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MULTIVARIATE CLUSTER ANALYSIS OF THE TEACHER STRESS INVENTORY (TSI) PRIOR TO AND DURING COVID-19

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By

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MULTIVARIATE CLUSTER ANALYSIS OF THE TEACHER STRESS INVENTORY (TSI) PRE-COVID-19 AND DURING COVID-19

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Abstract

The coronavirus disease 2019 (COVID-19) pandemic has caused a negative situation with no precedents in the education system of the United States (U.S.). To mitigate the spread of the virus, many school closures occurred nationwide, and schools transitioned from face-to-face instruction to a mixture of self-directed guide home education or online teaching. These drastic changes could be causing teachers, as many other professionals exposed to sudden adjustments (e.g., medical doctors/firefighters), to express high levels of stress, emotional burden, and anxiety. The purpose of this study is to compare the profiles of the teacher stress inventory (TSI) before and during COVID-19. Data from a representative sample of teachers in the U.S. collected during the Pandemic (n=361) was compared to data collected in 2017 (n=336). The goal of this study was to estimate the impact of COVID-19 on teachers' stress. In specific, this dissertation examined if individuals with high, medium, and low levels of stress differ in health outcomes before and during COVID-19. Results indicate that teachers report high levels of stress during normal circumstances and during the event of a pandemic. However, teachers' stress profile during the event of a pandemic showed a higher level of impact in Emotional manifestation including symptoms of Anxiety and Depression. The results of this study highlight the importance of promoting mental health and providing assistance to teachers at-risk to prevent teachers' disability and attrition.

Keywords: Teacher, stress, TSI, COVID-19

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CHAPTER I

Introduction

The coronavirus disease 2019 (COVID-19) is a highly infectious disease discovered in 2019 and categorized as a pandemic in March 2020 (World Health Organization; WHO, 2020a). In addition to the direct disease burden, COVID-19 has caused global harm in multiple areas of society, including the education system (Holmes et al., 2020; Kumar & Nayar, 2020; Shigemura et al., 2020). To mitigate the spread of COVID-19, school closures occurred worldwide, impacting more than 90% of the student population by April 2020 (United Nations Educational, Scientific and Cultural Organization; UNESCO, 2020a). In the United States (U.S.), at least 55.1 million students and 124,000 schools were affected by COVID-19 related closures (Education Week, 2020). Initially, some schools were fully closed, and classes were canceled. However, most schools transitioned to continue teaching via online methods (Van Lancker & Parolin, 2020) or to provide self-directed education at home with the use of physical packages. As a result, teachers' levels of stress have increased because they are expected to provide services in a way they have not been trained (e.g., online teaching, coordinating home-learning, etc.; MacIntyre et al., 2020; Moorhouse, 2020).

The teaching profession is one of the occupations with higher work-related stress and worse physical and psychological health (Johnson et al., 2005; Kyriacou, 2001; Tang

et al., 2001; Yang et al., 2009). Teaching stress is likely caused by a combination of factors related to teacher background, organizational factors, and personality factors (Weng, 2004). For instance, the stress in teachers is associated with poor job satisfaction, low economic income, and high classroom demands (Wang et al., 2015); feelings of being over-committed at work with duties that lead to taking work home, teaching disadvantaged students without adequate support, having little time to relax, teaching unmotivated students, and feeling the pressure of being accountable (Richards, 2012). All these variables could be exacerbated, given the impact of COVID-19 in the education system.

Similarly, studies have identified the following as stressors for teachers: the demands from administrators, coworkers, students, and parents, work overload, students' misconduct, and lack of acknowledgment of achievements (Greenglass & Burke, 2003). Thus, high work demand, low work satisfaction, students' behaviors, and low self-efficacy (Klassen & Chiu, 2010) are frequently cited as sources of teacher stress. In other words, although teachers with a high level of stress may gain satisfaction from what they do, this level of satisfaction may be reduced by role ambiguity, low autonomy, or frequency and level of conflict with students and colleagues (Greenglass & Burke, 2003), resulting in reports of lower personal accomplishment and higher emotional exhaustion (Martin et al., 2012; Van Droogenbroeck et al., 2014).

Furthermore, teachers are often used as key personnel in the front lines regarding responding to emotional and behavioral crises in schools (Hydon et al., 2015). However,

in the literature, little attention is paid to the needs of the teachers despite their role in working with children and trauma (Hydon et al., 2015). The goal of this study is to estimate the impact of the unprecedented COVID-19 on teachers' stress levels. Considering that people in similar situations (i.e., equally demanding jobs) can experience different levels of stress (Pearlin, 1982), this dissertation examined if individuals with high, medium, and low levels of stress, differ in the health outcomes of the teacher stress inventory (TSI) during and prior to COVID-19. Archival data from 2017 and new data collected in 2021 was used to evaluate the presence of differences between teachers' TSI profile before and during the COVID-19 pandemic; if the clusters before and during COVID-19 differ regarding the TSI variables of sources of stress; if there are any differences when the cluster results for both groups are compared regarding the manifestations of stress as measured by the TSI; if there are differences when the cluster results for both groups are compared regarding psychopathology; if there are any differences when the cluster results for both groups are compared regarding substance use.

Significance of the Study

Teachers are vital elements in the education system; the best programs, laboratories, and libraries are meaningful without the teachers who will bring them into force (Güneyli, 2012). As the need for public school teachers is increasing, the enrollment of students is growing, and the rates of attrition are increasing. Having teachers who are at risk by experiencing high levels stress, anxiety and depression, might

lead to reduction of productivity, burn-out, and disability. This study adds to the existing literature investigating the levels of stress in the teaching profession. However, this is the first study exploring the impact of COVID-19 on the teacher population.

Definition of Terms

Coronavirus Disease 2019

Also known as COVID-19, is a respiratory disease caused by the SARS-Cov-2 virus (Centers for Disease Control and Prevention; CDC, 2020a).

SARS-CoV-2

"The SARS-CoV-2 virus is a betacoronavirus," and it has its origin in bats (CDC, 2020a).

Quarantine

"Separates and restricts the movement of people who were exposed to a contagious disease to see if they become sick" (CDC, 2017).

Isolation

"Separates sick people with a contagious disease from people who are not sick" (CDC, 2017).

Social Distancing

Also known as physical distancing, "means keeping space between yourself and other people outside of your home. To practice social or physical distancing: Stay at least 6 feet (about 2 arms' length) from other people, do not gather in groups, and stay out of crowded places and avoid mass gatherings" (CDC, 2020b).

Teachers

Individuals who instruct in the levels of kindergarten through grade 12th.

Stress

"The pattern of specific and nonspecific responses a person makes to stimulus events that disturb his or her equilibrium and tax or exceed his or her ability to cope" (American Psychiatric Association, 2013, p. 829).

Somatization

This refers to a disorder where there is a physical pain not directly corresponding to a biomedical cause (Katon et al., 1982).

CHAPTER II

Literature review

Stress

The Diagnostic and Statistical Manual of Mental Disorders (DSM-5) defines stress as a pattern of responses a person makes to the environmental cues that interrupt one's equilibrium by exceeding the ability to cope (American Psychiatric Association, 2013). Although stress is a universal phenomenon that exists regardless of ethnicity, culture, and gender, there is no unanimity on its operational definition. For example, some definitions of stress are inclined to a stimulus-based focus, in which the growth of the pressure from an external stimulus leads to internal collapses (Butler, 1993), while others describe it as a response-based phenomenon with physiological emphasis (e.g., Selye, 1950).

A broader framework to help explain how the stress phenomenon is a dynamic process (Butler, 1993) is the biopsychosocial model (Bernard & Krupat, 1994). This model recognizes the significant contribution and interaction between the biological, psychological, and social systems on the perception and expression of stress by humans (Bernard & Krupat, 1994). Furthermore, this model acknowledges the importance of the environment, the interpretation of the individual, and the mental and physical reactions to stress (Bernard & Krupat, 1994). In this model, the environment is indicated to play an important role in the stress process (Bernard & Krupat, 1994). It is the situation that

occurs before the appraisal of stress, and that can provoke the stress response. These events are also known as stressors, and it refers to positive and negative events (Friedman, 2002). Some stressors can be major life events, and others are daily hassles related to role strains, work, school, etc. Some social factors associated with the environment and the experience of stress are socioeconomic levels, social instability, and the conditions of the living environments (McEwen, 1998). As noted by McEwen (1998), stressful life events and social instability have an impact on an individual's susceptibility to pain.

The physiological reaction to stress is associated with the general adaptation syndrome (GAS; Seyle, 1976, 1982) in which stress is the body's response to demands of the environment (Rice, 1992). According to the GAS, the response to stress unfolds as follows:

a) First, there is an alarm reaction, a natural reaction in which there is a fight-or-flight response (Selye, 1950); this is characterized by adaptive changes. In this stage, there is an activation of the hypothalamic-pituitary-adrenal (HPA) axis and the autonomic nervous system (ANS; Miller & O'Callaghan, 2002; Orem et al., 2019), this, in turn, results in changes such as increases in heart rate, sweating, and changes in appetite (Fechir et al., 2010; Sominsky & Spencer, 2014). Additionally, some hormones are released during the fight or flight response. For example, during a stressful situation, there is an increase in the production of epinephrine and cortisol, which are associated with adrenaline

and stress, respectively. Ultimately, long periods of stress in the body have been linked to physical and mental health issues like headaches, obesity, digestion problems, cardiovascular diseases, difficulties with concentration, memory impairment, depression, anxiety, and insomnia (Langille, 2017).

b) The second stage is resistance, in which defense mechanisms and the adaptive changes are sustained and optimal, but the body remains in high alert (Selye, 1950). If the stressor is resolved during the second stage, the body goes back to its natural condition (i.e., regular production of hormone levels, heart rate, and blood pressure). If the stress persists, the third stage, exhaustion, occurs.

c) During exhaustion, elevated levels of stress can lead to structural and functional brain alterations that are reflected in changes in behavior and physiological function (Cox, 1985; McEwen & Gianaros, 2011). Exhaustion refers to the results of prolonged stress that lead to the ceasing of adaptive responses and which may lead to illnesses (Selye, 1950). For example, exhaustion can lead to hypertension, heart attack, cancer, psychological illnesses like depression or breakdowns (Palmer et al., 2003), and even death (Selye, 1950).

Finally, personal interpretation or subjective meaning of the situation determines if and to what degree the event is experienced as stressful or not (Bernard & Krupat, 1994). This interaction explains why people in similar situations, for example, equally demanding jobs, can experience different levels of stress (Pearlin, 1982). It highlights the

notion of evaluation processes that precede the experience of stress and activation of GAS (Lazarus & Folkman, 1984; Lazarus & Launier, 1978; Pearlin, 1982).

Thus, the biopsychosocial model framework is the notion that stress is a state experienced when an individual perceives that the demands of a stressor surpass the personal and social resources available. After the initial assessment of a situation, the individual will measure available resources, and at the same time, physiological arousal occurs. Then, there is a secondary cognitive assessment process in which the person considers the resources for coping psychologically and behaviorally. In summary, the biopsychosocial model of stress takes into consideration the contribution of different variables in the experience of stress. This model suggests that the meaning of a stressor and the stress response might vary among individuals depending on the biological, social, and psychological resources that the individual has to deal with the event. In the following section, the impact of stress in the workplace will be presented.

Stress in the Workplace

Americans are among the most stressed-out individuals in the world (Gallup Inc, 2020). According to the Gallup 2019 Global Emotions Report, 55% of Americans reported being stressed compared to a world average of 35% (Gallup Inc, 2020). Their findings are based on 151,000 interviews in more than 140 countries (Gallup Inc, 2020). Likewise, a nationwide survey in which participants were interviewed every day for eight days found that respondents claimed to have experienced a daily stressor on an average of 40% of those days, and 10% experienced multiple stressors within a single day (Almeida

et al., 2002). The daily stressors were related to work concerns, interpersonal concerns, or issues related to commuting (Almeida et al., 2002). Furthermore, the American Psychological Association (APA) annual "Stress in America" survey suggests that 74% of adults in the U.S. report moderate to high levels of stress, and nearly 64% of Americans cited work and money as the primary sources of their stress (APA, 2018).

Some of the negative behaviors in the workplace due to stress are a decrease in job performance, absenteeism, or turnover (Cynkar, 2007). In regard to job performance, stress can take a significant portion of employees' time at work. For instance, in a survey of 1,506 U.S. consumers who worked full-time, 50% of workers acknowledged spending, every week, one to five hours of work thinking about what stresses them, and 22% said they spend more than five hours per week (Colonial Life, 2019). Similarly, data from the 2017 Gallup's State of the American Workplace survey suggests that because of stress, more than 50% of individuals are not engaged at work, 16% are actively disengaged, and only 33% are engaged at work (Gallup Inc, 2019). Additionally, stress affects productivity by worsening the rate and quality of the work. For example, when inquired about the impact of stress on their work performance, 41% believed it made them less productive, 33% noted it made them less engaged, 15% admitted to searching for a different job because of stress, and 14% said it causes them to be absent more frequently (Colonial Life, 2019).

Prolonged periods of time under stress, or chronic stress, can result in burnout and turnover (Wrike, 2019). In a report about the impact of stress for employees and their

work product, it was found that more than a quarter of workers felt they will burn out in the following 12 months if current levels of stress did not change (Wrike, 2019). When stress levels reach the burnout state, the production can be affected by exhaustion (e.g., anxiety, panic, anger, depression, sleeplessness) and breakdowns (e.g., lasting disease, infections, heart attack, cancer, diabetes; Wrike, 2019). Korn Ferry reports that most stressed employees (76%) noted that workplace stress had impacted their personal relationships negatively, and 66% of respondents said they had trouble sleeping due to work-related stress (2018). Thus, chronic stress affects the individual at work and at home, and it can also lead to mental and physical sickness.

With respect to absenteeism and stress, approximately 54% of work absences are due to stress (Elkin & Rosch, 1990). For instance, the American Institute of Stress (AIS) noted that work-related stress causes around one million workers to call in sick daily (2020). Another report by Verespej (2000) suggests that 75% to 90% of visits to the doctor are likely to be for complaints and illnesses that are stress related. Certainly, stress can lead to short or long-term negative health outcomes, including exhaustion, physical pain, depression, sleep disturbances, or even death (Brock & Grady, 2002; Fevre et al., 2003). In fact, it is estimated that about 120,000 deaths are associated with workplace factors (Goh et al., 2016).

In addition to the health care costs for the employee who goes to the doctor due to stress, work-related stress has an economic cost for the organizations (Cynkar, 2007). For example, the employer is at-risk of being held legally liable for damages resulting

from stress in the workplace (Fevre et al., 2003). Furthermore, when the cost of absenteeism is considered, it can be noticed that workplace stress affects the economy. For instance, work-related stress can lead to the loss of talented and trained employees. When stress at work becomes an intolerable condition for the individual; ultimately, it leads them to quit their job. For instance, 16% of workers report having to quit a job because of stress (Korn Ferry, 2018), and replacing an employee has a cost. The annual cost of work-related stress is an acknowledged problem across the world (Dollard, 2003). In the U.S., specifically, this cost is estimated to range from 200 to 300 billion dollars per year (Fevre et al., 2003).

Stress and the Teaching Profession

A teacher is an individual who instructs in the levels of kindergarten through grade 12th; those who instruct at the college and university level are called faculty or professor. In general, those who teach from kindergarten through 6th grade are Elementary teachers, and from 7th grade through 12th are considered Secondary teachers (NCES, 2017). The characteristics of a teacher's job can vary depending on where they work. In the U.S., the education system is decentralized; thus, each state has its own department of education that makes decisions on teacher education programs, certification requirements, education policies, curriculum, resources, school working conditions, and salaries (Collinson & Ono, 2001).

In the U.S. during the school year 2017-2018, there were 3.5 million public-school teachers (NCES, 2020). Approximately, 1.8 million taught in an elementary

school, and 1.8 million at the secondary level (NCES, 2020). About 76% of teachers were female and 24% were male, with a lower percentage of male teachers at the elementary school level (i.e., 11%) than at the secondary school level (i.e., 36%). Regarding race and ethnicity, 79 % were White, 9% Hispanic, 7% Black, 2% Asian, 2% had two or more races, 1% were American Indian/Alaska Native, and Pacific Islander made up less than 1% of public-school teachers (NCES, 2020).

In regard to childcare responsibilities, based on an analysis conducted by Dr. Hansen and Dr. Quintero from the Brookings Institution's, approximately 48% of public-school teachers have children living at home (Barnum, 2020). This includes younger children, who need constant supervision, as well as teenagers, who might not. Furthermore, according to Dr. Hansen (personal communication, December 11, 2020), this data comes from an analysis of the American Community Survey, 2018 five-year estimates, which surveys households about both occupation and household characteristics like the presence of children at home.

Additionally, a recent report of the NCES indicate that approximately 90% of teachers have a regular teaching certificate, and 57% have more advanced degrees (McFarland et al., 2019). Elementary teachers instruct in subjects that range from General Education, English, Mathematics, Science, Arts, Music, English as a Second Language/Bilingual, Health, Physical Education, and Special Education (NCES, 2017). In Secondary school, subjects like Foreign Language, Social Studies, Vocational, and Technical are added to the levels of instruction (NCES, 2017). On a national average,

teachers have approximately 14 years of experience in the field (McFarland et al., 2019). There are more than 50 million students enrolled in public school (McFarland et al., 2019). The teacher-student ratio is, on average, of 21 students in primary schools, 17 students in middle schools, 16 students for high schools, and 16 students for combined-grade schools among departmentalized classrooms, the average class size is 26 in primary, 25 in middle schools, 23 at the high school level, and 19 for schools with combined grades (Taie & Goldring 2020).

Teacher's salary varies broadly by state. Based on a national average, the U.S. teacher's salary in 2017–18 school year was $60,477 (National Education Association; NEA, 2019). In some states like New York, California, and Massachusetts, the salary was in the $80,000s, whereas in states like Mississippi, West Virginia, and Oklahoma, the salary was in the $40,000s (NEA, 2019). In general, the average one-year salary increase in the U.S. was 1.58% from the 2016–17 to 2017–18 school year. However, this also varied widely by state; for example, Alaska had the largest one-year increase with 4.6%, and Nevada had the largest one-year decrease with - 0.7% (NEA, 2019). The socioeconomic status of the area where teachers work also makes a difference in salary; nationwide, teachers working in rural areas earn less, on average, than their peers in cities, suburban, and towns, even after controlling for geographic cost differences (NCES, 2007).

In general, when compared to the salary of other professions, teachers make a lower income. For instance, Allegretto and colleagues (2011) used aggregated data of the

2006-10 period to analyze trends of teacher's salaries in parallel with comparable workers. Their study includes a national representative size that included all 50 states. Allegretto and colleagues (2011) found that teachers earned approximately 12% less than comparably educated workers in 2010. Later, in 2016, Allegretto and Mishel updated their report and found that in the 2015-2016 school year, the weekly wage of public-school teachers was 17% lower than those of comparable workers. Additionally, the salary disparity was more significant for experienced teachers than for those new to the profession (Allegretto et al., 2016). Overall, the authors found that teachers' compensation, including wages and benefits, was, on average, 11% lower than that of comparable workers in 2015 (Allegretto et al., 2016); even when benefits are included, the gap is equivalent to that found in previous studies.

Additionally, teacher's work patterns are different from other professions. For instance, teachers are mainly responsible for instructing students during school hours; however, they are also required to do other tasks during non-teaching time (e.g., creating lesson plans, grading assignments, etc.). According to an analysis conducted by Krants-Kent (2008), using data from the American Time Use Survey, on average teachers were more likely than other professionals to complete some work at home (i.e., 30% versus 20% respectively). Particularly on Sundays, 51% of teachers complete work from home, compared to a 30% of other full-time professionals.

Teachers' Attrition

Teachers who leave the profession represent the phenomenon of attrition (Croasmun et al., 1997). This has been a concern noted in research since as early as the 1970s (e.g., Charters 1970; Mark & Anderson 1978; Murnane 1981). In fact, when compared to other professions, the percentage of teacher attrition is higher (Glazer, 2018). A study suggests that, in the U.S., approximately 30% of new teachers leave the profession in the first five years (Ingersoll, 2001, 2003). Another study suggests that most educators leave the profession within two years (Glazer, 2018). Teacher attrition has negative implications for the school. For example, it represents a monetary loss; The Department of Labor estimated that teacher attrition costs the school 30% of the departing teacher's salary (Alliance for Excellent Education, 2004). Based on their estimates, each case of teacher attrition costs a school system approximately $12,546 (Alliance for Excellent Education, 2004). With 173,439 non-retired teachers who left the profession during the 1999–2000 period, the total cost of replacing them was about $2.2 billion for the year (Alliance for Excellent Education, 2004). Teacher attrition is not only associated with economic loss; it also has an effect in the school as an organization, and it implicates an educational cost (Borman & Maritza, 2008; Kelly & Northrop, 2015; Sutcher, Darling-Hammond, & Carver-Thomas, 2016).

Additionally, teacher attrition is detrimental to student educational progress and achievement of instructional goals (Boyd et al., 2005; Hanushek et al., 1999). For example, Guin examined the impact of turnover, including teachers leaving the

profession or transferring to other schools, on a school's climate and ability to function (2004). A total of 66 elementary schools were included. The authors investigated the relationship between turnover and the proportion of students who met standards on statewide assessments. The results indicated that students in schools with higher turnover had lower achievement scores (Guin, 2004). Therefore, the turn-over of teachers has an impact on educational achievement.

The estimated percent of public-school teachers turn-over per year is about 16%; of those, about 8% of teachers may leave their schools every year, including those who move to a different school, and about 8% leave the profession entirely (Goldring & Taie, 2014). Based on the results from the 2012–13 teacher follow-up survey, of those teachers who left, 51% reported having a more satisfactory workload in their current jobs, and 53% reported having better working conditions (Goldring & Taie, 2014). It is important to note that the number of teachers who leave the profession surpasses the number of those entering the field, which, in turn, leads to the current teacher shortage (Rich, 2015). For example, in the 2018–2019 school year, there were more than 120,000 unfilled teacher jobs nationwide (Wiggan et al., 2020). Moreover, school districts are struggling to find teachers in areas like bilingual education, math, science, and special education (Rich, 2015). For instance, some studies suggest that the phenomenon of attrition in the teaching profession is the result of burnout and emotional exhaustion (Rumschlag, 2017). Other studies, like a study conducted by Torenbeek and Peters, have identified job demands as the main cause of teacher attrition (2017). In both cases, stress is a

contributor to attrition, and research to better understand the factors that contribute to teacher's attrition and how to prevent it is highly warranted.

Teachers Stress and Mental Health

Numerous efforts have been made to understand how job and health factors influence the capacity of people to perform their daily activities. A growing body of research has shown that the teaching force is an at-risk population for stress, anxiety, depression, burn-out, and somatization. Several studies have focused on the relationship between teachers' stress levels and mental and physical health, suggesting that teaching is one of the occupations with higher work-related stress and worse physical and psychological health (Johnson et al., 2005; Kyriacou, 2001; Tang et al., 2001; Yang et al., 2009).

Teachers' Stress. Notably, teaching has been listed as a profession under high levels of stress (Kyriacou, 2001). For example, a study conducted by Johnson and colleagues (2005) compared the experience of occupational stress across 26 professions, including teaching. The authors selected three stress variables (i.e., psychological well-being, physical health, and job satisfaction) to be compared in a database of more than 25,000 individuals. When mean scores were compared, the authors found that teaching was the second profession with significantly worse than average scores on physical health and psychological well-being. Regarding Job satisfaction, teaching felt in sixth place. In this study, the possible contributors to occupational stress were work overload, lack of control of work issues, and emotional demands. Additionally, the authors found a

significant relationship between the three variables: physical health and psychological well-being, physical health and job satisfaction, psychological well-being, and job satisfaction.

The teaching job comes with stress caused by a combination of stressors related to teacher background, organizational factors, and personality factors (Weng, 2004). Numerous efforts have been made to understand the sources of stress for teachers. For example, a nationwide study by Richards (2012) evaluated teachers in three areas: sources of stress, manifestations of stress, and coping strategies. The study used as measurement an adapted version of the TSI to assess sources and manifestations of stress, and the Coping Scale for Adults to evaluate how teachers deal with stress. The study found that the primary sources of stress are: 1) feelings of being over-committed at work with too many duties and responsibilities that often lead to taking work home; 2) teaching needy students without enough support; 3) having little time to relax; 4) teaching students who do not seem motivated to learn; and 5) feeling the constant pressure of being accountable. Additionally, the study found that the top five ranked manifestation of stress were: 1) being physically exhausted, 2) not being as idealistic and enthusiastic about teaching as previously; 3) feeling overwhelmed with what is expected of me as a teacher and doubting my ability to make a difference in students' lives; 4) having frequent headaches, stomach pains, and/or high blood pressure; 5) job stress has negatively affected personal relationships in my life. When inquired about coping strategies, the highest rated ways of dealing with stress by teachers were: 1) having good friends and

family who are there for me; 2) having a good sense of humor to carries me through challenges; 3) having time of solitude to help me cope with stress at school; 4) I see stress as a problem to be solved, and I believe that I can succeed; 5) having a positive attitude no matter what is going on.

Similarly, other studies have identified the following stressors demands from administrators, coworkers, students, and parents, work overload, students' misconduct, lack of acknowledgment of achievements (Greenglass & Burke, 2003). Thus, high work demand, low work satisfaction, behaviors of students, and low self-efficacy (Klassen & Chiu, 2010) are frequently cited as sources of teacher stress. This is not to say that stressed teachers do not enjoy their job. Teachers with elevated levels of stress gain satisfaction from what they do, but it is reduced by stress variables (e.g., the ambiguity of their role, low autonomy, frequency, or level of conflict with students and colleagues; Greenglass & Burke, 2003). For instance, the stress in teachers is associated with poor job satisfaction, low economic income, and high classroom demands (Wang et al., 2015). Furthermore, Female teachers, particularly, report having lower personal accomplishment as well as higher emotional exhaustion (Martin et al., 2012; Van Droogenbroeck et al., 2014).

Psychopathology. Stress can lead to several mental illnesses, such as anxiety and depression (Langille, 2017; Wilkerson & Bellini, 2006). Howard and colleagues (2017) examined the presence of psychological disorders in the teaching profession. The authors conducted an online survey where 2,988 teachers from 46 Texas districts participated.

Results indicated that higher levels of stress, inferior physical quality of life, major depression, panic, and anxiety disorder were significantly related to somatization. This study suggests that higher levels of stress and poorer physical and mental health were the psychosocial and demographic factors associated with somatization disorder in teachers. The authors used a regression analysis to identify the variables most strongly associated with the presence of somatization disorder in teachers. The authors found that compared to Caucasians, African American teachers are 3.9 times, and Hispanic teachers are two times more likely to develop somatization disorder.

Similarly, a study conducted by Green (2017) evaluated the effects of coping strategies on teachers' chronic pain reports. In this study, high levels of stress, chronic pain, anxiety, and depression were prevalent for the teachers. This study noted that high levels of stress, lower levels of job satisfaction, increased physical demands, and older age were the variables associated with chronic pain in their sample. Furthermore, this study found that positive religious or spiritual coping strategies were effective to moderate pain reports for the teachers with high levels of stress, but for those with low levels of stress, these coping strategies were associated with higher levels of pain reports. The results of this study highlight the importance of identifying strategies to reduce stress and improve the health outcomes of teachers.

A study conducted by Chambers-Mack and colleagues (2019) provided evidence to support that depression is linked to intentions to quit among teachers. The authors used data from an online survey. The sample consisted of 2,588 participants from different

school districts in Texas. Specifically, somatization disorder, along with poorer mental health, high levels of stress, and major depression, were predictors of intentions to quit. This study highlights the relationship between stress and depression and its importance of mental health to prevent teachers' disability.

Overall, the literature of the biopsychosocial model provides a framework to understand the process of stress because it takes into consideration the contribution of different variables in the experience of stress. This model suggests that the meaning of a stressor and the stress response might vary among individuals depending on the biological, social, and psychological resources that the individual has to deal with the event. A growing body of research has shown that, during normal circumstances, teaching is an at-risk population for stress, anxiety, depression, burn-out, and somatization. Several studies have focused on the relationship between teachers' stress levels and mental and physical health, suggesting that teaching is one of the occupations with higher work-related stress and worse physical and psychological health.

COVID-19

COVID-19 is a highly infectious disease discovered in 2019 (WHO, 2020b). It is novel because, before that year, there had not been cases identified in humans by the scientific community (WHO, 2020b). COVID-19 was first found in Wuhan, China, and in 30 days, it had spread from one city to the entire country (Wu & McGoogan, 2020). Due to the increasing number of cases presented in China and in the international community, COVID-19 was categorized as a Public Health Emergency of International

Concern on January 30, 2020 (WHO, 2020c). Later, as the presence of cases was identified in more countries, COVID-19 was categorized as a pandemic in March 2020 (WHO, 2020a). By that time, some of the countries that had been severely affected by major outbreaks included China, Italy, Iran, South Korea, Spain, Germany, France, and the U.S. (Khachfe et al., 2020).

COVID-19 is part of the vast family of Coronaviruses (CoV); these are viruses that cause illness that range from the common cold to more complex pulmonary diseases like the Middle East Respiratory Syndrome (MERS-CoV) and Severe Acute Respiratory Syndrome (SARS-CoV; WHO, 2020b). The first coronavirus was found in 1937 (Beaudette & Hudson), and it was isolated in chicken embryos, and later viral isolations were found in humans and other animals. CoV, in general, are zoonotic, which means they cause illnesses and can be transmitted between humans and animals (WHO, 2020b). For example, research indicates that MERS-CoV was transmitted from dromedary camels to humans (Gossner et al., 2016) and SARS-CoV from civets to humans (Guan et al., 2003; Song et al., 2005).

Transmission and Symptomology

COVID-19 spreads from person-to-person between those who are in close contact with each other (CDC, 2020c). It is transmitted through respiratory droplets resulting from coughs and sneezes (CDC, 2020c). When these droplets end up in someone's mouth or nose or are inhaled into the lung, the transmission of COVID-19 occurs (CDC, 2020c). The symptomology associated with COVID-19 includes respiratory symptoms, fever,

cough, shortness of breath, breathing difficulties, persistent pain or pressure in the chest, confusion, inability to arouse, and bluish lips or face (WHO, 2020b; CDC, 2020d). In severe cases, it can cause pneumonia, SARS, kidney failure, and even death (WHO, 2020b).

Additionally, the CDC indicates that, although it is less likely, COVID-19 can spread from being in contact with surfaces or objects that are contaminated with SARS-CoV-2 (2020e). This type of spread will require someone to be in contact with a surface or object that has the virus on it and then touching their mouth, nose, or eyes (CDC, 2020e). There is evidence supporting that the SARS-CoV-2 that causes COVID-19 can remain viable on surfaces and objects from hours to days before it naturally dies (CDC, 2020e). However, the CDC highlights that transmission through surfaces is not considered the main way that COVID-19 spreads (2020e).

Wu and McGoogan (2020) presented a summary report of key findings of the largest case series to date of COVID-19 in mainland China. Based on this report, the age distribution of patients with COVID-19 was: 87% of cases were 30 to 79 years of age, 8% were aged 20-29 years, 3% were 80 years or older, 1% of cases were 10 to 19 years old, and 1% of cases were younger than 10. Of these cases, 81% were classified as Mild (i.e., no having pneumonia or having mild pneumonia); 14% of cases were classified as Severe (i.e., presence of dyspnea, respiratory frequency ≥30/min, blood oxygen saturation ≤93%, partial pressure of arterial oxygen to fraction of inspired oxygen ratio <300, and/or lung infiltrates >50% within 24 to 48 hours); and 5% of cases were

classified as critical (i.e., respiratory failure, septic shock, and/or multiple organ dysfunction or failure). The case-fatality rate (CFR) was 2.3%; of these, 14.8% happened in patients who were 80 years and older; 8% occurred in patients aged 70-79 years, and 49% in critical cases.

Government Responses

Worldwide, government officials and public health experts are taking several measures to mitigate the spread of the virus. Given the lack of effective pharmaceutical measures for prevention or treatment of COVID-19, governments are relying on community-based, non-pharmaceutical interventions (NPIs; Ferguson et al., 2020). Some NPIs commonly used across nations are self-isolation and quarantine (Bedford et al., 2020), social distancing (CDC, 2020g), and shelter-in-place (Courtemanche et al., 2020). These measurements have the common goal of reducing person-to-person transmission, and the terminology is often interchangeable. However, these terms have different meanings. Quarantine refers to a restriction of movement of "people who were exposed to a contagious disease to see if they become sick" (CDC, 2017). Isolation refers to the separation of "sick people with a contagious disease from people who are not sick" (CDC, 2017). Social distancing refers to a reduction of the frequency of large crowds and limitations in the number of people in gatherings (CDC, 2020g). Shelter-in-place orders (SIPO) refers to residents staying at home and only leaving to attend essential matters (Dave et al., 2020).

Furthermore, other commonly used strategies were the strengthening of health facilities to control the disease (Bedford et al., 2020), a request for employees to work from their homes, restrictions of flights and public transportation (Douglas et al., 2020), and even border shutdowns (Al Jazeera, 2020). For instance, in the U.S., there is currently a travel ban for individuals coming from China, Iran, Brazil, Ireland, and some European countries, and it also includes those who recently visited these countries within 14 days prior to their trip to the U.S. (CDC 2020h).

Of all the previous measurements noted, social distancing has been the primary strategy implemented by governments (Dave et al., 2020). This practice involves altering work-schedules to reduce contact, decreasing social interactions, creating distance or e-learning opportunities where possible, increasing physical space between coworkers at the workplace, reducing activities involving direct contact, increasing video or audio events, and limiting the number of visitors in various settings (CDC,2020g). In addition, social distancing has led to restriction of allowed costumers for dine-in restaurants and the closure of nonessential businesses such as bars, beauty salons, etc. (Courtemanche et al., 2020). Furthermore, a common but less abrasive recommendation is the practice of good hygiene like washing the hands with soap and water for at least 20 seconds or using a hand sanitizer that contains at least 60% alcohol if soap and water are not available and to avoid touching the eyes, nose, and mouth with unwashed hands (CDC, 2020c).

In the U.S. specifically, on March 16th, the government announced the following guidelines: recommendation to stay at home for those who feel sick; if someone in the

house is confirmed to have the virus, all members of the household are suggested to stay at home; elders are encouraged to stay home and away from others as well as people with a serious underlying health condition (CDC, 2020f). Social gatherings of more than 10 people were recommended to be avoided as well as eating and drinking at bars and restaurants (CDC, 2020f). By April 2020, at least 40 states in the U.S. had implemented SIPOs in one way or another (Dave et al., 2020). For instance, some applied to specific counties, cities, or towns and others across the state (Dave et al., 2020). SIPOs are different than other stay-at-home recommendations because it is a state law accompanied by different punishments (i.e., warning, fines, and even prison; Dave et al., 2020). All these community based NPIs have the purpose of flattening the curve of the infection. However, simultaneously, they are causing negative indirect effects on education, mental health, and economics (Douglas et al., 2020). In the following sections, the impact of COVID-19 on these areas will be discussed.

Economic Impact

The COVID-19 outbreak has caused unprecedented disruptions to the lives and work of people across the world, causing economic harm that could lead to an international economic recession (Alon et al., 2020; Fairlie, Couch & Xu, 2020; Nicola et al., 2020; Tull et al., 2020; Zhang et al., 2020). Factors such as social distancing, self-isolation, and travel restrictions have resulted in a reduction of workforces in every economic sector, ultimately leading to a rise in unemployment (Nicola et al., 2020). Restrictions due to COVID-19 are associated with loss of income in numerous ways.

Douglas and colleagues list the following examples of how COVID-19 affects unemployment (2020): First, some individuals are able to work remotely, but that is not the case for many others (i.e., those who have roles in service industries and who face already precarious employment and low income); Secondly, employees can be affected by workplace closures (e.g., either by government mandate, an infected co-worker, or loss of business); Third, those working in the informal economy (e.g., filmmakers, artists, musicians, etc.) are especially vulnerable given that they do not have sick pay, are on zero-hours contracts, or are self-employed.

Similarly, Nicola and colleagues (2020) reported a summary of the socio-economic implications of COVID-19 on distinct aspects of the economy. The authors presented an analysis by sectors: primary sectors (i.e., industries involved in the extraction of raw materials), secondary sectors (i.e., business in charge of the production of finished products), and tertiary sectors (i.e., industries dedicated to service provision). In the primary sector, they noted the effect of COVID-19 involves a decrease in the demand for products in agriculture linked to the closing and reduction of customers in hotels and restaurants; for petroleum and oil, they noted destabilization in the oil prices followed by an oil-price war. In the secondary sector, it was highlighted how the manufacturing industry is being affected by importation issues, staffing deficiencies, and disruption of the supply chains. Lastly, the tertiary sector is the most extensive and most affected. This includes education, finance, healthcare, pharmaceutical, hospitality, tourism, aviation, real estate, housing, sports industry, information technology, media,

research- development, and the food sector. In summary, this article provides evidence of the impact of COVID-19 on different areas of the world economy and the possibility of a new recession and financial collapse (Nicola et al., 2020).

The U.S. Congressional Budget Office (2005) conducted a study that assessed two influenza pandemic scenarios in the U.S. This study can serve as an estimator of the cost of COVID-19. Their study had a mild scenario with a Case Fatality Rate (CFR) of 0.1%, an attack rate of 20%, and estimated time out of work of less than four days, on average. Their findings suggest that the economic effects might not even be discernible from the regular changes in economic activity for the mild scenario. The Gross Domestic Product (GDP) contraction would be 1.5%, which is not different from what is typically expected (i.e., in the absence of a pandemic). For the severe scenario, with a CFR of 2.5%, an attack rate of 30%, one-tenth of workers affected, and estimated time out of work of a week, the GDP reduction would be 5% which is more significant. In other words, these projections indicate that a pandemic could affect the U.S. economy more than the recessions experienced since World War II (U.S. Congressional Budget Office, 2005).

Educational Impact

The education sector, as previously noted, does not escape from facing the consequences of the pandemic. From daycares and head-starts to colleges and universities (Nicola et al., 2020), COVID-19 disturbed all levels of education. As a result of the outbreak of the disease, large-scale and national school closures occurred around the

world (UNESCO, 2020a). UNESCO reported in April 2020 that COVID-19 had affected 194 countries and more than 90% of the student population (i.e., 1.5 billion students). Initially, the data from COVID-19 cases suggested that the virus affected mostly the elderly population and that youth were less vulnerable (e.g., Liu et al., 2020; Wu & McGoogan, 2020). According to Jiang and colleagues (2020), data from Asia, Europe, and North America suggests that the total cases of children account for 2.1 to 7.8% of confirmed cases. Nevertheless, even if children are not as vulnerable in regard to consequences of getting COVID-19, they are still agents of transmission. A large body of literature exists on the closure of educational institutions to reduce the spread of infectious disease in the community by breaking important chains of transmission (e.g., De Luca et al., 2018; Kawano & Kakehashi, 2015; Wheeler et al., 2010). Thus, the reasoning for school closure was that due to the high level of contact between kids and adults (i.e., teachers and parents), it is difficult to stop them from spreading the virus (Liu et al., 2020).

In the U.S., school closures occurred nationwide (Education Week, 2020). There are approximately 98,000 public schools and at least 34,000 private schools in the U.S., according to the National Center for Education Statistics (NCES; Education Week, 2020). These schools educate about 50.8 million students in public schools and 5.8 million students in private schools (Education Week, 2020). COVID-19 has affected at least 55.1 million students and 124,000 public and private schools across the U.S. (Education Week, 2020). Furthermore, by April 9th, 19 states and 3 U.S. territories had

mandated or suggested school building closures for the remainder of the 2019-20 school year (Education Week, 2020). This action of closing schools has been used during other public health situations. For example, in 2009, there was an H1N1 influenza pandemic, and the Australian government closed the schools to mitigate the spread of the infection (Braunack-Mayer et al., 2013).

There are several negative indirect, and direct consequences of school closures in many aspects of society. For example, in the U.S., low-income children depend on the schools to eat; with COVID-19, its impact on social mobility, and school closures, some kids are no longer receiving their free school meals (Douglas et al., 2020). Every year, approximately 30 million school-aged children receive help from free or subsidized school meals, and for the eligible households, the rates of food insecurity even increase during the summer (NSLP, 2019). Projections in only one state show that 3 days of school represent more than 405,000 missed meals for low-income children (Kinsey et al., 2019).

Furthermore, a significant impact of school closures is the increase in childcare costs for families with young children (Douglas et al., 2020). If the parents are not able to work from home, they have an unexpected need for childcare or might be unable to work (Douglas et al., 2020). For instance, Chen and colleagues (2011) reported that one week of school closures in Taiwan during the 2009 H1N1 outbreak resulted in 27% of families not being able to go to work and losing 18% of income as a direct result. Similarly, the Brookings Institution (2009) conducted a series of modelings for school closures in the

U.S. Their estimations suggest that $142 would be the median cost of missing a week of school per student. For instance, an estimated period of four-week of closures in New York City would result in an economic cost of $1.1 billion, and a nationwide closure of 12 weeks would cost 1% of GDP. Moreover, the Brookings Institution (2009) noted that the direct impact of school closures for children whose parents work in the healthcare field could result in approximately 6 to 19% of workforce hours lost. In addition to the previously mentioned negative effects of school closures, UNESCO (2020b) list the followings: interrupted learning, confusion, and stress for teachers, parents being unprepared for distance and homeschooling, challenges creating, maintaining, and improving distance learning, the unintended strain on health-care systems, increased pressure on schools and school systems that remain open, rise in dropout rates, increased exposure to violence and exploitation, social isolation, and challenges measuring and validating learning.

Viral Diseases and Mental Health

Given the novelty of COVID-19, it is important to evaluate how other viral infections/diseases like SARS, H1N1 influenza, and MERS have impacted an individual's mental health. A study conducted by Sprang and Silman (2013) used a cross-sectional design to assess PTSD (Post Traumatic Stress Disorder) symptomology on parents and youth who lived in areas severely affected by H1N1 or SARS. Their study sample included 398 participants from the U.S., Mexico, and Canada. The measurements were the Posttraumatic Stress Disorder Reaction Index (PTSD-RI) Parent Version and the

PTSD Check List Civilian Version (PCL-C). Their findings indicated that quarantine and isolation due to public health concerns could be traumatizing for children and parents. They found that 30% of quarantined children met criteria for PTSD based on parental reports, and 25% of quarantined parents met criteria based on self-reports. These results suggest that responses such as being in quarantine for an epidemic can be traumatic for the families.

Similarly, Reynolds and colleagues (2008) assessed post-traumatic stress symptoms in a cohort of individuals who were in quarantine during the SARS outbreak in 2003 in Canada. The authors used the Impact of Events Scale-Revised (IES-R) to assess for PTSD symptomology. A questionnaire was administered to 1912 adults who met the criteria. Participants had to be 18 years and older, be in quarantine, remained well regarding physical health, and followed for at least two full days by the Durham Region Health Department (DRHD) who developed a computerized database including demographics, date of exposure, exposure setting, etc. There were two groups, the health-care workers and patients. The results of this study indicated that health-care workers experienced greater psychological distress, including PTSD symptoms ($P<.001$). The most commonly reported feelings experienced during the quarantine by the participants were boredom (62.2%, n=638) isolation (60.6%, n=622), and frustration (58.5%, n=600). This study provides a reference for the impact of being quarantined for health care workers, but it did not have a breakdown of the profession of the patients.

Wang and colleagues (2011) conducted a study to investigate if being in quarantine to contain the transmission of H1N1 flu led to direct negative psychological effects such as PTSD. This study was conducted in China and used a cross-sectional method. General mental health was evaluated with the 20-item Self-Report Questionnaire (SRQ-20), and PTSD was measured with the Impact of Event Scale-Revised (IES-R). The study sample included 419 undergraduate students, and there were two groups, one was with individuals who were quarantined (n=176), and a control group (n=243). This study did not find any significant differences between the two groups in regard to general mental health or PTSD. Instead, the study found that dissatisfaction with control measures (i.e., quarantine) was a better predictor of PTSD (OR=2.22) and poor mental health (i.e., SRQ-20 positive screening, OR=2.22). Although this study did not find that a quarantine experience was a predictor of PTSD, it is important to note that the length of the quarantine was seven days, and the sample was entirely undergraduate students. Thus, it is possible that these conclusions cannot be generalized to the wider population because undergraduate students are usually young, have better health, and fewer responsibilities than other age range such as adults who are employed full-time.

A few studies have specifically evaluated the impact of COVID-19 in the general population. For example, Zhu and colleagues (2020a) evaluated the immediate impact of COVID-19 on stress, depression, and anxiety symptoms. The study had two groups; the quarantine group consisted of 1443 participants (N=206 close-contacts, N= 320 frontline medical personnel under hotel-quarantine, N=917 public residents' home-quarantined),

and the without quarantine group had 836 participants (N=538 non-frontline medical personnel, N=298 community support workers). Data collection occurred in the same month for both groups, and those in the quarantine group had to be more than 10 days in quarantine to meet the "quarantine" criteria. This study used a 20-item Self-Report Questionnaire (SRQ-20), the 7- item Generalized Anxiety Disorder Scale (GAD-7), and the 9-item Patient Health Questionnaire (PHQ-9) to screen the general psychological symptoms. Additionally, participants were asked to rate on a Likert scale their perception of the impact of COVID-19 on their daily life; responses went from 0 representing not at all to 3 being extremely affected. The results indicated no significant difference between the with or without quarantine groups regarding the screening-positive rate of SRQ-20, GAD-7, and PHQ-9. However, the results showed a high prevalence of mental health effects for both groups. Furthermore, logistic regression showed that the impact of COVID-19 on the participants' daily life was the best predictor for the screening-positive rate of SRQ-20, GAD-7, and PHQ-9. This study supports that the COVID-19 pandemic has an impact on mental health.

Another study by Zhu and colleagues (2020b) evaluated the psychological impact of COVID-19 on health workers and the predictors for stress and protective factors. There was a total of 5062 participants. The results showed that 29.8% of the sample met the criteria for stress, 13.5 for depression, and 24.1 for anxiety. The instruments used were the Impact of Event Scale-Revised (IES-R) to measure stress, the Patient Health Questionnaire-9 (PHQ-9) for depression, and the Generalized Anxiety Disorder 7-item

(GAD-7) for anxiety. With a Multivariate logistic regression, this study identified the following predictors of acute stress, depression, and anxiety in health workers: being women, having more than 10 years of working, concomitant chronic diseases, history of mental disorders, and family members or relatives confirmed or suspected to have COVID-19. Additionally, they found that the support provided at work and by the department administrators, and full coverage of all departments with protective measures were protective factors.

Summary

COVID-19 caused unprecedented disruptions to people's lives across the world. Given the lack of medical solutions to cure or treat COVID-19, several community-based interventions are being used, such as self-isolation, quarantine, social distancing, and shelter-in-place orders. The impact of COVID-19 on different areas of the economy and the possibility of a new recession and financial collapse has been documented.

The education sector does not escape from the consequences of the pandemic. School closures occurred worldwide to reduce the spread of COVID-19. In the U.S., school closures occurred nationwide, affecting at least 55.1 million students. The are many negative indirect and direct consequences of school closures in food insecurity, interruption of learning, social isolation, exposure to violence and exploitation, and challenges measuring and validating learning.

There is evidence of the impact of other viral infections on mental health. A few studies have specifically evaluated the impact of COVID-19 on mental health (i.e.,

anxiety, stress, depression). A study found that being women, having more than ten years of working, concomitant chronic diseases, history of mental disorders, and family members or relatives confirmed or suspected to have COVID-19 were risk factors for anxiety, depression, and stress due to the pandemic. Thus, COVID-19 can be considered a major stressor that can lead to mental health illness and rise the levels of stress. In the following section, the rationale, purpose, and research questions of this study will be presented.

Rationale, Purpose, and Research Questions

COVID-19 is a highly infectious disease recently discovered and categorized as a pandemic in 2020. Governments across the world are taking numerous measures to mitigate the spread of the virus. The most common interventions include social distancing, isolation, shelter in place orders, and other community-based interventions. COVID-19 has had an effect on different areas of society, like different sectors of the economy as well as the health and education systems. Regarding mental health, COVID-19 can be considered a major stressor that can rise the levels of stress and lead to illness such as depression and anxiety. The education sector does not escape from the consequences of the pandemic.

School closures occurred worldwide to reduce the spread of COVID-19. In the U.S., school closures occurred nationwide, affecting at least 55.1 million students. The are many negative indirect, and direct consequences of school closures for the students, the parents, and the teachers. In the general population, a few studies have specifically

evaluated the impact of COVID-19 on mental health, suggesting there is a prevalence of anxiety, stress, and depression associated with the pandemic. However, there are no studies evaluating the effects of the pandemic on teacher's levels of stress in the U.S. Statistics related to mental health in the workplace and stress shows that it reduces worker productivity and leads to burn-out and disability. Ultimately, stress has a cost in the human and financial resources of any company. Thus, research to better understand and reduce stress within individuals and organizations is warranted.

Teachers are key elements in the education system; the best programs, laboratories and libraries are meaningful without the teachers who will bring them into force (Güneyli, 2012). The need for public school teachers is increasing as the enrollment of students grows, and the rates of attrition increase. A growing body of research has shown that the teaching force is an at-risk population for stress. Currently, nationwide, schools are rapidly shifting their working modalities due to the pandemic. Considering the factors that contribute to stress on teachers, the pandemic can potentially be a major stressor for them. COVID-19 is a stressor that has disrupted the regular working modality for teachers, and that can impact the social support that teachers' use as a coping mechanism to manage their stress. Thus, it will be important to understand the impact of the pandemic on teachers' levels of stress.

The goal of this exploratory study was to estimate the impact of the unprecedented COVID-19 on teachers' stress levels. Considering that people in similar situations (i.e., equally demanding jobs) can experience different levels of stress (Pearlin,

1982), this dissertation will examine if individuals with high, medium, and low levels of stress, differ in the health outcomes of the teacher stress inventory (TSI) during and prior to COVID-19. Archival data from 2017 and data collected in 2021 was used to conduct an exploratory analysis and evaluate: differences between teachers' TSI profile before and during the COVID-19 pandemic; if the clusters before and during COVID-19 differ regarding the TSI variables of sources of stress; if there are any differences when the cluster results for both groups are compared regarding the manifestations of stress as measured by the TSI; if there are differences when the cluster results for both groups are compared regarding psychopathology; and if there are any differences when the cluster results for both groups are compared regarding substance use.

CHAPTER III

Method

Participants

Teacher reports based on archival data from a study conducted in 2017 (Green, 2017) and data collected in 2021. One was conducted three years prior to COVID-19 and the other was data collected in the month of February 2021 or 11 months since COVID-19 was declared a Public Health Emergency in the U.S. The participants were recruited through social media posts in teacher groups including Facebook, LinkedIn, and emails. The researcher joined groups in several states and posted a standard message with a Link to the survey inviting them to participate. Appendix A presents a list of the Facebook groups where teachers were recruited for the 2021 study. Both studies were approved by the Institutional Review Board of Stephen F. Austin State University (SFASU), and permission from the principal investigator of the 2017 study (Dr. Green) was given for this study.

The inclusion criteria for the group pre-COVID-19 (Green, 2017) was current employment in a teaching capacity in a public school; the exclusionary criteria included: primary assignment other than teaching (e.g., speech therapist, administrator, etc.), reported age that appeared unreasonable for a presumed college graduate (e.g., 18 years), and completion of less than 90% of the survey. After applying the inclusion and exclusion criteria, the Pre-COVID-19 group had a total of 336 participants.

The During COVID-19 group had a total of 502 participants. The exclusionary criteria included: primary assignment other than teaching (e.g., speech therapist, administrator, etc.), reported age that appeared unreasonable for a presumed college graduate (e.g., 18 years) and completion of less than 95% of the survey. The inclusion criteria were current employment in a teaching capacity in a public school. After applying the inclusion and exclusion criteria the sample was N=361. A total of 109 participants were removed because they completed lower than 95% of the survey, and 32 participants were not teachers in the U.S. in the current year.

Measures and Variables

Demographics

Pre-COVID-19 Group. This study collected the following demographic information: gender, age, length of employment, and nature of the assignment (e.g., special education, general education, etc.).

During COVID-19 Group. This study was an exact replica of the 2017 study and collected the following demographic information: gender, age, length of employment, and nature of the assignment (e.g., special education, general education, etc.).

The Teacher Stress Inventory (TSI)

The TSI was used in both studies and was the primary measure of analyses. TSI measures the perceived causes of stress from the teacher's perspective. This questionnaire includes 49-items used to assesses the degree of strength of occupational stress experienced by teachers (Fimian, 1988). Answers are rated on a Likert-scale, where 1 is

no strength/not noticeable and five major strengths/extremely noticeable. This instrument includes ten subscales; five subscales measure sources of stress (i.e., Time Management, Work-Related Stressors, Professional Distress, Discipline and Motivation, and Professional Investment) and five subscales measure manifestations of stress (i.e., Emotional, Fatigue, Cardiovascular, Gastronomical, and Behavioral). The ten subscales contribute to a Total Stress scale. Its reliability was determined by the calculation of Cronbach's alpha coefficient of α coefficient .93.

Statistical Analyses

1. Prior to analysis, the inclusion and exclusion criteria were applied to the data. Thus, the data sets were examined for missing values, normality of distributions, etc.
2. After the sample has been selected, the first step was to do a descriptive analysis of each group (pre and during COVID-19) in regard to all the variables available to make simple comparisons. This can include frequencies, means, and standard deviations. The categorical variables are gender, marital status, highest degree earned, primary assignment. The continuous variables are age, the number of years teaching, Total TSI, and sources and manifestations of stress as measured by the TSI.
3. Then, a two-step cluster analysis was conducted to explore the profile of the pre COVID-19 group of teachers and to identify patterns in the sample. To determine the cluster profiles, the variables used were sources of stress (i.e., Time Management, Work-Related Stressors, Professional Distress, Discipline and Motivation, and Professional Investment).

4. A two-step cluster analysis was conducted to explore the profile of the during COVID-19 group and identify patterns in the sample. To determine cluster profiles, the variables used were Sources of Stress (i.e., Time Management, Work-Related Stressors, Professional Distress, Discipline and Motivation, and Professional Investment).
5. A Multivariate Analysis of Variance (MANOVA) was used to determine differences between the Manifestations of Stress (i.e., Emotional, Fatigue, Cardiovascular, Gastronomical, and Behavioral) in the resulted subgroups.
6. Lastly, an Analysis of Variance (ANOVA) and a Chi-squared analysis were used to determine differences between the resulted subgroups regarding the non-TSI variables: substance use, and psychopathology.

Group Assignments: Two-Step Cluster Analysis Algorithm

A statistical technique that can be used to form groups with common patterns based on the participants' answers is Cluster Analysis. There are different types of cluster analysis. For this study, the two-step cluster analysis was selected, given that it is the preferred method for large databases (Chiu et al., 2001). The process of the two-step cluster analysis consists of two phases: First, there is an initial clustering of observations or records into small sub-clusters by constructing a cluster features tree in which the decision of whether the observation is joined in an already formed cluster or a new cluster shall be formed is made based on the distance criteria. The second phase involves clustering the sub-clusters resulting from the first stage into a desired number of clusters

based on probabilistic hierarchical cluster analysis (Chiu et al., 2001). The Two-Step cluster analysis automatically chooses the ideal number of clusters by examining the Bayesian Information Criterion (BIC) values (Chiu et al., 2001). In interpreting BIC scores, the smaller values of the BIC indicate better models, and the "best" cluster solution has the smallest BIC (Chiu et al., 2001). In addition, ratios of BIC changes and ratios of distance measures are evaluated to determine the best number of clusters (Chiu et al., 2001).

Once the cluster solution is formed, chi-squared tests are conducted for the categorical variables and t-tests for continuous variables to examine the importance of individual variables in a cluster (Norusis, 2011). A variable can be considered important in discriminating between clusters when the absolute value of the statistic for a cluster is greater than the critical value (Norusis, 2011). After the cluster solution is formed, three validation measures are required. First, the silhouette measure of cohesion and separation is required to be above the required level of 0.0 to suggest that the within-cluster distance and the between-cluster distance is valid (Norusis, 2011). Second, chi-squared and t-tests are used on the categorical and continuous variables, respectively, to identify the importance of individual variables in a cluster and indicate significant differences amongst clusters. Third, the final cluster solution must be similar (e.g., size, number, and characteristics of clusters) when divided into two equal parts (Norusis, 2011).

Research Design

This study was an experimental research design. An exploratory analysis was used to estimate the differences between teachers' levels of stress and its manifestation, prior to and during COVID-19. Data was analyzed and interpreted using the IBM SPSS Statistics for Mac, version 27. The data was examined for missing values, normality of distributions, etc. There was a descriptive analysis of each group (pre and during COVID-19) in regard to all the variables available to make simple comparisons. Then, a two-step cluster analysis was conducted to explore the profile of the pre COVID-19 group of teachers and to identify patterns in the sample. To determine the cluster profiles, the variables used were sources of stress (i.e., Time Management, Work-Related Stressors, Professional Distress, Discipline and Motivation, and Professional Investment). A two-step cluster analysis was conducted to explore the profile of the during COVID-19 group and identify patterns in the sample. To determine cluster profiles, the variables used were Sources of Stress (i.e., Time Management, Work-Related Stressors, Professional Distress, Discipline and Motivation, and Professional Investment). A MANOVA was used to determine differences between the Manifestations of Stress (i.e., Emotional, Fatigue, Cardiovascular, Gastronomical, and Behavioral) in the resulted subgroups. Lastly, an ANOVA, and Chi-squared analysis were used to determine differences between the resulted subgroups regarding the non-TSI variables: substance use, and psychopathology. The results were classified as statistically significant based on an alpha level of $p < .05$ and $p < .001$.

CHAPTER IV

Results

Demographics

Before conducting the analyses, the current sample of teachers was described in terms of demographics variables. In specific, Table 1 summarizes the data for the final sample of the Pre-COVID-19 Group (N =336) and During COVID-19 group (N=361); age, number of years teaching, gender, marital status, degree earned, and primary assignment were the variables included. Results indicated that the Pre-COVID-19 and During COVID-19 groups were represented similarly in regard to age, number of years teaching, gender, marital status, degree earned and primary assignment. Both groups were composed for a majority of female teachers with more than more than 94%; had more than 45% of teachers who have taught between 1 to 9 years; and the majority of teachers were married (Pre-COVID-19, 73% and During COVID-19 65%). In regard to degree earned, both groups were divided in half bachelors and half Master/specialist and less than 2% of doctorates and other. In regard to primary assignment, both groups were mostly represented by General education (i.e., above 70%). Regarding age, teachers in the age range of 30 to 39 years old was the highest represented group with a 31% for the pre-COVID-19 group and the 40 to 49 group was represented with a 31%.

Table 1

Descriptive Statistics for the Final Sample

Variable	**Pre-COVID-19** ***(N = 336)***		***During COVID-19 (N=361)***	
	N	Percentage	N	Percentage
Age				
20-29	70	20.8%	73	20.2%
30-39	104	31.0%	96	26.6%
40-49	98	29.2%	112	31.0%
50-59	53	15.8%	66	18.3%
60 or over	11	3.3%	14	3.9%
Years Teaching				
1-9	152	45.2%	164	45.4%
10-19	121	36.0%	122	33.8%
20-29	48	14.3%	62	17.2%
30 or more	15	4.5%	13	3.6%
Gender				
Female	325	96.7%	342	94.7%
Male	3	0.9%	18	5.0%
Prefer not to answer	8	2.4%	1	0.3%
Marital Status				
Single	60	17.9%	91	25.2%
Married	246	73.2%	233	64.5%
Divorced	22	6.5%	33	9.1%
Widowed	5	1.5%	3	0.8%
Separated	3	0.9%	-	-
Degree Earned				
Bachelors	168	50.0%	171	47.4%
Masters/Specialist	164	48.8%	180	49.9%
Doctorate	1	0.3%	5	1.4%
Other	3	0.9%	5	1.4%
Primary Assignment				
General Education	259	77.1%	270	74.8%
Special Education	76	22.6%	41	11.4%
Other	1	0.3%	50	13.9%

Preliminary Analyses

Before running the cluster analyses, assumptions of normality and independence of variables were evaluated for both groups, Pre-COVID-19 and During COVID-19. The distributions presented on Table 2 and Table 3 indicated that all the TSI variables of sources and manifestations of stress were normally distributed for both groups (Skewness and Kurtosis < + or -2.0; Shapiro & Wilk, 1965).

Table 2

Normality Statistics for TSI Variables Sources of Stress - Pre-COVID-19 group (N=306) and During COVID-19 group (N=361)

TSI Variable	**Pre-COVID-19**				**During COVID-19**			
	Skewness		**Kurtosis**		**Skewness**		**Kurtosis**	
	Statistic	SE	Statistic	SE	Statistic	SE	Statistic	SE
TM	-.32	.14	.61	.28	-.59	.13	.33	.26
WRS	-.60	.14	.38	.28	-.74	.13	.27	.26
PD	-.25	.14	-.70	.28	-.08	.13	-.72	.26
DM	-.19	.14	-.77	.28	.09	.13	-.75	.26
PI	.27	.14	-.46	.28	.19	.13	-.55	.26

Note. TM= Time Management; WRS= Work-Related Stressors; PD= Professional Distress; DM= Discipline and Motivation; PI= Professional Investment; SE= Standard Error.

Table 3

Normality Statistics for TSI Variables Manifestations of Stress – Pre-COVID-19 Group (N=310) and During COVID-19 group (N=361)

TSI Variable	Pre-COVID-19				During COVID-19			
	Skewness		Kurtosis		Skewness		Kurtosis	
	Statistic	SE	Statistic	SE	Statistic	SE	Statistic	SE
E	0.05	.14	-.89	.28	.98	.13	.45	.26
F	0.13	.14	-.67	.28	.77	.13	-.36	.26
C	0.49	.14	-.68	.28	.44	.13	-.72	.26
G	1.07	.14	.15	.28	-.13	.13	-.73	.26
B	1.32	.14	1.60	.28	-.16	.13	-.84	.26

Note. E=Emotional; F=Fatigue; C=Cardiovascular; G=Gastronomical; B=Behavioral; SE= Standard Error.

Two-Step Cluster Analysis Algorithm for the Pre COVID-19 Group

Defining the Number of Clusters

To determine the cluster solution for the Pre-COVID-19 group, an exploratory two-step cluster analysis was conducted using the variables of Sources of Stress (i.e., Time Management, Work-Related Stressors, Professional Distress, Discipline and Motivation, and Professional Investment). The autoclustering selection from SPSS 27 was used to select the best cluster solution. The SPSS auto clustering selects as the best solution the one with the lowest information criterion measure (Schwarz Bayesian Information Criterion; BIC) and the highest ratio of distance measures (RDM). According to Milligan and Hirtle (2003), the autoclustering solution is affected by order of the data. Thus, autoclustering was conducted with different modalities of order of data. First, on the full data set with a random order of identification (ID) number. Then, the full

data set was sorted descendingly by the participant's ID number. Then, full data set was sorted ascendingly by patient's ID number. The data was also sorted ascending, descending, and random by start date and end date.

Table 4

Selection of Best Cluster Solution Pre-COVID-19

Order of Data	Number of Clusters	Schwarz's Bayesian Criterion (BIC)	Radio of Distance Measures (RDM)
ID Random order	2	904.66	2.62
ID Descending	2	904.66	2.62
ID Ascending	2	904.66	2.62
Start Date Ascending	3	837.98	2.47
Start Date Descending	2	904.66	2.62
Start Date Random	2	904.66	2.62
End Date Random	2	904.66	2.62
*End Date Ascending	2	859.78	4.17
End Date Descending	2	904.66	2.62

Note. *Represents best cluster solution.

Table 4 shows that out of the nine trials, eight times it was determined that the optimal number of clusters was the two-cluster solution and one time it was determined that the optimal number of clusters was a three-cluster solution. (i.e., Start Date Ascending). The solution obtained when the data was sorted ascendingly on the variable End Date was the best combination of lowest BIC and highest RDM for the Pre-COVID-19 group (BIC=859.78; RDM= 4.17).

Two-Step Cluster Analysis Algorithm for the During COVID-19 Group

Defining the Number of Clusters

The same steps followed for the Pre-COVID-19 group were followed for this group. An exploratory two-step cluster analysis was conducted using the variables of Sources of Stress (i.e., Time Management, Work-Related Stressors, Professional Distress, Discipline and Motivation, and Professional Investment). Autoclustering was conducted on the full data set using the same modalities of order of data than in the previous group; the data was also sorted ascending, descending, and random by ID, start date, and end date.

Table 5

Selection of Best Cluster Solution During COVID-19

Order of Data	Number of Clusters	Schwarz's Bayesian Criterion (BIC)	Radio of Distance Measures (RDM)
*ID Random order	2	970.94	3.92
ID Descending	2	991.60	2.60
ID Ascending	2	977.96	2.86
Start Date Ascending	2	970.94	3.92
Start Date Descending	3	932.86	1.98
Start Date Random	2	970.94	3.92
End Date Random	2	970.94	3.92
End Date Ascending	2	1012.15	2.31
End Date Descending	2	1012.15	2.31

Note. ***** Represents best cluster solution.

Table 5 shows that out of the nine trials, eight times it was determined that the optimal number of clusters was the two-cluster solution and one time it was determined that the optimal number of clusters was a three-cluster solution. The best combination of

lowest BIC and highest RDM for the during COVID-19 group were by ID random order (BIC=970.94; RDM=3.92) and Start Date Descending (BIC=932.86; RDM= 1.98). Thus, for the during-COVID-19 group two cluster solution was selected.

Defining the Qualitative Descriptors of the Sub-Clusters

The qualitative descriptor of the clusters (i.e., Medium and High) was selected based on the decile ranges of the variables of sources of stress using the norming sample of the TSI manual (Fimian, 1988). Table 6 indicates the decile range of each variable of sources of stress in each subgroup for the groups pre-COVID-19 and During COVID-19.

Table 6

Decile Range for the Variables of Sources of Stress in the Sub-Clusters

Variable	Pre-COVID-19		During COVID-19	
	Medium	High	Medium	High
TM	30 to 39	80 to 89	50 to 59	80 to 89
WRS	40 to 49	80 to 89	50 to 59	80 to 89
PD	40 to 49	70 to 79	30 to 39	70 to 79
DM	40 to 49	70 to 79	30 to 39	60 to 69
PI	20 to 29	60 to 69	20 to 29	70 to 79

Note. TM = Time Management; WRS= Work-Related Stressors; PD= Professional Distress; DM= Discipline and Motivation; PI= Professional Investment.

Comparison of Clusters

Sources and Manifestations of Stress

First, the subgroups of the two-cluster solution of both groups (i.e., Pre-COVID-19 and During COVID-19) were compared on the variables Sources of stress (i.e., Time Management, Work-Related Stressors, Professional Distress, Discipline and Motivation,

and Professional Investment) and Manifestations of Stress (i.e., Emotional, Fatigue, Cardiovascular, Gastronomical, and Behavioral). The Multivariate Analysis of Variance (MANOVA) demonstrated overall differences in the TSI variables sources of stress between the two groups [Wilk's Lambda; F (15, 1753.357) = 58.52 p<.001, Eta2=.312]. Table 7 presents means, standard deviations, and statistical differences by subgroup for the variables of sources of stress. There were not observable differences in the percentage of participants in the groups and subgroups before and during COVID-19.

Table 7

Mean, Standard Deviations, and Statistical Differences by Types of Sources of Stress

	Pre-COVID-19		**During COVID-19**				
TSI Variable	Medium (n=143; 47%) M (SD)	High (n=163; 53%) M (SD)	Medium (n=155; 46%) M (SD)	High (n=182; 54%) M (SD)	*F*	*p*<	Eta2
TM	3.11 (.55) [a]	3.80 (.46) [b]	3.28 (.63) [c]	3.82 (.45) [b]	75.40	.001	0.26
WRS	3.08 (.68) [a]	4.18 (.50)[b]	3.27 (.78)[c]	4.20 (.56) [b]	137.47	.001	0.39
PD	2.56 (.81) [a]	3.82 (.67) [b]	2.42 (.73) [a]	3.82 (.74) [b]	173.31	.001	0.45
DM	2.74 (.84) [a]	3.79 (.86) [b]	2.53 (.82) [a]	3.48 (.92) [c]	75.56	.001	0.26
PI	1.94 (.59) [a]	3.05 (.74) [b]	1.96 (.60) [a]	3.28 (.72) [c]	180.25	.001	0.46

Note. M= Mean; TM = Time Management; WRS= Work-Related Stressors; PD= Professional Distress; DM= Discipline and Motivation; PI= Professional Investment; ABC row means with the same letter are not significant at alpha < .05.

Figure 1

Post Hoc Test: Tukey's B. Estimated Marginal Means of Sources of Stress – Time Management

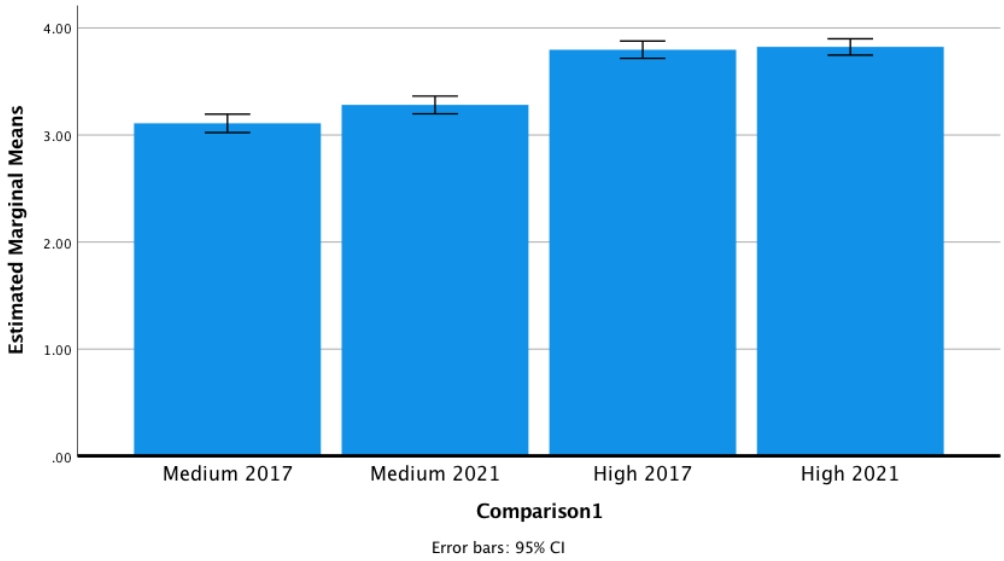

Figure 1 shows the post hoc test: Tukey's conducted for estimated marginal means of Time Management as a Source of Stress. The margined means for the Pre-COVID-19 group shows that the medium group had lower levels of stress in regard to Time Management (M = 3.11, *SD*= .55) than the comparable group During COVID-19 (M = 3.28, *SD* = .63). Furthermore, the groups with high levels of stress prior to COVID-19 (M = 3.80, *SD* = .46) and During COVID-19 (M = 3.82, *SD* = .45) had similar levels of stress regarding Time Management.

Figure 2

Post Hoc Test: Tukey's B. Estimated Marginal Means of Sources of Stress – Work-Related Stressors

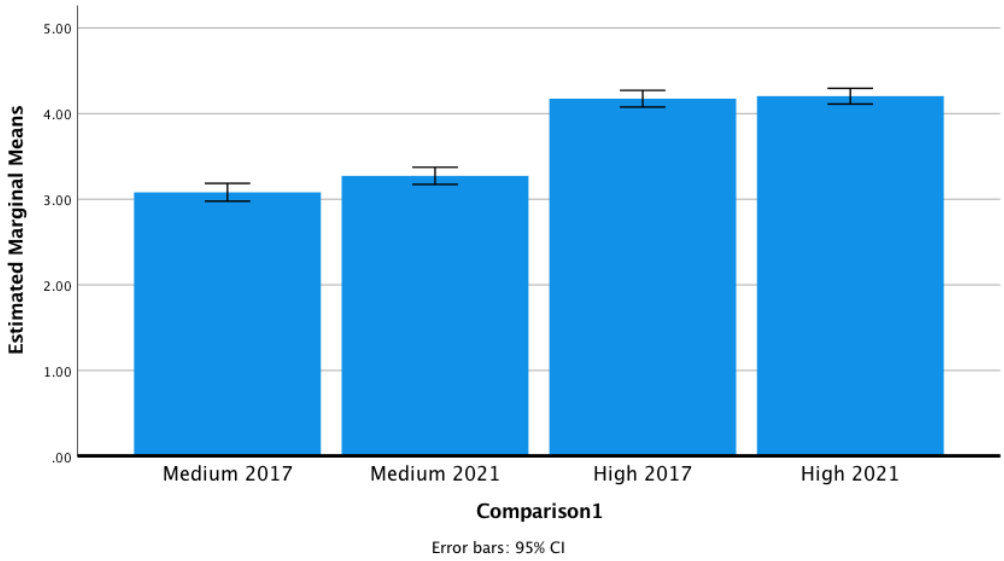

Figure 2 shows the post hoc test: Tukey's conducted for estimated marginal means of Work-Related Stressors as a Source of Stress. The margined means for the Pre-COVID-19 group shows that the medium group had lower levels of stress in regard to Work-Related Stressors (M = 3.08, *SD*= .68) than the comparable group During COVID-19 (M = 3.27, *SD* = .78). Furthermore, the groups with high levels of stress prior to COVID-19 (M = 4.18, *SD* = .50) and During COVID-19 (M = 4.20, *SD* = .56) had similar levels of stress regarding Work-Related Stressors.

Figure 3

Post Hoc Test: Tukey's B. Estimated Marginal Means of Sources of Stress – Professional Distress

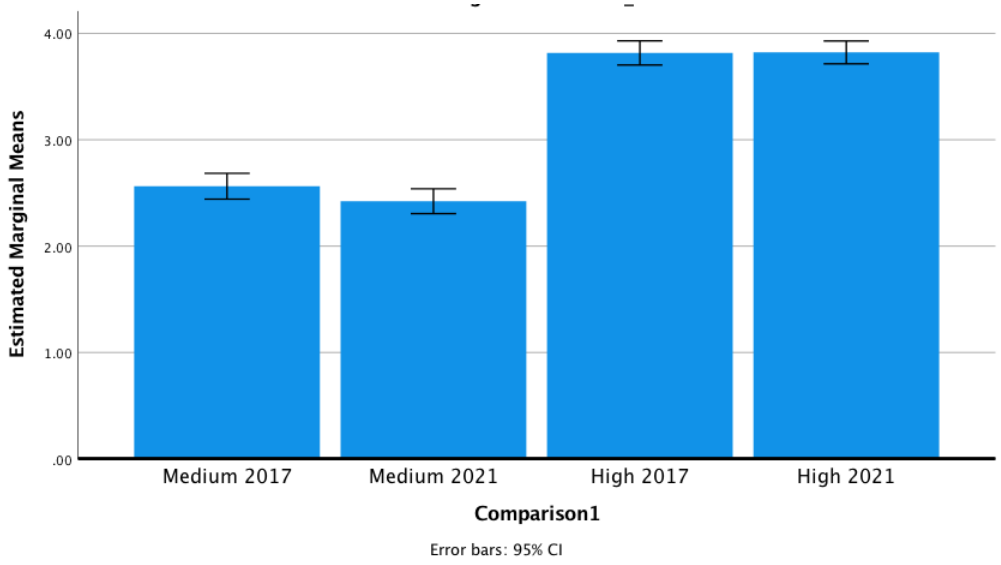

Figure 3 shows the post hoc test: Tukey's conducted for estimated marginal means of Professional Distress as a Source of Stress. The margined means indicate that the group with medium levels of stress prior to COVID-19 (M = 2.56, *SD* = .81) and During COVID-19 (M = 2.42, *SD* = .73) had similar levels regarding Professional Distress. Similarly, the group with high levels of stress prior to COVID-19 (M = 3.82, *SD* = .67) and During COVID-19 (M = 3.82, *SD* = .74) had similar levels regarding Professional Distress.

Figure 4

Post Hoc Test: Tukey's B. Estimated Marginal Means of Sources of Stress – Discipline and Motivation

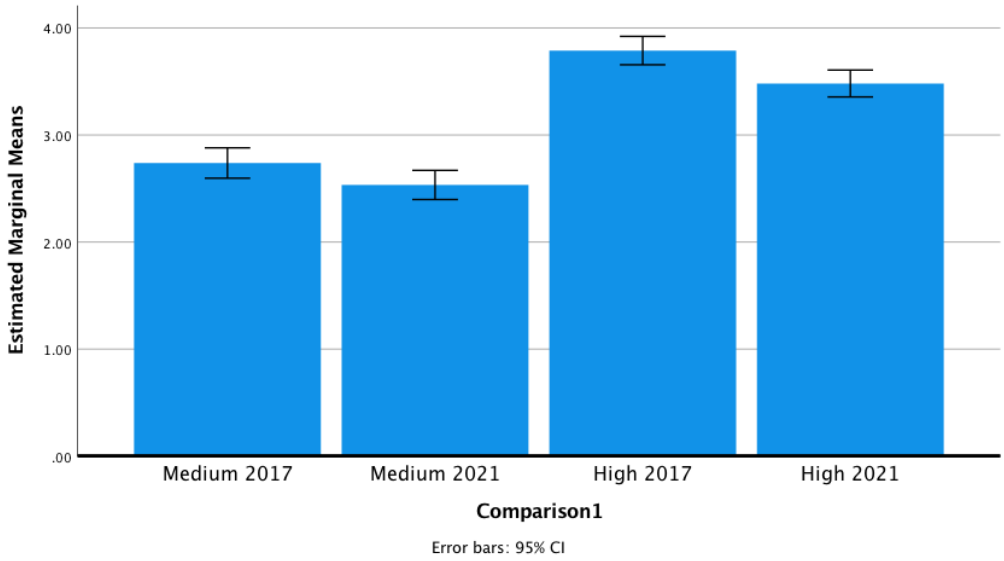

Figure 4 shows the post hoc test: Tukey's conducted for estimated marginal means of Discipline and Motivation as a Source of Stress. The margined means indicate that the group with medium levels of stress prior to COVID-19 (M = 2.74, *SD* = .84) and During COVID-19 (M = 2.53, *SD* = .82) had similar levels regarding Discipline and Motivation. However, the group with high levels of stress prior to COVID-19 (M = 3.79, *SD* = .86) and During COVID-19 (M = 3.48, *SD* = .92) were different regarding Discipline and Motivation; the group prior to COVID-19 with high levels of stress in this variable had a higher mean.

Figure 5

Post Hoc Test: Tukey's B. Estimated Marginal Means of Sources of Stress – Professional Investment

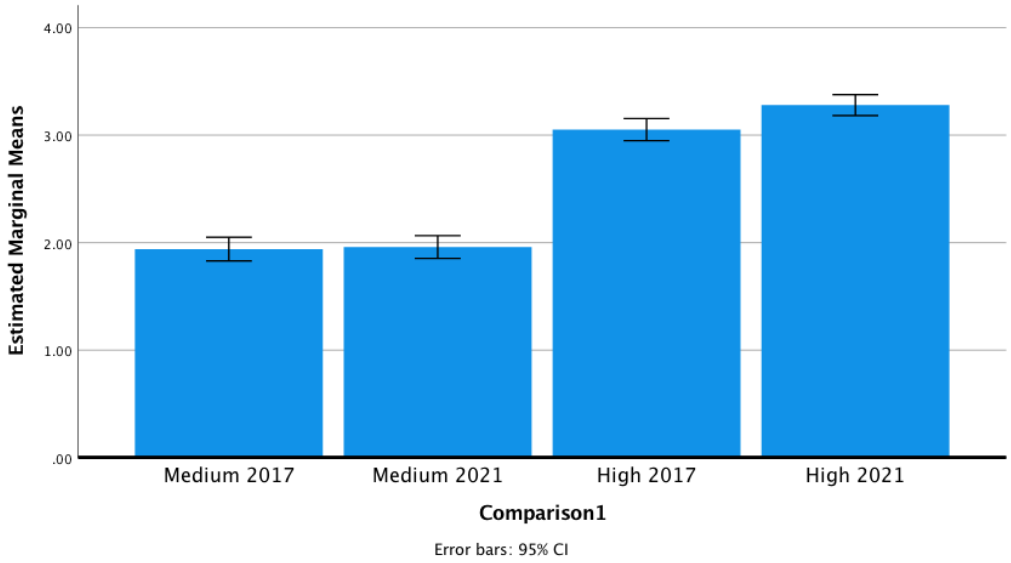

Figure 5 shows the post hoc test: Tukey's conducted for estimated marginal means of Professional Investment as a Source of Stress. The margined means indicate that the group with medium levels of stress prior to COVID-19 (M = 1.94, *SD* = .59) and During COVID-19 (M = 1.96, *SD* = .60) had similar levels regarding Professional Investment. However, the group with high levels of stress prior to COVID-19 (M = 3.05, *SD* = .74) and During COVID-19 (M = 3.28, *SD* = .72) were different regarding Professional Investment; the group prior to COVID-19 with high levels of stress in this variable had a lower mean.

Furthermore, the MANOVA demonstrated overall differences in the TSI variables manifestations of stress between the two groups [Wilk's Lambda; F (20, 2080.47) = 10.462 p<.001, Eta2=.076]. Table 8 presents means, standard deviations, and statistical differences by subgroup for the variables of manifestations of stress.

Table 8

Mean, Standard Deviations, And Statistical Differences by Types of Manifestations of Stress

TSI Variable	**Pre-COVID-19**		**During COVID-19**		*F*	*p*<	Eta2
	Medium (n=135; 47%) M (SD)	High (n=152; 53%) M (SD)	Medium (n=152; 47%) M (SD)	High (n=174; 53%) M (SD)			
B	1.49 (.57)[a]	1.97 (.80)[b]	1.53 (.56)[a]	2.08 (.83)[b]	20.54	.001	.115
G	1.64 (.96)[a]	2.17 (1.09)[bc]	1.76 (1.02)[ab]	2.47 (1.11)[c]	15.43	.001	.089
C	1.85 (.90)[a]	2.71 (1.12)[b]	2.09 (1.00)[a]	2.91 (1.15)[b]	25.81	.001	.141
F	2.46 (.89)[a]	3.18 (.89)[b]	2.59 (.91)[a]	3.44 (.92)[b]	31.71	.001	.167
E	2.50 (1.00)[a]	3.28 (.96)[b]	2.73 (.98)[a]	3.70 (.89)[c]	38.10	.001	.195

Note. M= Mean; B=Behavioral; G=Gastronomical; C=Cardiovascular; F=Fatigue; E=Emotional; ABC row means with the same letter are not significant at alpha < .05.

Figure 6

Post Hoc Test: Tukey's B. Estimated Marginal Means of Manifestations of Stress – Behavioral

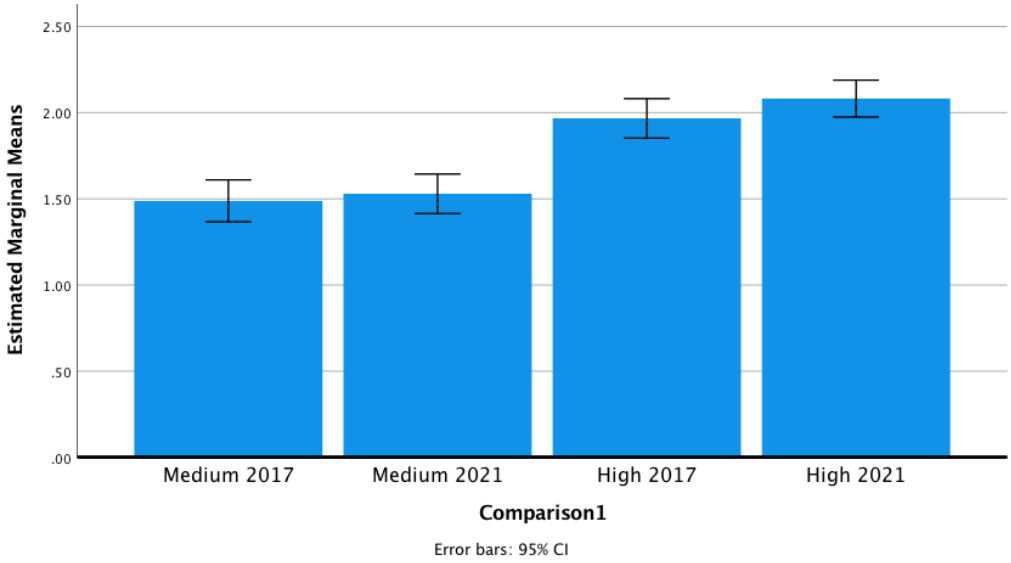

Figure 6 shows the post hoc test: Tukey's conducted for estimated marginal means of Behavioral Manifestations of Stress. The margined means indicate that the group with medium levels of stress prior to COVID-19 (M = 1.49, *SD* = .57) and During COVID-19 (M = 1.53, *SD* = .56) had similar levels regarding Behavioral Manifestations of Stress. Similarly, the group with high levels of stress prior to COVID-19 (M = 1.97, *SD* = .80) and During COVID-19 (M = 2.08, *SD* = .83) had similar levels regarding Behavioral Manifestations of Stress.

Figure 7

Post Hoc Test: Tukey's B. Estimated Marginal Means of Manifestations of Stress – Gastronomical

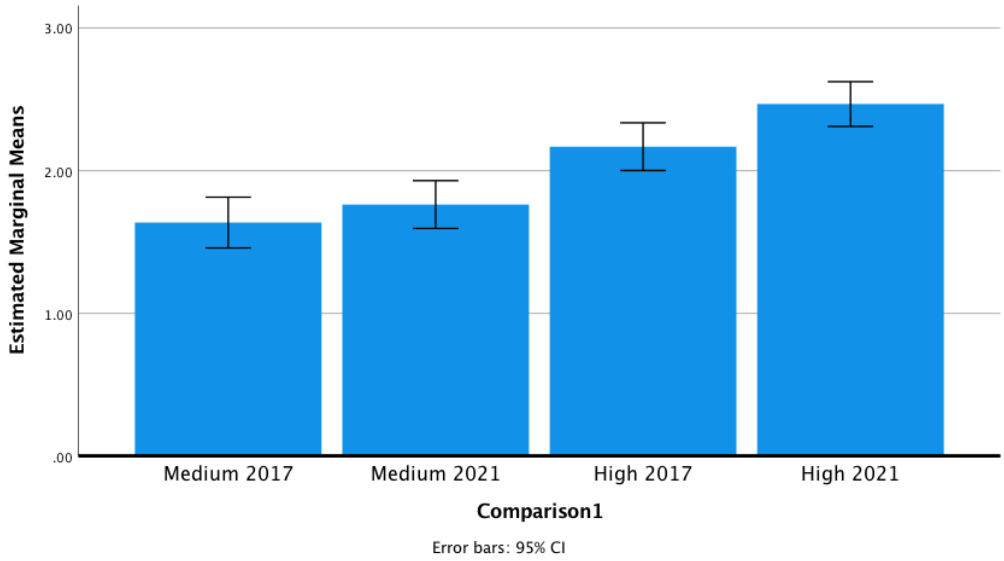

Figure 7 shows the post hoc test: Tukey's conducted for estimated marginal means of Gastronomical Manifestation of Stress. The margined means indicate that the group with medium levels of stress prior to COVID-19 (M = 1.64, *SD* = .96) and During COVID-19 (M = 1.76, *SD* = 1.02) had similar levels regarding Gastronomical Manifestation of Stress. Furthermore, the group with high levels of stress prior to COVID-19 (M = 2.17, *SD* = 1.09) and During COVID-19 (M = 2.47, *SD* = 1.11) were not different regarding Gastronomical Manifestation of Stress.

Figure 8

Post Hoc Test: Tukey's B. Estimated Marginal Means of Manifestations of Stress – Cardiovascular

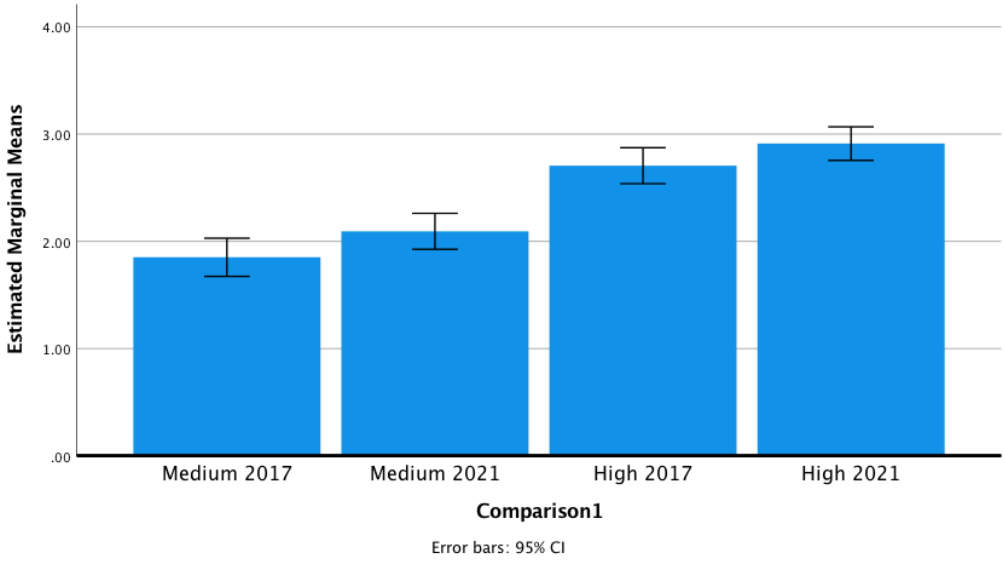

Figure 8 shows the post hoc test: Tukey's conducted for estimated marginal means of Cardiovascular Manifestation of Stress. The margined means indicate that the group with medium levels of stress prior to COVID-19 (M = 1.85, *SD* = .90) and During COVID-19 (M = 2.09, *SD* = 1.00) had similar levels regarding Cardiovascular Manifestation of Stress. Similarly, the group with high levels of stress prior to COVID-19 (M = 2.71, *SD* = 1.12) and During COVID-19 (M = 2.91, *SD* = 1.15) had similar levels regarding Cardiovascular Manifestation of Stress.

Figure 9

Post Hoc Test: Tukey's B. Estimated Marginal Means of Manifestations of Stress – Fatigue

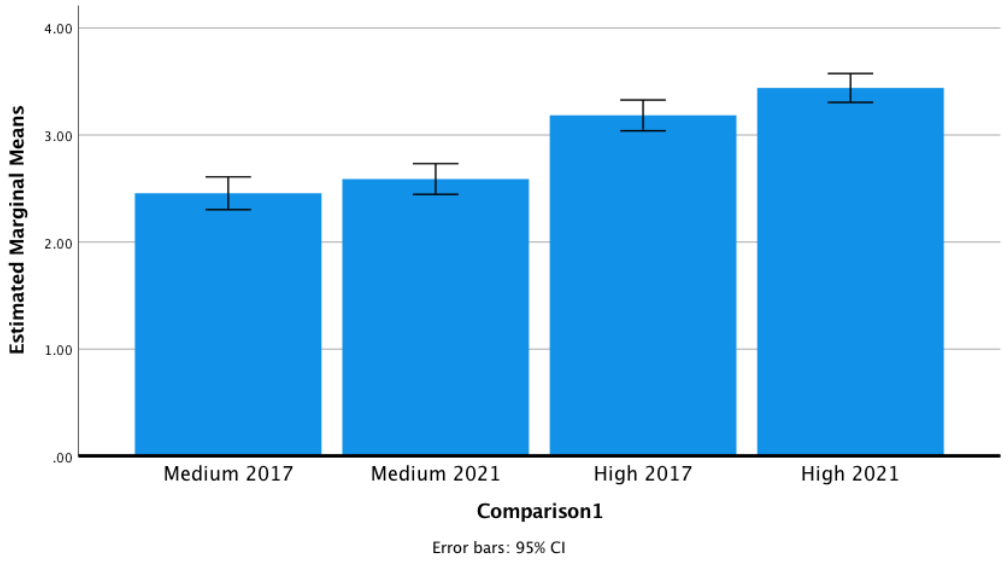

Figure 9 shows the post hoc test: Tukey's conducted for estimated marginal means of Fatigue as a Manifestation of Stress. The margined means indicate that the group with medium levels of stress prior to COVID-19 (M = 2.46, *SD* = .89) and During COVID-19 (M = 2.59, *SD* = .91) had similar levels regarding Fatigue. Similarly, the group with high levels of stress prior to COVID-19 (M = 3.18, *SD* = .89) and During COVID-19 (M = 3.44, *SD* = .92) were not different in regard to Fatigue.

Figure 10

Post Hoc Test: Tukey's B. Estimated Marginal Means of Manifestations of Stress – Emotional

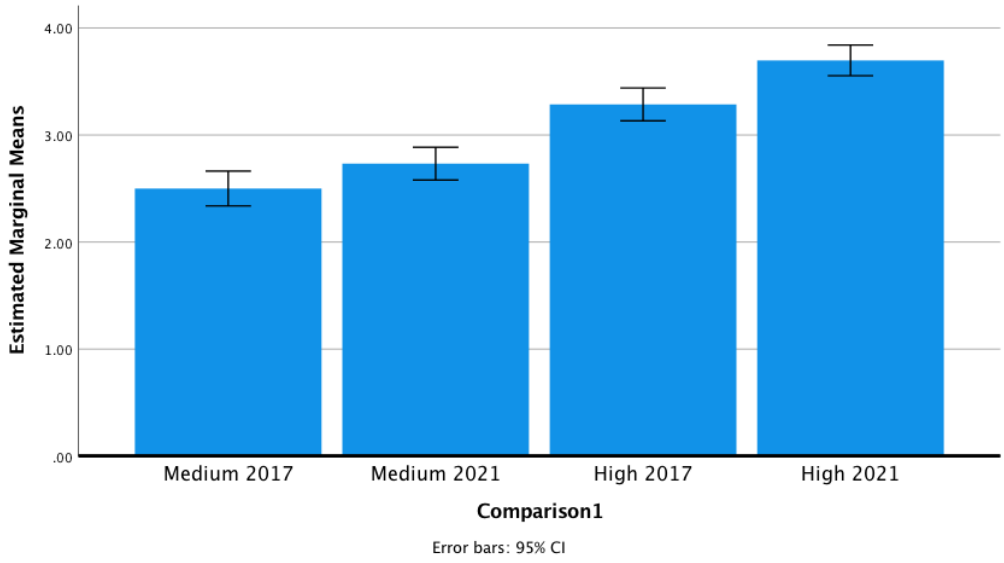

Figure 10 shows the post hoc test: Tukey's conducted for estimated marginal means of Emotional Manifestation of Stress. The margined means indicate that the group with medium levels of stress prior to COVID-19 (M = 2.50, *SD* = 1.00) and During COVID-19 (M = 2.73, *SD* = .98) had similar levels regarding Emotional Manifestation of Stress. However, the group with high levels of stress prior to COVID-19 (M = 3.28, *SD* = .96) and During COVID-19 (M = 3.70, *SD* = .89) were different regarding Emotional Manifestation of Stress; the group during COVID-19 with high levels of stress had a higher mean in this variable.

Anxiety and Depression

To estimate the differences of Levels of Anxiety and Depression between the subgroups of two-cluster solution for the Pre-COVID-19 group and the two-cluster solution for the During COVID-19 groups a Chi-square was conducted.

Table 9

Differences in Regard to Anxiety and Depression

Anxiety & Depression	Pre COVID-19				During COVID-19			
	Medium		High		Medium		High	
	N	%	N	%	N	%	N	%
Yes	116	81.1%	90	55.9%	129	83.2%	173	95.1%
No	27	18.9%	71	44.1%	26	16.8%	9	4.9%

Table 9 shows the results of a chi-square analysis comparing the pre COVID-19 group and During COVID-19 group in regard to symptoms of Anxiety and Depression. Table 9 shows that the group with medium levels of stress prior to COVID-19 and During COVID-19 had similar percentages of symptomology; in other words, prior to COVID-19 81.1% of participants had symptoms and during COVID-19 83.2% of participants also reported Anxiety and Depression symptomology. However, the group with high levels of stress was significantly different; prior to COVID-19 there was a 55.9% of participants reporting symptoms of Depression and Anxiety whereas the during COVID-19 group 95.1% reported symptoms.

Figure 11

Differences in Regard to Anxiety and Depression Bar Chart

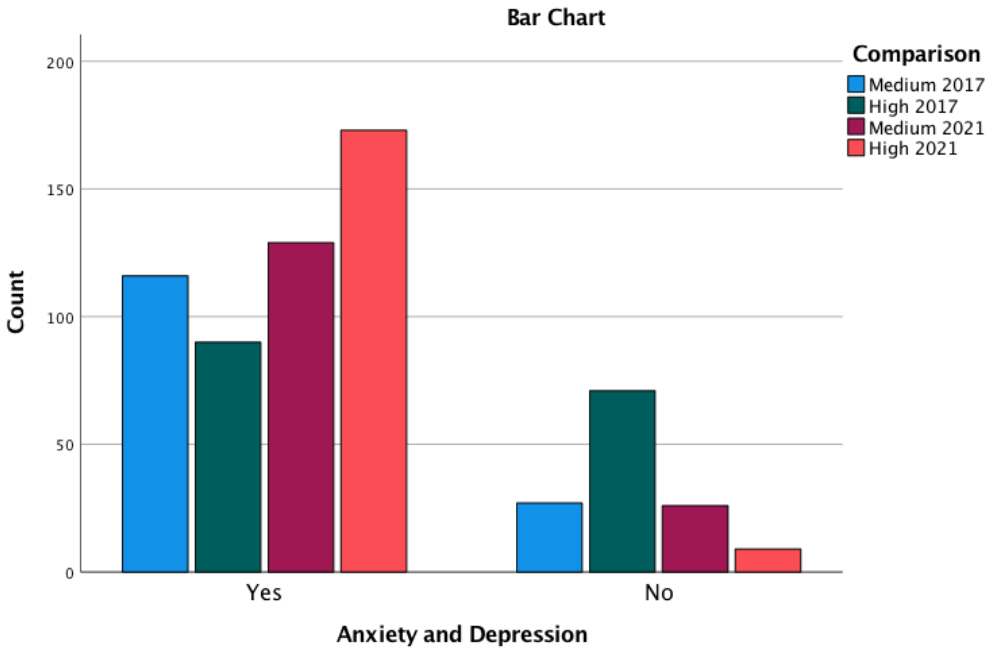

Figure 11 is a visual representation of Table 9 and represents the differences between reported symptoms of Anxiety and Depression in the pre-COVID-19 and during COVID-19 groups.

Substance Use

To estimate the differences of Substance Use between the subgroups of two-cluster solution for the Pre-COVID-19 group and the two-cluster solution for the During COVID-19 groups a Oneway ANOVA was conducted. There was a statistically significant difference between groups as determined by one-way ANOVA ($F(4,654) = 14.94$, $p<.001$). A Tukey post hoc test was conducted to follow up. Table 10 presents

means, standard deviations, and statistical differences by subgroups for the dependent variable Substance Use.

Table 10

Mean, Standard Deviations, and Statistical Differences in Regard to Substance Use

	Pre-COVID-19		**During COVID-19**			
Variable	Medium (n=140; 47%) M (SD)	High (n=159; 53%) M (SD)	Medium (n=154; 46%) M (SD)	High (n=179; 54%) M (SD)	*F*	*p<*
Substance Use	4.73 (2.06)[a]	6.14 (2.76)[b]	4.91 (2.13)[a]	6.59 (2.93)[b]	14.94	.001

Note. M= Mean; ABC row means with the same letter are not significant at alpha < .05

Table 10 shows the results of a one-way ANOVA comparing the pre COVID-19 group and During COVID-19 group in regard to Substance Use. Table 10 shows that the there are not significant differences in the groups; The pre-COVID-19 group with medium levels of stress (M=4.73, *SD*= 2.06) and during COVID-19 group (M=4.91, *SD*=2.93) were not statistically different. Similarly, for the group with high levels of stress prior to COVID-19 (M=6.14, *SD*=2.76) and during COVID-19 (M=6.59, *SD*=2.93) the levels of Substance Use reported were not different.

Figure 12

Post Hoc Test: Tukey's B. Substance Use comparison

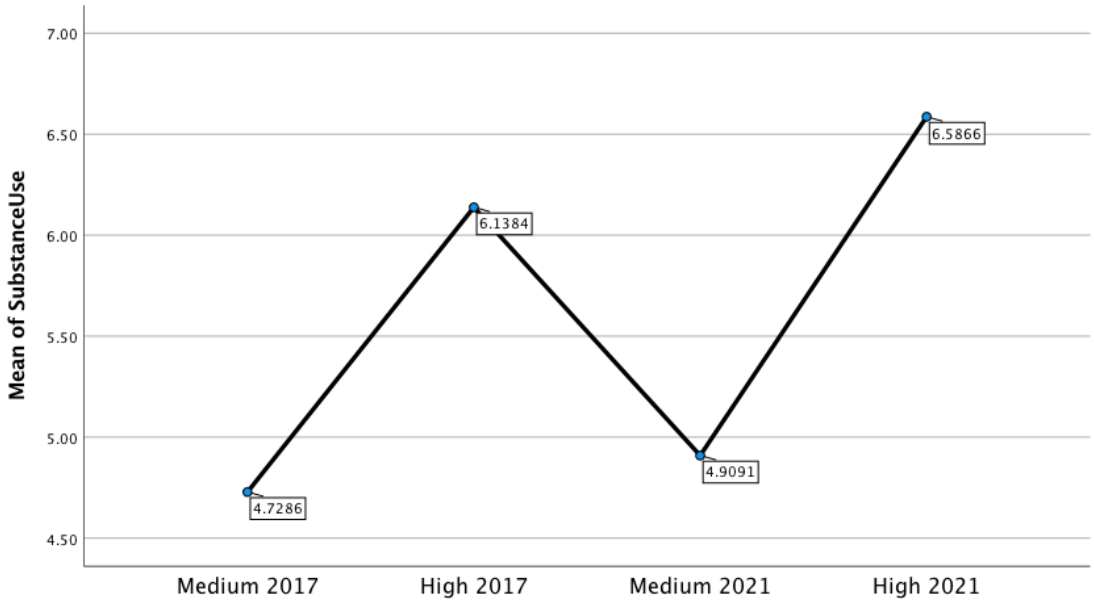

Figure 12 is a visual representation of Table 10 and represents the differences between reported symptoms of Substance Use in the pre-COVID-19 and during COVID-19 groups.

CHAPTER V

Discussion

The current study sought to compare the TSI profiles before and during COVID-19. The goal of this study was to estimate the impact of COVID-19 on teachers' stress. The clusters for the groups pre-COVID-19 and during COVID-19 were obtained through an exploratory two-step cluster analysis conducted using the TSI variables of Sources of Stress (Time Management, Work-Related Stressors, Professional Distress, Discipline and Motivation, and Professional Investment). The teachers in both groups of this study (i.e., before and during the pandemic) fell into two categories: medium or high levels of stress; there was not a group with low levels of stress. When the clusters of the group Pre-COVID-19 and during COVID-19 are compared regarding the percentage of participants in each group, they are very similar. Furthermore, these results indicated comparable levels of stress Before and During COVID-19 and are congruent with previous studies that list teaching as a profession under high levels of stress (Kyriacou, 2001; Johnson et al., 2005).

Nonetheless, there were some differences in the profile of teachers Prior to and During COVID-19. For example, the differences between the sources of stress were found in the variables: Time Management, Work-Related Stressors, Discipline and Motivation, and Professional Investment. Regarding Professional Distress, there were no differences between the Pre-COVID-19 and During COVID-19 groups when the

subgroups were compared. The differences in the groups' profile in the Medium Category are as follows: When compared to the equivalent group, the During-COVID-19 group had higher levels of stress concerning Time Management and Work-Related stressors. Thus, during COVID-19, time management played a higher role as a stress source for those teachers with medium levels of stress. These findings are consistent with the information suggesting that the pandemic caused challenges for those creating, maintaining, and improving distance learning (UNESCO, 2020b); navigating the new challenges and managing the time with a new routine might have caused higher levels of stress for teachers. Furthermore, those who are parents and teachers might have struggled with time management due to having to manage two conflicting roles. As noted in the literature, in regard to childcare responsibilities, about 48% of public-school teachers have children living at home (Barnum, 2020). This would implicate that for those teachers doing remote work, who are also parents of a school age child or children, had to teach their own kids while also doing online teaching. Thus, the findings of this study regarding more stress related to time-management align with the evidence suggesting that COVID-19 is a stressor that has disrupted the regular working modality for teachers.

Furthermore, teachers with medium levels of stress struggled more with work-related stressors during COVID-19. Work-related stress as measured by the TSI includes having little time to prepare for lessons and responsibilities, having too much work to do, having a fast pace of the school day, caseload being too big, and personal priorities being shortchanged due to time demands, and having too much administrative paperwork. This

study is consistent with the literature, for example, as noted by Richards (2012) some of the primary sources of stress for teachers are related to feelings of being over-committed at work with too many duties and responsibilities that often lead to taking work home, teaching needy students without enough support, having little time to relax, teaching unmotivated students, and feeling the constant pressure of being accountable. All of these stressors can potentially be exacerbated during the pandemic due to the rapid shifting of the working modalities for the teachers.

Furthermore, teachers with high levels of stress During COVID-19 struggled less with Discipline and Motivation; and more with Professional Investment while also having higher levels of Emotional manifestations of stress. The results of this study support previous studies that have found a relationship between teachers' stress levels and poor mental health, suggesting that teaching is one of the occupations with higher work-related stress and worse psychological health (Johnson et al., 2005; Kyriacou, 2001; Tang et al., 2001; Yang et al., 2009). Furthermore, teachers with high levels of emotional distress during the pandemic might have struggled more to stay Motivated, Disciplined, and Invested Professionally; these results align with Zhu and colleagues' (2020a) findings, suggesting that the COVID-19 pandemic has an impact on mental health. However, this study adds to the literature because it is the first evaluation of the effects of COVID-19 in the teaching population.

Moreover, this study found significantly higher symptomology of anxiety and depression specifically in the group of high levels of stress during COVID-19. As noted

by Langille (2017) and Wilkerson and Bellini (2006), stress can lead to several mental illnesses, such as anxiety and depression. Thus, these findings support the idea that the education sector does not escape from the consequences of the pandemic and teachers with high levels of stress are at risk for developing a psychological disorder such as anxiety and depression.

Implications

This study adds to the existing literature showing the strong relationship between stress and the teaching profession during normal circumstances. Additionally, this is the first study exploring the impact of COVID-19 on the teacher population and showing the effect that it had on the emotional manifestations of stress, including Anxiety and Depression. A growing body of research has shown that the teaching force is an at-risk population for stress. Additionally, this study shows how levels of stress related to Discipline and Motivation were lower, showing that teachers were not highly stressed about these factors during the Pandemic. This might be the consequence of the high levels of anxiety and depression, as teachers who are experiencing emotional distress might not have the energy to stress about Motivational Factors.

Teachers are vital elements in the education system; the best programs, laboratories, and libraries are meaningful without the teachers who will bring them into force (Güneyli, 2012). As the need for public school teachers is increasing, the enrollment of students is growing, and the rates of attrition are increasing. Having teachers who are at risk by experiencing high levels stress, anxiety and depression, might

lead to reduction of productivity, burn-out, and disability. Burnout is the result of work-related chronic stress that leads to reduced occupational satisfaction (Hydon et al., 2015). The burnout phenomenon is commonly noted on health care workers and other care-taker professions like teachers (Leiter, et al., 2015). Thus, teacher's at-risk for high levels of stress can ultimately experience burn-out which increases the intentions to quit as noted by Chambers-Mack et al. (2019). In their study, the authors found that poor mental health, high levels of stress, depression, and somatization disorder were predictors of intentions to quit. Similarly, Liu and Wang (2000) conducted a study to examine the relationship between occupational burnout and teachers' mental health and found that burnout is correlated with mental health including: Somatization, Depression, and Anxiety. Hence, the importance of promoting mental health and providing assistance to teachers at-risk to prevent teachers' disability and attrition.

Regarding the relationship between teachers' disability and its implication in school, one of the most important consequence is the adverse effects on the learning of students. Ultimately, the attrition of teachers is detrimental to student educational progress and the achievement of instructional goals. For example, Miller et al. (2008) found that a teacher absent from work represents a significant adverse influence on the academic attainment of the students in that classroom. Results indicated that the absence of teachers was correlated to lower academic achievement among their students. Hence, the importance of exploring ways to better support the teaching personnel to address the levels of stress and its effects.

School psychologists are in charge of working with students and the school personnel to address the needs of the students. In the past, the school psychologist's traditional role has been to conduct full individual evaluations and worked mainly with the special education population. However, nowadays, there has been a movement towards using multi-tiered systems of support (MTSS) that requires working with the school system as a whole, including the general education, those at-risk receiving interventions, and the special education population. In light of this new working modality, adding referral for interventions for at-risks teachers to the school psychologist workload could serve to better address concerns with tier 1 level (i.e., general education). The better well-being of the teacher, the less attrition and better outcomes for the students. Thus, school psychologist could be the agents who assists teachers by recognizing who is at risk and referring them to the appropriate mental health professional.

Limitations and Future Studies

The following limitations were present in this study and should be considered when examining the results. There is a limitation associated with the data collection instrument and measurement scale. The TSI is considered a reliable instrument to measure teacher's work stress in multiple dimensions and has been used in the U.S. to study large samples (Fimian & Fastenau, 1990); however, this instrument is approximately 30 years old and its norming sample has not been updated. Developing an instrument to measure teacher's levels of stress that is current and sensitive to multiple

uses during the year is warranted for future studies. It is important to have an instrument that can be used as a screener of teacher's well-being and specific enough to capture differences across the year.

There was a limitation related to sampling. The data set was comprised almost completely of participants recruited through social media. Thus, this study used a convenience sample to recruit U.S. public school teachers; this sampling method is not ideal for inferential statistical analysis. Furthermore, given this recruiting method, it is possible that those teachers who are less comfortable with technology, and perhaps older teachers, were less likely to participate and might be underrepresented. Future studies can collect in-person data to increase the participation of older teachers.

The two data sets used had an overrepresentation of female teachers (i.e., 96.7% for the 2017 study and 94.7% for the 2021 study). However, it is important to note that this is consistent with the U.S. teacher population (i.e., about 76% of teachers in the U.S are female; NCES, 2020). Another limitation of this study is that only public-school teachers were selected, and private school teachers were excluded. This limitation is in part because of the different stressors the private school teachers might encounter. Thus, these results might not hold true for private school teachers. Future studies can investigate the levels of stress in the private education sector.

The self-report nature of the survey can be considered a limitation. This study did not have any external motivator. The stress that the survey intended to measure might also represent a limiting factor. Those teachers that are experiencing a significant amount

of stress might have ignored this request to complete additional work. Additionally, some respondents might have spent more or less time thinking about their responses. All of these elements are a threat to the internal validity of the study that can be considered in future studies. Additional demographic information (race, childcare responsibilities, and teaching modality in-person vs. telepractice) and analysis would increase the depth of comparison in future studies. Research focusing on interventions to decrease teacher's levels of stress is warranted.

Conclusion

The overall purpose of this study was to examine the impact of COVID-19 on the teacher population. In conclusion, this study showed that teachers report high levels of stress during normal circumstances and during the event of a pandemic. However, teachers' stress profile during the event of a pandemic showed a higher level of impact in Emotional manifestation. Stress has been shown to be related to mental health conditions such as anxiety and depression. Future studies can focus on investigating strategies to reduce stress and improving the mental health of teachers. School psychologists could potentially serve the teacher population by recognizing those at-risk and being a source to provide referrals. This not only will benefit the teachers, but it will serve as an intervention at a tier-one level since student outcomes have been linked to teacher's well-being.

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Appendix A

Facebook Groups Where Teachers Were Recruited in 2021

1. HISD TEACHER GROUP
2. Texas teachers ACP official Community
3. Self-Contained SpEd & Distance Education
4. Middle School Art Teachers
5. TeacherHunters DFW
6. Teachers Corner of North Texas
7. Houston teachers in need
8. Texas teachers' projects
9. Texas Teachers ACP official Community
10. School Psychology Interns 2020-2021
11. Georgia Teachers Helping Teachers
12. OKCPS Teachers
13. We Support Wyoming Teachers and Staff
14. Missouri Teachers Take A Stand
15. Alaska Science Teachers
16. Teacher/Educator Resources and Jobs in Arizona
17. 4th Grade Texas Writing Teachers
18. We Are Teachers
19. Middle School Art Teachers
20. Teachers Sharing Resources | Lesson Planned
21. Maine Teachers
22. The Teachers' Lounge – Houston & Surrounding Areas
23. Preschool Teachers
24. Hawaii teachers
25. Houston Area Alliance of Black School Educators
26. North Carolina Teachers United
27. TN Teachers United
28. Teachers
29. English Activities for Teachers
30. Help a teacher community
31. Teachers asks teachers
32. The Secondary Series

33. Free Teacher Resources
34. Delaware teachers
35. Illinois Teachers
36. Texas Teachers’ Lounge
37. Teaching Alaska’s Native languages
38. Indiana Public School Teachers
39. Indiana Association of Biology Teachers
40. 6th grade ELA Teachers
41. Second Grade Smiles - 2nd Grade Teachers' Group
42. Teachers of New York City
43. Sixth Grade Teacher Family
44. Empowering DC Teachers
45. Kindergarten Teachers of Albuquerque
46. Teaching Social Studies

Appendix B

Teacher Stress Inventory

The following are a number teacher concerns. Please identify those factors which cause you stress in your present position. Read each statement carefully and decide if you ever feel this way about your job. Then, indicate how strong the feeling is when you experience it by circling the appropriate rating on the 5-point scale. If you have not experienced this feeling, or if the item is inappropriate for your position, circle number 1 (no strength; not noticeable). The rating scale is shown at the top of each page.

Examples:

I feel insufficiently prepared for my job. 1 2 3 4 5

If you feel very strongly that you are insufficiently prepared for your job, you would circle number 5.

I feel that if I step back in either effort or commitment,
I may be seen as less competent. 1 2 3 4 5

If you never feel this way, and the feeling does not have noticeable strength, you would circle number 1.

HOW STRONG ?	1 no strength not noticeable	2 mild strength barely noticeable	3 medium strength moderately noticeable	4 great strength very noticeable	5 major strength extremely noticeable
TIME MANAGEMENT					
1. I easily over-commit myself.	1	2	3	4	5
2. I become impatient if others do things to slowly.	1	2	3	4	5
3. I have to try doing more than one thing at a time.	1	2	3	4	5
4. I have little time to relax/enjoy the time of day.	1	2	3	4	5
5. I think about unrelated matters during conversations.	1	2	3	4	5
6. I feel uncomfortable wasting time.	1	2	3	4	5
7. There isn't enough time to get things done.	1	2	3	4	5
8. I rush in my speech.	1	2	3	4	5

Add items 1 through 8; divide by 8; place your score here:

WORK-RELATED STRESSORS

9. There is little time to prepare for my lessons/responsibilities.	1	2	3	4	5
10. There is too much work to do.	1	2	3	4	5
11. The pace of the school day is too fast.	1	2	3	4	5
12. My caseload/class is too big.	1	2	3	4	5
13. My personal priorities are being shortchanged due to time demands.	1	2	3	4	5
14. There is too much administrative paperwork in my job.	1	2	3	4	5

Add items 9 through 14; divide by 6; place your score here:

PROFESSIONAL DISTRESS

15. I lack promotion and/or advancement opportunities.	1	2	3	4	5
16. I am not progressing my job as rapidly as I would like.	1	2	3	4	5
17. I need more status and respect on my job.	1	2	3	4	5
18. I receive an inadequate salary for the work I do.	1	2	3	4	5
19. I lack recognition for the extra work and/or good teaching I do.	1	2	3	4	5

Add items 15 through 19; divide by 5; place your score here:

DISCIPLINE AND MOTIVATION

I feel frustrated...

20. ...because of discipline problems in my classroom.	1	2	3	4	5
21. ...having to monitor pupil behavior.	1	2	3	4	5
22. ...because some students would better if they tried.	1	2	3	4	5
23. ...attempting to teach students who are poorly motivated.	1	2	3	4	5
24. ...because of inadequate/poorly defined discipline problems.	1	2	3	4	5
25. ...when my authority is rejected by pupils/administration.	1	2	3	4	5

Add items 20 through 25; divide by 6; place your score here:

PROFESSIONAL INVESTMENT

26. My personal opinions are not sufficiently aired.	1	2	3	4	5
27. I lack control over decisions made about classroom/school matters.	1	2	3	4	5
28. I am not emotionally/intellectually stimulated on the job.	1	2	3	4	5
29. I lack opportunities for professional improvement.	1	2	3	4	5

Add items 26 through 29; divide by 4; place your score here:

EMOTIONAL MANIFESTATION

I respond to stress...

30. ...by feeling insecure.	1	2	3	4	5
31. ...by feeling vulnerable.	1	2	3	4	5
32. ...by feeling unable to cope.	1	2	3	4	5
33. ...by feeling depressed.	1	2	3	4	5
34. ...by feeling anxious.	1	2	3	4	5

Add items 30 through 34; divide by 5; place your score here:

FATIGUE MANIFESTATIONS

I respond to stress...

35. ...by sleeping more than usual.	1	2	3	4	5
36. ...by procrastinating.	1	2	3	4	5
37. ...by becoming fatigued in a very short time.	1	2	3	4	5
38. ...with physical exhaustion.	1	2	3	4	5
39. ...with physical weakness.	1	2	3	4	5

Add items 35 through 39; divide by 5; place your score here:

CARDIOVASCULAR MANIFESTATIONS

I respond to stress...

40. ...with feelings of increased blood pressure.	1	2	3	4	5
41. ...with feeling of heart pounding or racing.	1	2	3	4	5
42. ...with rapid and/or shallow breath.	1	2	3	4	5

Add items 40 through 42; divide by 3; place your score here:

GASTRONOMICAL MANIFESTATIONS

I respond to stress...

43. ...with stomach pain of extended duration.	1	2	3	4	5
44. ...with stomach cramps.	1	2	3	4	5
45. ...with stomach acid.	1	2	3	4	5

Add items 43 through 45; divide by 3; place your score here:

BEHAVIORAL MANIFESTATIONS

I respond to stress...

46. ...by using over-the-counter drugs.	1	2	3	4	5
47. ...by using prescription drugs.	1	2	3	4	5
48. ...by using alcohol.	1	2	3	4	5
49. ...by calling in sick.	1	2	3	4	5

Add items 46 through 49; divide by 4; place your score here:

TOTAL SCORE

Add all calculated scores; enter the value here _____.
Then, divide by 10; enter the Total Score here _____.

Appendix C

Demographic Variables

Your sex:

Number of years you have taught? _____
Your age: _____
How many students do you teach each day? _____
What level students do you teach? (circle the rest of your answers)
Elementary Middle School Secondary

With what type of students do you work?
General Education Special Education

Which is the most advanced degree you have?
Bachelors Masters Doctorate Other

VITA

Berenice Saez Briceno graduated from U.E. Colegio Republica de Venezuela High School in Valera, Trujillo, Venezuela, in 2008. The same year, she started a cultural exchange program, which consisted of taking an extra year of high school at Van High School in Van, Texas, United States. In the Fall of 2009, she enrolled in a Bachelor of Science in Communications program at Rafael Belloso Chacin University in Maracaibo, Zulia, Venezuela. While finishing her classes in the B.S. program, she started working as an Intern of the Press Department at Corporación Televen in Caracas, Venezuela. Then, she was hired as a Television Producer for Brújula International, Globovisión, in Caracas, where she worked until July 2013. She received her B.S. degree in May 2013. She started graduate school seeking her Master of Fine Arts (M.F.A.) degree in Filmmaking at Stephen F. Austin State University (SFASU) in Nacogdoches, Texas, in Spring 2014, and graduated in Spring 2017. In August 2017, she started the doctoral program of School Psychology at SFASU. Berenice will receive her Doctor of Philosophy in School Psychology in August 2021.

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