalence of vaping behavior is higher among females than it is among males. In the research conducted by Hopkins and Al-Hamdani (2021), one of the most important findings was that males and females reacted differently to the pandemic. In particular, males reduced the number of puffs they took during each vaping episode during the pandemic, while females did not. This finding is in line with findings of previous studies that demonstrated a greater receptivity among females to non-nicotinic aspects of the vaping experience, such as reduced levels of stress. Further, the stressful circumstances related to the pandemic, such as the unpredictability in females' personal lives, may have kept female vaping consistent during the entirety of the pandemic as opposed to the time before the pandemic. These findings should serve as a warning that females need to develop more healthy coping mechanisms in order to deal with the pandemic.

According to additional research, it appears that even though the prevalence of vaping tends to be higher among males in comparison to females during high school,

over the past few years the corresponding rise in vaping prevalence has actually been significantly higher among females as opposed to males. According to the findings of Leatherdale et al. (2022) it was discovered that even though the rate of vaping was less for females compared to males, it was found that during the initial phases of the COVID-19 pandemic period, females appeared to be more likely to preserve or even expand the daily vaping use relative to males across all vaping outcomes depicted. Findings have also revealed differences in changes in electronic cigarette use and by ethnicity.

Regarding the nationalities of the people who took part in the study, distinguishing between Europeans, Americans, and those who answered "Other". Participants from the United States living in Greece reported higher rates of using electronic cigarettes, followed by Europeans with a slight gap between their scores. Participants from other nations reported lower rates of vaping in comparison to the rates reported by Americans and Europeans. However, the response "Other" did not provide any further clarification as to which nationalities were included, so it was impossible to draw any further conclusions from the data. According to a research, young people and non-Hispanic Whites are less likely to decrease their use of tobacco and vaping products in response to COVID-19 pandemic (Bennett et al.,2022). Moreover, a study conducted by Clendennen et al. (2021) and pertaining to race and nationalities, it was reported that the answer "other" race or ethnicity, which included multi-racial or ethnic, Asians, American Indians or Alaska Natives, and Native Hawaiians or Pacific Islanders, was highly associated with increasing marijuana and e-cigarette use due to COVID-19. This was the case when comparing "other" race or ethnicity to white race or ethnicity. This highlighted a major health disparity as young individuals who are related to such populations, such as American Indians, historically

experienced greater prevalence of marijuana and vaping use compared to their peers, and crises like COVID-19 could heighten the discrepancies that already exist in this regard. Additional research is required to examine the relationships between stress, dependency, and other potential determinants, such as race/ethnicity and cultural factors and changes in substance use related to socioeconomic emergencies or other emerging events affecting public.

Limitations

In light of the fact that this study was part of an MA Thesis, which meant that it had to be completed within a predetermined amount of time, as well as the fact that the age of the participants imposed certain limitations and constraints on the recruitment process, the methodology and administration of the study were satisfactory.

Notwithstanding the forgoing, there were several limitations that could have been improved. At the outset, an insufficient number of participants were included in the study ($N=105$), and they were distributed unevenly according to gender, age group, and ethnicity. For instance, this study included participation from 49 males and 54 females. Additionally, 76 participants were European, 18 participants were American, and 11 participants reported "Other", about which no further determinations had been made. Due to the low number of participants in the sample, it is not possible to generalize the findings to the entire population of adolescents in Greece, and no further conclusions could be made. It is important to note, however, that this study represents a novel approach to research because the effects of post COVID-19 anxiety signs and vaping behaviors on adolescents living in Greece have not been investigated to this extent before.

Secondly, the current data come from a sample that was chosen among Greek adolescents who are fluent in English and live in Athens. As a consequence to this, it is possible that the adolescents who took part in the current study do not represent a typical Greek adolescent. As a result, it is not yet known whether the findings can be applied to populations that differ in terms of characteristics, for example, adolescent populations that do not speak English, adolescent populations that come from a variety of ethnic backgrounds, and adolescents that reside in smaller towns or villages. Additionally, the questionnaire was administered in English, and it was expected that participants were fluent in this language in order to complete the survey. As a consequence this leads to another limitation of the measures as they do not take into consideration the language differences resulting from the translation, as well as language idioms.

Third, the data was gathered through the use of an online survey, with social media and websites dedicated to educational news serving as venues for promotion. As a result, there is a possibility that the survey included some form of sampling bias. Another limitation concerns the possibility that the individuals with an existing curiosity about mental health and/or experiencing emotional distress would be more inclined to react to the survey, which may have exaggerated the prevalence of anxiety. It was not possible to ascertain the number of adolescents who were exposed to the questionnaire but decided against taking part in it. Despite this, however, this limitation is present in the majority of the COVID-19 mental health surveys, which have predominantly relied on web-based convenience samples.

The fact that the adolescents' physical and mental health, innate abilities and personality traits, family's socioeconomic status, environmental influences, peer influences, overall experience of the pandemic, potential risk factors, possible losses

due to COVID-19, or any other traumatic experience were not inquired about in the survey is another limitation of the study. There is a possibility that the participants' anxiety levels and their vaping behaviors were significantly influenced by at least some of the factors that were not investigated in this study. Therefore, it is essential that future research take into account these different aspects in order to provide an in-depth comprehension of the factors that have the most significant influence on the manifestations of anxiety and the use of electronic cigarettes among adolescents.

Another limitation is that the analysis of the data was not correlational, which means that it is impossible to draw conclusions regarding possible causal relations between the pandemic fatigue and signs of anxiety, as well as the relation between signs of anxiety and increased use of electronic cigarettes. This is a limitation that prevents the study from being more definitive. Even though the analyses suggested that both signs of anxiety and vaping scores were significantly high among adolescents, no correlation was found between the COVID-19 pandemic in either signs of anxiety or use of electronic cigarettes. This is the case despite the fact that the variables are being examined in a post-COVID-19 period. Because of this, it is impossible to assert causality based on patterns of correlation between the variables.

The current research design is another limitation of the study that was conducted. The findings were based on a cross-sectional study that used data collected at a single point in time past two years of the COVID-19 pandemic. The anxiety scores as well as the vaping scores were analyzed, and the results were compared to previous findings in the literature generally, rather than results from research conducted at the same population in Greece prior to COVID-19. On the other hand, the impact of multiple effects that have built up over the course of these years could potentially have an effect on the development of anxiety signs and lead to an increase

in vaping behaviors. There was no additional information that could be found regarding the prevalence of anxiety and the vaping behaviors among the participants during the pre-COVID-19 period or immediately after. Therefore, the temporal trends that were seen in this study, particularly the indications of increased anxiety signs and the use of e-cigarettes, need to be reevaluated and confirmed in subsequent longitudinal studies. A final limitation of this study is that the measures, namely PF, GAD-7, and HONC, have not been validated in Greek adolescent population. Despite this, high levels of internal consistency were found across all measures, across the entire sample, and in both sexes.

In spite the fact that the findings of this study might be subject to a number of limitations, the surprisingly high rates of symptoms associated with anxiety and vaping behaviors warrant an immediate call to action. It is of the utmost importance to recognize and monitor young individuals who have such vulnerabilities, particularly at this age.

Future Research

The findings of the study, as well as its limitations, provide the basis for a number of important recommendations for subsequent research.

To start with, it seems that additional replications of the study with a greater number of participants are required before the findings can be considered generalizable. Additionally, in the future, research should incorporate a larger sample size to ensure that there are more variations in the number of adolescents who take part in the study. In the future, it may be possible to recruit a larger sample by either devoting a longer period of time to the process of participant recruitment or by

ensuring in advance that the necessary authorizations are given to collaborate with public schools.

Second, the participants in this study were restricted by age between the ages of 13 to 19 years old, as that was the only age range covered by the research. It is important that future research take younger children into consideration, generalize the findings to include both children and adolescents, and make comparisons between the two age groups. As it is supported from prior research, children also exhibit increased levels of anxiety since the pandemic (de Figueiredo et al. 2021; Imran et al., 2020; Ma et al.,2021; Racine et al.,2021).

Third, additional factors, such as the individual's race or ethnicity, the socioeconomic background of their family, whether or not they or a member of their family has a history of mental illness, the educational background of their family, whether or not a member of the family or a friend smokes or uses electronic cigarettes, as well as the location in which they live, should also be taken into consideration. According to research done in the past, it has been established that all of these characteristics have a significant impact on the mental and physical health of adolescents, in addition to their likelihood of beginning to vape (Bennett et al., 2022; Clendennen et al. 2021; Dumas et al. 2020; Ellis et al. 2020; Feinberg et al. 2021; Imran et al., 2020).

Since we are now living in a period of time that is post-COVID-19, and anxiety and stress ratings are higher than they were before, it is important that the impact of the COVID-19 pandemic be researched in greater depth. Individuals who have been personally affected by the disease, or wo have suffered the loss of someone close to them as a result of the disease, should be taken into consideration, and an

investigation should be conducted into how this harrowing experience impacted their lives. Individuals, and particularly adolescents, were negatively affected by the quarantine because they missed out on opportunities for socialization with their peers, time spent participating in activities they enjoyed, and opportunities to interact with nature and pursue interests that were important to them (Cooper et al., 2021). These are factors that have had an impact on the mental health of adolescents, and it is important to investigate the degree to which these factors continue to have an impact on the adolescents' day-to-day life.

The pandemic caused by COVID-19 was a very stressful experience for the majority of people. Many other challenges came to the surface as a result of the isolation of the families in their homes, with parents working from a remote location and children and adolescents receiving online education at home. Laptops and internet connections were not available for all families, and especially not every family could afford to buy one laptop for each member of the household. As a result, many households were unable to keep up with their work or school obligations. Because of this, students missed hours of class time or opportunities to socialize with their peers via the internet, both of which contributed to an increase in the students' feelings of isolation and stress. To continue, during the period of the quarantine, many families were subjected to disagreements, fights, and even instances of domestic violence, all of which had a significant influence on the lives of adolescents. According to the research, such experiences are extremely traumatic and can lead to increased feelings of anxiety, depression, and even suicidal ideation (Bernert & Nadorff, 2015; Ezpeleta et al. 2020; Feinberg et al. 2021; Hoekstra 2020; Lavigne-Cerván et al. 2021; Okajima et al. 2022; Sher 2020). Such considerations ought to also be incorporated into the design of subsequent research.

In terms of the use of electronic cigarettes, despite the fact that previous research has reported that adolescents' use decreased during the pandemic, such results were not present in this study (Leatherdale et al., 2022; Gaiha et al., 2020; Hopkins & Al-Hamdani, 2021). This may be due to the fact that this research was conducted after the pandemic. The high levels of use of electronic cigarettes that were reported in this study should be taken into consideration, and further investigation into whether or not these findings are general to the adolescent population living in Greece should be conducted usings a larger sample size. In addition, the factor that contributed to the initiation of electronic cigarette use among adolescents, as well as the factors that contributed to an increase in the use of electronic cigarettes, should be investigated.

The COVID-19 pandemic was an alarming ordeal that had a significant negative effect on the lives of a great number of people all over the world. Because adolescence is also a period that is characterized by a significant among of steress and is affected by a great deal of different factors, it is essential to conduct additional research on the correlation between the symptoms of anxiety experienced by adolescents and the use of electronic cigarettes.

Conclusion

This current study, despite its limitations, has improved our understanding of the symptoms of anxiety and the levels of electronic cigarette use among adolescents living in Athens, Greece, during a post-COVID-19 period. Even though the findings did not correlate with one another in the way that was anticipated, the rates were discovered to be significantly high. The results reported high ratings into adolescents pandemic fatigue, signs of anxiety, as well as vaping behavior. The demographic

variables were not found to have a significant effect on the additional factors that were examined. This study confirmed the findings of previous research on the symptoms of anxiety experienced by adolescents in the wake of the pandemic. However. The study did not replicate the research findings that supported a systematic decline in the use of electronic cigarettes as a consequence of the COVID-19 pandemic.

Due to the correlational nature of this research, no assumption about the presence of a causal relationship were made. Despite the fact that the results imply the pandemic fatigue and anxiety sign ratings were high, there was no correlation between the two reported. In addition, high ratings were demonstrated to both the signs of anxiety as well as the vaping behavior, but there was still no correlation found between the two factors. An additional step that could be taken would be an investigation into the correlation between anxiety symptoms and the use of electronic cigarettes. This would make it possible to draw more definitive conclusions regarding the relationship between the variables over time. Future research should make an effort to isolate and investigate the factors that are associated to the high rates of signs of anxiety and the use of electronic cigarettes. This will allow researchers to investigate potential explanations for differences in impacts and obtain an improved understanding of which specific behaviors have a beneficial or detrimental effect on signs of anxiety experienced by adolescents and the motivations for vaping at this age. Moreover, in order to provide the necessary information for the design of interventions aimed at promoting individuals' resilience, mental and physical health, it will be necessary to have a clear picture of the risk factors of anxiety as we all the potential harm of vaping. Adolescents are a key demographic that should be the focus of efforts to promote and disseminate information about the risks associated with

vaping. Interventions should promote the mental health and well-being of adolescents, strategies for coping with anxiety, risks that stem from vaping, and ways to reduce and/or eliminate use of electronic cigarettes.

In conclusion, the current study was able to provide some insight into the anxiety signs and vaping behavior among adolescents in Greece. This information could be helpful for parents and adolescents when seeking to improve their resilience factors and coping mechanisms, as well as for school psychologists when developing psychoeducational programs. The current study has provided significant results for mental health in terms of anxiety among adolescents, as well as how much electronic cigarette devices are used by adolescents in Greece. In spite the fact that the generalizability of the present findings ought to be established by subsequent research, the current study has yield significant findings for the mental health of adolescents. Additional research is required to verify and generalize the findings of this study.

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Appendix A

Initial Pandemic Fatigue Scale

Pandemic fatigue	***Please indicate the extent to which you disagree or agree with the following statements.***	
	I am tired of all the COVID-19 discussions in TV shows, newspapers, and radio programs, etc.	
	I am sick of hearing about COVID-19	
	When friends or family members talk about COVID-19, I try to change the subject because I do not want to talk about it anymore	*(1) Strongly disagree - (7) Strongly agree*
	I feel strained from following all of the behavioural regulations and recommendations around COVID-19	
	I am tired of restraining myself to save those who are most vulnerable to COVID-19	
	I am losing my spirit to fight against COVID-19	

Appendix B

Initial Generalized Anxiety Disorder-7 (GAD-7) Scale

GAD-7 Anxiety

Over the last two weeks, how often have you been bothered by the following problems?	Not at all	Several days	More than half the days	Nearly every day
1. Feeling nervous, anxious, or on edge	0	1	2	3
2. Not being able to stop or control worrying	0	1	2	3
3. Worrying too much about different things	0	1	2	3
4. Trouble relaxing	0	1	2	3
5. Being so restless that it is hard to sit still	0	1	2	3
6. Becoming easily annoyed or irritable	0	1	2	3
7. Feeling afraid, as if something awful might happen	0	1	2	3

Column totals _____ + _____ + _____ + _____ =

Total score _____

Appendix C

Initial Hooked-on Nicotine Checklist (HONC)

HONC questions adapted for vaping for adolescents:

Nicotine dependence if "Yes" to any of the questions below:

Have you ever tried to quit vaping, but couldn't?

Do you vape <u>now</u> because it is really hard to quit?

Have you ever felt like you were addicted to vaping?

Do you ever have strong cravings to vape?

Have you ever felt like you really needed to vape?

Is it hard to keep from vaping in places where you are not supposed to?

When you haven't vaped for a while do you...

Find it hard to concentrate?

Feel more irritable?

Feel a strong need or urge to vape?

Feel nervous, restless or anxious?

Appendix D

Final Survey Questionnaire

Please answer the following questions according to the group you belong in.

Q1 What is your age?

- 13-14
- 14-15
- 15-16
- 17-18
- 18-19

Q2 What is your biological gender?

- Male
- Female
- Prefer not to say.

Q3 What is your nationality?

- European
- American
- Other

Q4 What is your grade level?

- Middle school (11-13 years-old)
- High school (13-18 years-old))

Q5 Are you an e-cigarette user of have you ever e-cigarette products?

- Yes
- No

Below is a list of statements that describe how people may feel. Read its statement carefully and decide which answer best represents your feelings. For each statement, select the answer that corresponds to the response that seems to describe your feelings since the pandemic. Please respond to all statements, even if some do not seem to concern you.

Q1. I am tired of all the COVID-19 discussions on TV shows, newspaper, and radio-programs, etc.

- Disagree

- Somewhat disagree.

- Neither agree nor disagree

- Somewhat agree.

- Agree

- Strongly agree.

Q2. I am sick of hearing about COVID-19.

- Disagree

- Somewhat disagree.

- Neither agree nor disagree

- Somewhat agree.

- Agree

- Strongly agree.

Q3. When friends or family members talk about COVID-19, I try to change the subject because I do not want to talk about it anymore.

- Disagree

- Somewhat disagree.

- Neither agree nor disagree

- Somewhat agree.

- Agree

- Strongly agree.

Q4. I feel strained from following all of the behavioral regulations and recommendations around COVID-19.

- Disagree
- Somewhat disagree.
- Neither agree nor disagree
- Somewhat agree.
- Agree
- Strongly agree.

Q5. I am tired of restraining myself to save those who are most vulnerable to COVID-19.

- Disagree
- Somewhat disagree.
- Neither agree nor disagree
- Somewhat agree.
- Agree
- Strongly agree.

Q6. I am losing my spirit to fight against COVID-19.

- Disagree
- Somewhat disagree.
- Neither agree nor disagree
- Somewhat agree.
- Agree
- Strongly agree.

Below is a list of statements that describe how people may feel. Read its statement carefully and decide which answer best represents your feelings.

The last two weeks, how often have you been bothered by the following problems?

Q7. Feeling nervous, anxious, or on edge.

- Not at all
- Several days
- More than half the days
- Nearly every day

Q8. Not being able to stop or control worrying.

- Not at all

- Several days

- More than half the days

- Nearly every day

Q9. Worrying too much about different things.

- Not at all

- Several days

- More than half the days

- Nearly every day

Q10. Trouble relaxing.

- Not at all

- Several days

- More than half the days

- Nearly every day

Q11. Being so restless that it is hard to sit still.

- Not at all

- Several days

- More than half the days

- Nearly every day

Q12. Becoming easily annoyed or irritable.

- Not at all

- Several days

- More than half the days

- Nearly every day

Q13. Feeling afraid, as if something awful might happen.

- Not at all

- Several days

- More than half the days

- Nearly every day

Below is a list of statements that describe how people may feel. Read its statement carefully and decide which answer best represents your feelings. For each statement, select the answer that corresponds to the response that seems to describe your feelings since the pandemic. Please respond to all statements, even if some do not seem to concern you.

Q14. Have you ever tried to quit vaping but couldn't?

- Yes

- No

Q15. Do you vape now because it is really hard to quit?

- Yes

- No

Q16. Have you ever felt like you were addicted to vaping?

- Yes

- No

Q17. Do you ever have strong cravings to vape?

- Yes

- No

Q18. Have you ever felt like you really needed to vape?

- Yes

- No

Q19. Is it hard to keep from vaping in places where you are not supposed to?

- Yes

- No

When you haven't vaped for a while, do you...

Q20. Find it hard to concentrate?

- Yes

- No

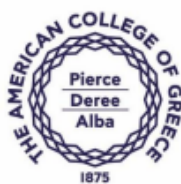Q21. Feel more irritable?

- Yes

- No

Q22. Feel a strong need or urge to vape?

- Yes

- No

Q23. Feel restless, nervous, or anxious?

- Yes
- No

Appendix E

March 6th, 2023

Eleni Basai, Master of Arts-Applied Educational Psychology

Re: Expedited determination (IRB protocol #20230341)

Dear Researcher,

Thank you for submitting your study entitled, "Covid-19 Related Changes In Signs Of Anxiety And Electronic Cigarette Use Among Adolescents in Greece". The IRB has reviewed and approved your study under the following conditions:

1) "This study will take approximately 15 to 20 minutes to be completed and there will be of other people in the study."

The red part of the text that is included in the parental informed consent needs to be deleted.

2) The questionnaires that will be used have globally shown significant strengths such as… **This sentence/idea in the parental informed consent needs to be concluded.**

3) Will the participants complete the survey in the Greek or the English language? If the Greek language is selected then you should submit to the IRB committee the "Greek" versions of the informed consent and the debriefing statement as well.

4) A thorough Assent form should be added as well in the Introductory section of the online survey. Attached, you can find an indicative template of this form

5) "If you have any questions or concerns regarding this study, its purpose, or procedures, please feel free to contact the researcher Eleni Basai graduate student at The American College of Greece-Dere."

Please correct the spelling of "Deree" in the debriefing form

6) Please include in the parental informed consent the contact information (name and email-address) of the supervisor of the study

7) Further information needs to be provided regarding the process that will be followed for approaching the parents of the participants of the study. Also, you mention the following point in the Methods section of the study: "Additionally, an announcement will be given to the participants of the school setting, and the vocational centers (Frontistirio) regarding the guidelines of the questionnaires, the study's aims, objectives, the data collection process, and the confidentiality of their voluntary participation." Will schools or vocational centers have any involvement in this study? If schools have an active participation then an approval letter is required from the corresponding schools as well.

You may send the additional information in the following e-mail address (iberatis@acg.edu).

Please keep in mind that the IRB Committee must be contacted if there are any changes to your research protocol. Feel free to contact the IRB [irb@acg.edu] if you have any questions.

Best Wishes for your research work.

Ion Beratis, Ph.D.
Chair, IRB
Cc: Office of the Chief Academic Officer

6 Gravias Street, 15
Aghia Paraskevi
Athens, Greece
t: +30 210 600 980
www.acg.edu

Appendix F

Parental Permission for Child Participation

I invite your child to take part in a research study being conducted by Eleni Basai, who is a graduate student at The American College of Greece-Deree, MA, as part of her thesis completion: *Covid-19 Related Changes In Anxiety and Electronic Cigarette Use in Adolescents in Greece.* The study, as well as the participants' rights, are described below.

Introduction

The purpose of this form is to provide you-as the parent of a prospective research study participant- information that may affect your decision as to whether or not to let your child participate in this research study. The person performing the research will describe the study to you and answer all your questions. Read the information below and ask any questions you might have before deciding whether or not to give your permission for your child to take part. If you decide to let your child be involved in this study, this form will be used to record your permission.

Purpose of the study: The Covid-19 pandemic and related lockdown has been a very stressful period for everyone and especially to young individuals. Research has indicated that anxiety symptoms and vaping use have increased after the lockdown to adolescents, however, the research is limited, and it warrants attention in adolescents living in Greece. If you agree, your child will be asked to participate in a research study about how Covid-19 pandemic has affected the increase in anxiety symptoms in adolescents and the use of electronic cigarette (vaping). The study will also investigate and identify the difference between age groups and gender across the scores.

What my child is going to be asked to do?
If you allow your child to participate in this study, they will be asked to:
- Enter the online survey link.
- Provide you, the parent, the time to go through the introduction of the study and this permission form.

- Before the initiation of the study, you the parent have to provide your permission by putting your signature at the online survey.

- Before the initiation of the survey, the participants will give their own permission to begin the questionnaire. Participants' names will not be asked at any stage and for no reason throughout their participation to protect their anonymity.

- After providing permission, the participants will be asked to answer a 22-item survey with answers such as "YES" or "NO", and from 0 to 2 (Not Even True or Hardly Even True to Very True or Often True.

This study will take approximately 15 to 20 minutes to be completed. This is a research study and, therefore, not intended to provide a medical or therapeutic diagnosis or treatment.

Risks and Benefits of this study: There are no foreseeable risks to participating in this study. The possible benefits of participation are that our current knowledge of the prevalence of anxiety and e-cigarette use among adolescents will be increased. This will raise awareness of the potential risks and it will benefit further research for crisis readiness and intervention procedures.

Participation: Participation in this study is voluntary. Your child may decline to participate or to withdraw from participation at any time. You can agree to allow your child to be in the study now and change your mind later without any penalty. In addition to your permission, your child must agree to participate in the study. If your child does not want to participate they will not be included in the study and there will be no penalty. If your child initially agrees to be in the study they can change their mind later without any penalty.

Data security: Data will be anonymous. The data will be stored in electronic form, on a password protected computer and the folder of the data will be named by an ID number. As with any data collected online, there is always a risk of data being hacked or intercepted, but I will use a secure system to collect this data to eliminate risk as possible. Through the data analysis the participants' personal information will not be included or be available to anyone, but rather only the reported answers of the survey.

Access to the data will be available to the researcher to conduct the study and analyze the data, and to the IRB (Institutional Review Board) to ensure we are following laws and ethical guidelines. After the thesis completion all data will be deleted and destroyed except from findings which will be published and presented. The participants names will not be identified.

Confidentiality: Your child will be treated with respect and courtesy. Confidentiality and anonymity of the participants will be maintained throughout the process of the survey completion and data analysis. No names will be asked or provided from the participants during the survey completion. Furthermore, anonymity for the school and vocational center will be maintained and will not be referred at any step of the research to exclude any identifying information that could associate it with your child, or with your child's participation in the study.

Contact information for any further questions.

Prior, during or after your participation you can contact the researcher Eleni Basai at +30 6980748077 or send an email to E.Basai@acg.edu for any questions or if you fell that you have been harmed. This study has been reviewed and approved by The College Institutional Review Board and the study number is 20230341.
You are kindly asked to download the current consent form and keep it for your records.

Appendix G

The American College of Greece

Assent Form for Human Research Subjects

Title: Covid-19 Related Changes in Signs of Anxiety and Electronic Cigarette Use Among Adolescents in Greece

Principal Investigator: Eleni Basai

Supervising Investigator: Remos Armaos

Why are you here?

The researcher want to tell you about a study looking at how Covid-19 pandemic has affected symptoms of anxiety and the use of e-cigarette among adolescents. We decided to invite you to be in the study because we want to learn more about the effects of the Covid-19 pandemic and because your parent or guardian thought you might like to be in the study too.

Why is this study being done?

We want to learn more about the effects of the Covid-19 pandemic and how it continues to impact in the increased signs of anxiety and use of e-cigarette products.

What will happen to me?

Only if you want, these things will happen:

1) Answer questions about symptoms of anxiety, e-cigarettes use and the fatigue resulting from the pandemic and the news overload.

Will the study hurt?

Nothing in this study will hurt.

Will the study help me?

The study will help get a better understanding of the prevalence of anxiety and if e-cigarette use among adolescents has been increased. This will raise awareness of the potential risks and it will benefit further research and intervention procedures.

What if I have questions?

You can ask us questions any time. You can ask questions now or later. You can talk to any of the people who are helping with the study.

Do my parents know about this?

This study was explained to your parents, and they said that you could be in it. You can talk this over with them before you decide.

Do I have to be in the study?

You do not have to be in the study. No one will be upset if you don't want to do this. If you don't want to be in this study, you just have to tell us. If you want to be in the study, you just have to tell us. You can say yes now and change your mind later. It's up to you.

Choosing the "Yes" answer on this section means that the page was read by you or to you and that you agree to be in the study.

Appendix H

Debriefing Form for Participation in Research Study

The American College of Greece-Deree

Thank you for your participation in my research study. Your participation is greatly appreciated.

Purpose of the study:

I previously informed you that the purpose of the study is to investigate how Covid-19 pandemic has affected the increase in anxiety symptoms and e-cigarette use in adolescents living in Greece. The goals of this research are to investigate the post Covid-19 pandemic prevalence of anxiety symptoms among adolescents. Examine the prevalence of e-cigarette use among adolescents after the Covid-19 pandemic related anxiety symptoms. Additionally, to investigate the difference across age and gender to the anxiety levels. Examine the autonomy or dependence of the adolescents to vaping products and determine the difference of vaping scores in relation to age and gender.

Right to withdraw data:

You may choose to withdraw the data you provided prior to debriefing, without penalty or loss of benefits to which you are otherwise entitled. Please initial below if you do, or do not, give permission to have your data included in the study:

_____I give permission for the data collected from or about me to be included in the study.

_____I DO NOT give permission for the data collected from or about me to be included in the study.

Final Report:
If you would like to receive a copy of the final report of this study (or a summary of the findings) when it is completed, please feel free to contact us.
Contact information:

If you have any questions or concerns regarding this study, its purpose, or procedures, please feel free to contact the researcher Eleni Basai graduate student at The American College of Greece-Deree. If you have questions later, you may contact at
E.Basai@acg.edu or at +30 6980748077.

***Please keep a copy of this form for your future reference. Once again, thank you for your participation in this study! *

Appendix I

Frequencies of Signs of Anxiety Answers

	N	Percentage
Feeling nervous, anxious, or on edge.		
Not at all	10	9.5%
Several days	21	20%
More than half the days	29	29%
Nearly everyday	45	45%
Not being able to stop or control worrying.		
Not at all	17	16.2%
Several days	30	28.6%
More than half the days	22	21%
Nearly everyday	36	34.3%
Worrying too much about different things.		
Not at all	10	9.5%
Several days	24	22.9%
More than half the days	31	29.5%
Nearly everyday	40	38.1%

Trouble relaxing		
Not at all	23	21.9%
Several days	31	29.5%
More than half the days	23	21.9%
Nearly everyday	28	27.7%
Being so restless that it is hard to sit still.		
Not at all	32	30.5%
Several days	33	31.4%
More than half the days	14	13.3%
Nearly everyday	25	23.8%
Missing system	1	1%
Becoming easily annoyed or irritable		
Not at all	10	9.5%
Several days	23	21.9%
More than half the days	20	19%

Nearly everyday	52	45.5%
Feeling afraid, as if something awful might happen		
Not at all	22	21%
Several days	21	20%
More than half the days	25	23.8%
Nearly everyday	37	35.2%

Frequencies of Vaping Answers

	N	Percentage
Have you ever tried to quit vaping but couldn't?		
Yes	39	37.1%
No	66	62.9%
Do you vape now because it is really hard to quit?		
Yes	28	26.7%
No	77	73.3%
Have you ever felt like you were addicted to vaping?		
Yes	35	33.3.&
No	70	66.7%
Do you ever have strong cravings to vape?		
Yes	48	45.7%
No	57	54.3%
Have you ever felt like you really needed to vape?		
Yes	62	59%
No	57	54.3%
Yes	62	59%
No	43	41%
Is it hard to keep from vaping in places where you are not supposed to?		
Yes	54	51%
No	50	47.6%

	N	Percentage
Missing system	1	1%
Find it hard to concentrate?		
Yes	32	30.5%
No	73	69.5%
Feel more irritable?		
Yes	47	44.8%
No	58	55.2%
Feeling a strong need or urge to vape?		
Yes	45	42.9%
No	60	57.1%
Feel restless, nervous, or anxious?		
Yes	47	44.8%
No	58	55.2%

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LIST OF TABLES AND FIGURES

Table 1

Reliability Statistics

Scale	N	Items	Cronbach's a
Pandemic Fatigue	105	6	0.846
Generalized Anxiety Disorder	105	7	0.877
Hooked-on Nicotine	105	10	0.913

Table 2

*ANOVA testing for Generalized Anxiety Disorder * Nationalities and Hooked-on*

*Nicotine * Age*

		Sum of Squares	df.	Mean Square	F	Sig.
Generalized Anxiety Disorder	Between Groups	1.475	2	.738	1.072	.346
	Within Groups	70.214	102	.688		
	Total	71.689	104			
Hooked-on Nicotine	Between Groups	0.52	4	.13	.094	.948
	Within Groups	13.643	100	.136		
	Total	13.695	104			

Table 3

Multiple Linear Regression for vaping scores

|			95% CI			
Variable	Beta	SE	LL	UL	β	*p*
What is your age?	0.02	0.03	-0.042	0.074	0.054	.586
What is your biological gender?	0.12	0.07	-0.020	0.245	0.167	.094

*Note. * p<.05.*

Table 4

Chi Square Test for Electronic Cigarette Use and Grade Level

Chi Square Test Are you an e-cigarette user or have you ever tried e-cigarette products * What is your grade level			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi Square	.912	1	.304
Likelihood Ratio	1.669	1	.196
Linear-by-Linear Association	.903	1	.342
N of Valid Cases	105		

a. 1 cells (25%) have expected count less than 5. The minimum expected count is .76.
b. Computed only for a 2x2 table

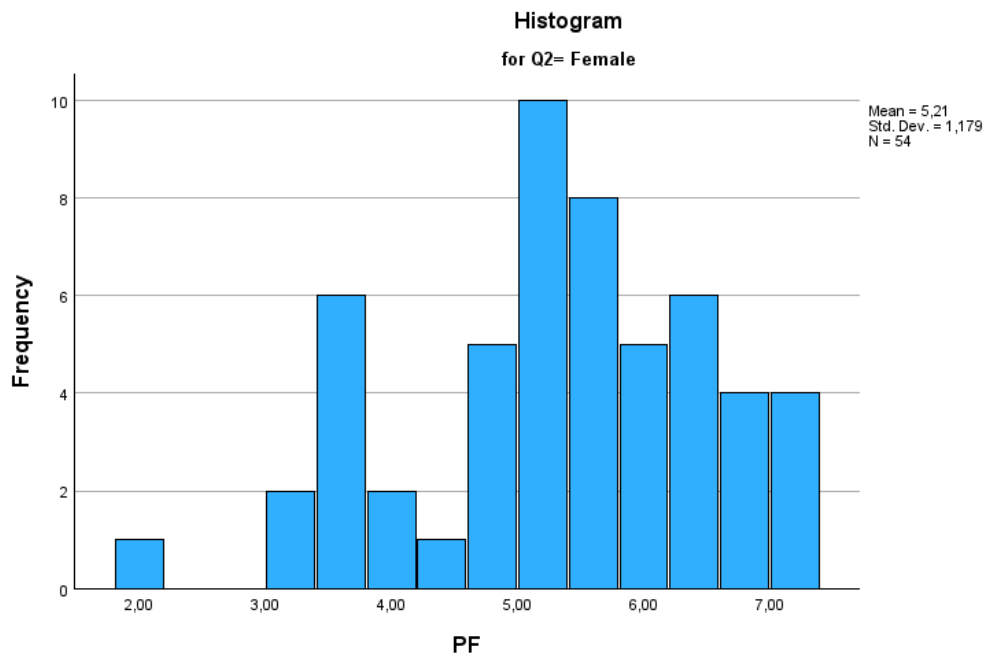**Lists of Figures**

Figure 1

Distribution of the Pandemic Fatigue Scale
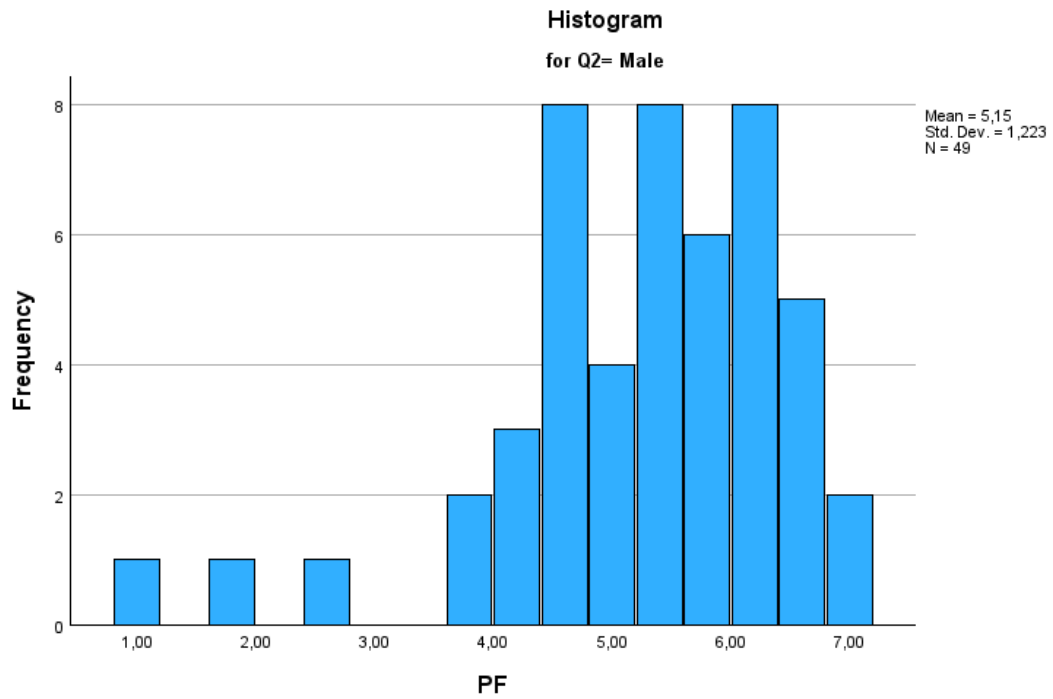
Note: Histogram of data distribution of the Pandemic Fatigue scale to male
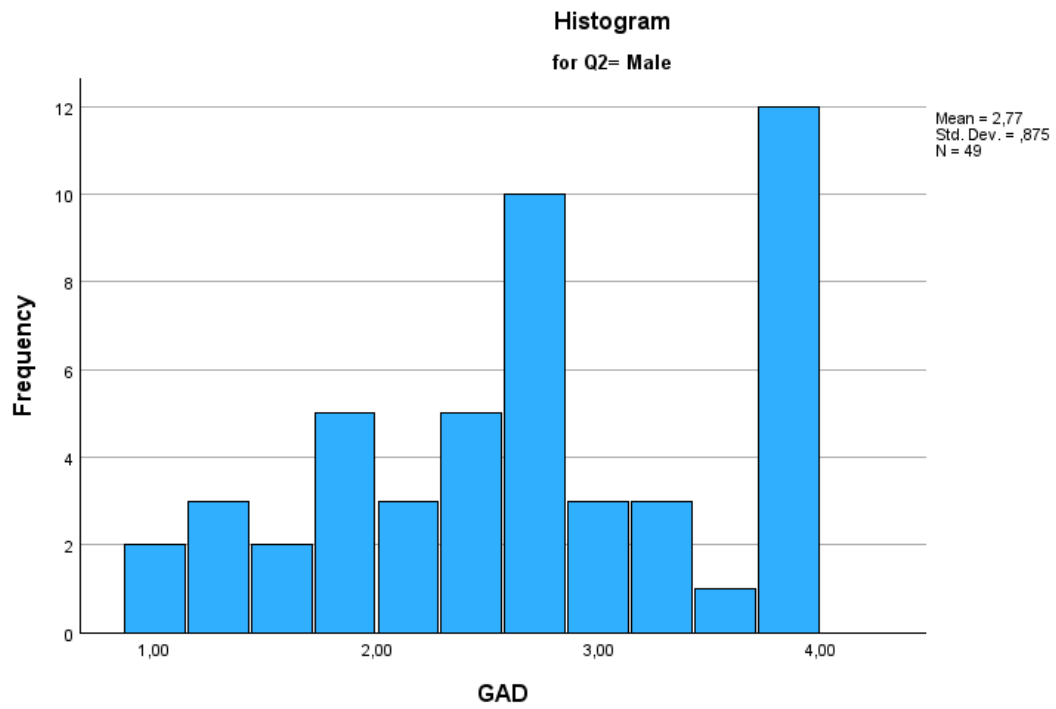
participants.

Figure 2

Distribution of the Pandemic Fatigue Scale

Note: Histogram of data distribution of the Pandemic Fatigue Scale to female
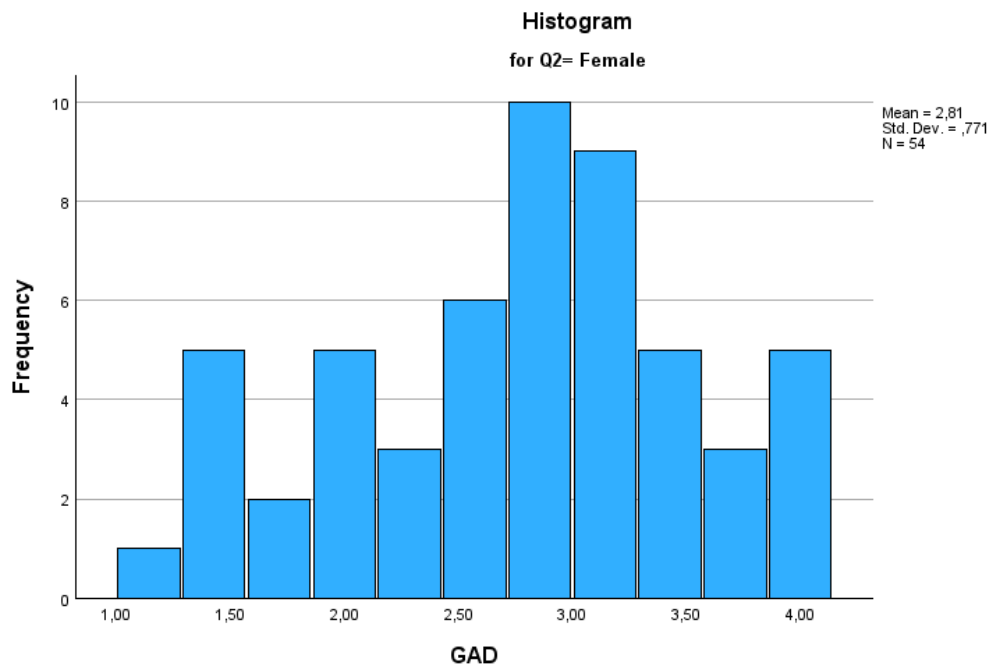
participants.

Figure 3

Distribution the Generalized Anxiety Disorder-7 (GAD-7)

Note: Histogram of the distribution of the Generalized Anxiety Disorder-7 (GAD-7)

Scale to male participants.

Figure 4

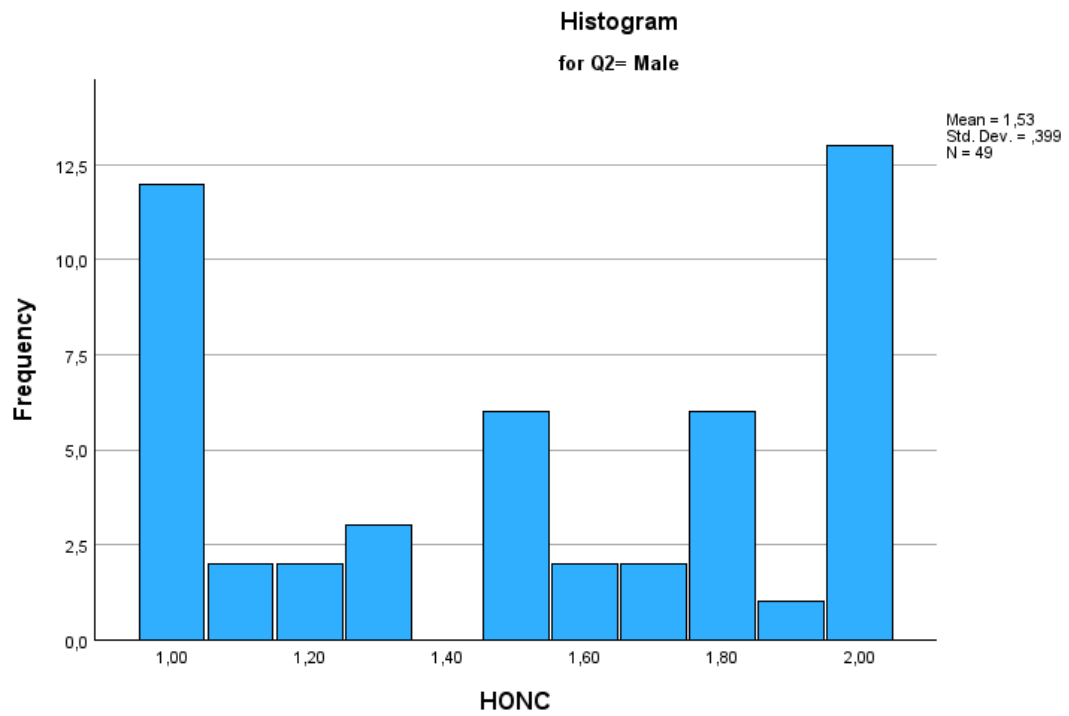*Distribution the Generalized Anxiety Disorder-7 (GAD-7)*

Note: Histogram of the distribution of the Generalized Anxiety Disorder-7 (GAD-7)
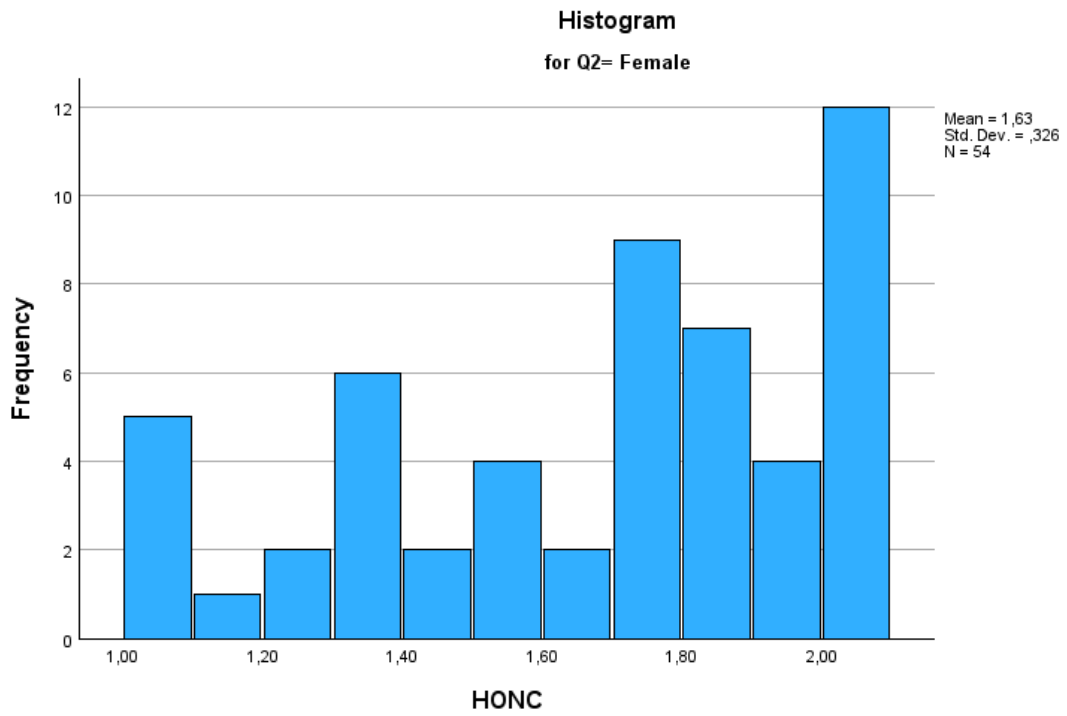
Scale to female participants.

Figure 5

Distribution of the Hooked-on Nicotine Scale (HONC)

Note: Histogram of the distribution of the Hooked-on Nicotine Scale (HONC) to male

participants.

Figure 6

Distribution of the Hooked-on Nicotine Scale (HONC)

Note: Histogram of the distribution of the Hooked-on Nicotine Scale (HONC) to

female participants.

Figure 7

Descriptive statistics

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
What is your age?	105	1	5	3,30	1,226	-,318	,236	-,728	,467
What is your biological gender?	105	1	3	1,55	,537	,168	,236	-1,185	,467
What is your nationality?	105	1	3	1,38	,671	1,520	,236	,934	,467
What is your grade level?	105	1	2	1,90	,295	-2,798	,236	5,941	,467
Are you a e-cigarette user or have you ever tried e-cigarette products?	105	1	2	1,10	,295	2,798	,236	5,941	,467
Valid N (listwise)	105								

Note: A summary of the demographic data collected from the participants.

Figure 8

Pearson's Correlation of the pandemic fatigue and signs of anxiety

Correlations

		PF	GAD
PF	Pearson Correlation	1	,446**
	Sig. (2-tailed)		<,001
	N	105	105
GAD	Pearson Correlation	,446**	1
	Sig. (2-tailed)	<,001	
	N	105	105

**. Correlation is significant at the 0.01 level (2-tailed).

Figure 9

Pearson's correlation of signs of anxiety and the e-cigarette use

Correlations

		GAD	HONC
GAD	Pearson Correlation	1	-,460[**]
	Sig. (2-tailed)		<,001
	N	105	105
HONC	Pearson Correlation	-,460[**]	1
	Sig. (2-tailed)	<,001	
	N	105	105

[**]. Correlation is significant at the 0.01 level (2-tailed).