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Examining the Relationship Between Puberty and Trauma Symptomatology

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EXAMINING THE RELATIONSHIP BETWEEN PUBERTY AND TRAUMA SYMPTOMATOLOGY

by

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ABSTRACT

This study sought to examine the relation between puberty and trauma symptomatology in young adults. More specifically, does it matter what developmental period one is in when trauma occurs? Additionally, geographical region was examined as it relates to receiving and reporting mental health services and later trauma symptoms. Using data from 362 students at Georgia Southern University, multiple analyses were conducted. A Moderation Analysis where adverse events served as the predictor, trauma symptomatology as the outcome variable, and the developmental period in which the trauma occurred as the moderator was conducted. The interactions for this hypothesis were not significant. However, the main effects for the multiplicity score, severity score, and grouping were significant. Additionally, a Chi-Square test for Variance was analyzed to assess whether one's geographical region related to rates of receiving and reporting mental health care. Receiving mental health services was found to be independent of childhood geographic region. Similarly, reporting mental health services was also found to be independent of childhood geographic region. Finally, an Analysis of Variance (ANOVA) was conducted to assess how childhood geographic regions and receiving mental health treatment related to trauma symptoms in young adults. The interaction effect as well as the main effect for rurality were not statistically significant. However, the main effect for mental health services was significant. Overall, participants who reported experiencing traumatic experiences throughout their childhood and adolescence also reported having trauma symptoms

as young adults. Interestingly, the findings of this study suggest that there may be a threshold of

symptom severity that is associated with seeking mental health treatment regardless of

geographic region.

INDEX WORDS: College students, Adverse events, Trauma symptoms, Geographic region

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by

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CHAPTER 1

INTRODUCTION

Prevalence of Childhood Adversity

Since 1991, NCANDS (National Child Abuse and Neglect Data System) annually publishes a report of child abuse and neglect information (United States Department of Health and Human Services, 2023). The data includes reports from all 50 states, the Commonwealth of Puerto Rico, and the District of Columbia. Reporting these statistics by state is beneficial, but other methods may also be helpful as state reports exclude abuse that is not reported to authorities. Each state has its own definition of child abuse and neglect, making it difficult to accurately determine prevalence; however, this report uses the definition provided by federal legislation (United States Department of Health and Human Services, 2023):

> *Any recent act or failure to act on the part of a parent or caretaker which results in death, serious physical or emotional harm, sexual abuse or exploitation; or an act or failure to act, which presents an imminent risk of serious harm (p. ix).*

From the statistics below, collected between October 1st, 2020, and September 30th, 2021, it is clear that trauma is a widespread problem and "one of the Nation's most serious concerns" (United States Department of Health and Human Services, 2023, p. 1).

In 2021, there were approximately 4 million referrals of possible maltreatment of 74.1 million children; overall, 53.8 for every 1,000 children were suspected of experiencing maltreatment (United States Department of Health and Human Services, 2023). Most reports were for some form of neglect: 77.7% for neglect (failure of caregiver to provide needed and age-appropriate care), 8.1% for medical neglect (failure of caregiver to provide health care of the child), 42.8% for physical abuse (physical acts that could cause physical injury to the child),

2.4% for psychological maltreatment (acts or lack thereof that could cause behavioral or mental disorders; typically in the form of verbal abuse or excessive demands), and 0.8% for sexual abuse (the involvement of a child in a sexual activity meant to provide sexual gratification for the perpetrator, such as prostitution, pornography, incest, etc.) (United States Department of Health and Human Services, 2023).

In the most tragic and severe cases, child abuse and neglect results in child fatalities. To emphasize the severity, there were 1,820 child deaths due to maltreatment in the U.S. during 2021 (United States Department of Health and Human Services, 2023). Most deaths occurred in very young children, with 66.2% being children younger than three and 45.6% younger than one. Overall, deaths were at a rate of 2.46 per every 100,000 children with boys having a higher fatality rate (3.01 per every 100,000) compared to girls (2.15 per every 100,000) (United States Department of Health and Human Services, 2023).

One prevalent form of maltreatment is sexual victimization. In America, about eight to 10 percent of youth (ages 0-17) experience at least one sexual assault, with higher rates of victimization among girls (13-17%) compared to boys (3-5%) (Saunders & Adams, 2014). Specifically, one out of six American girls and one out of 25 American boys experience a sexual assault involving physical contact in their lifetimes. However, when using data from a 17-year-old sample, this rate increases to 1 out of 5 girls and 1 out of 20 boys (Saunders & Adams, 2014). As these rates suggest, certain forms of abuse are more prevalent and gendered than others; sexual assault is primarily against women and girls and is more prevalent than the other forms of maltreatment noted above.

Unfortunately, incidence rates of maltreatment grossly underestimate cases. According to Saunders and Adams (2014), childhood trauma (specifically interpersonal violence) tends to

occur in private settings and are rarely observed, leaving the knowledge of the event with the perpetrator and child survivor, who may not report what occurred. More specifically, children may not disclose maltreatment from fear of getting in trouble, feelings related to stigma, shame, guilt, self-blame, and fear of the offender, or worry that disclosing the abuse will result in punishment of the offender. Further, children may not understand what occurred and that it was wrong or may not categorize the events as abuse or victimization (Saunders & Adams, 2014). For example, a child who receives a severe beating for misbehaving and believes that it was appropriate may not see the event as abusive or may not want the perpetrator punished for the maltreatment. Therefore, according to Saunders and Adams (2014), children may not disclose their maltreatment, lessening the chance of an official report to authorities. Additionally, cases that are reported to law enforcement or other authorities may lack crucial details such as the demographics of the offender and victim and the severity and nature of the event (Saunders & Adams, 2014). These details may also explain the lack of reporting, especially for survivors who are members of subpopulations. For example, boys may be more hesitant to report sexual assault due to cultural stigma related to same-sex sexual behaviors; girls from groups valuing "virginity" may be less likely to report sexual abuse than girls from other groups; children from regions where physical punishment is typical may not identify physical abuse because it is viewed as normal (Saunders & Adams, 2014).

Impacts of Trauma on Children

Youth between the ages of three and 16 are more vulnerable than other age groups when it comes to the impacts of trauma because they do not have the skills to help them cope in a prosocial and adaptive way (Turanovic & Pratt, 2019). Additionally, being victimized during youth can lead to distressing flashbacks, insecure attachment, and difficulties with affective and

emotional regulation difficulties into adulthood as a result of no longer feeling safe, in control, and confident about their survival (Turanovic & Pratt, 2019). However, for most children, positive stress is a brief physiological state that is mild to moderate in magnitude that occurs during feelings of frustration or going to school for the first time (Shonkoff et al., 2012). This stress gives the caregiver a chance to help the child cope which has a protective effect of getting the stress response back to baseline. However, frequent activation of the stress response from repeated exposures of adversity in childhood without a buffering caregiver is also known as toxic stress (Oh et al., 2018) and may affect the brain structure of the child such as the size and neuronal architecture of the amygdala (mediates fear and anxiety and activated the physiological stress response), hippocampus (controls learning, memory, and mood), and prefrontal cortex (PFC; controls high-order functions such as planning, strategy, and executive decisions, plays a role in our emotional state, inhibits primal survival instincts) (Hathaway & Newton, 2022; Shonkoff et al., 2012). This change in brain structure increases the risk of developing poor physical, behavioral, socio-emotional, and cognitive health (Shonkoff et al., 2012). Additionally, it is also associated with chronic illnesses in adulthood such as heart disease, substance abuse, and depression (Francis et al., 2018).

Depending on age/developmental level when the trauma occurs, different parts of the brain may be affected (Plumb et al., 2016). For example, if trauma occurs during the development of the limbic system (responsible for the fight-or-flight response, emotional control, heartbeat, and physical balance), one's ability to interpret social cues, ability to wake, sleep, breathe, relax, and sexual behavior could be impacted. If trauma occurs during the development of the midbrain, one may experience difficulties with motor function, coordination, and spatial awareness (Plumb et al., 2016). Finally, if trauma occurs during the development of the cerebral

cortex (controls higher order functions of the brain), it can impact one's ability to plan, problem solve, use language, and develop higher order thinking (Plumb et al., 2016).

Additionally, if children experience chronic or complex trauma, they may experience hyperarousal or hypoarousal and may be in constant fight, flight, or freeze modes where their body is primarily concerned with survival and self-preservation, negatively impacting a child's ability to learn. The longer children spend in states of hyperarousal the more often they will stay in hyperarousal (Plumb et al., 2016). These children will often act out in the classroom because they cannot distinguish between safe and unsafe environments (Plumb et al., 2016).

Trauma

Despite the prevalence and severe outcomes following a traumatic event, there is uncertainty about the concept of trauma (Krupnick, 2019). Therefore, Krupnik (2019) proposes the following definition for traumatic events: "to be considered traumatic, a stress response to an event must meet a necessary condition that the event be outside of the person's normative life experience, and a sufficient condition that the response include a breakdown of self-regulatory functions" (p. 2). There are three types of trauma: acute, chronic, and complex (Plumb et al., 2016). Acute trauma is a single event, such as a car accident. Chronic trauma includes events to which one is repeatedly exposed, such as domestic violence (Plumb et al., 2016). Finally, complex trauma is when one is exposed to traumatic events repeatedly and cumulatively, specifically one is exposed to varied and multiple traumatic interpersonal events (Plumb et al., 2016). There are a variety of experiences considered traumatic. Some traumatic events include sexual victimization, physical abuse and assault, witnessing violence, death of a loved one, internet-assisted victimization, disasters (natural or man-made), car accidents, other accidents (e.g., accidental fall, accidentally struck by or against another person or object), animal attacks,

polyvictimization, war, torture, and mass violence (Mesfin et al., 2007; Saunders & Adams, 2014). These situations may not only lead to a stress response outside of one's normative experience, but they can also lead to psychological difficulties, including mental health disorders (Mesfin et al., 2007). In fact, Perry (2007) expects that at least 40% of all children exposed to traumatic events develop some form of chronic neuropsychiatric challenge. In addition, further gendered effects are found in the development of posttraumatic disorder (PTSD; the development of symptoms such as intrusive memories, and dissociative reactions such as flashbacks following a traumatic event) (American Psychiatric Association, 2013). Women are twice as likely to develop PTSD as men after experiencing trauma (Mesfin et al., 2007). Specifically, women are more likely to be exposed to abuse, rape, and carry a heavier family burden while men are more likely to be exposed to direct combat activities and war conflicts during displacement (Mesfin et al., 2007). These differences in types of trauma experienced may relate to the differential rates of PTSD between women and men.

Childhood Adversity

To emphasize the severity of this concept, around 3.5 million U.S. children were referred for suspected child abuse and neglect in 2019, out of which 656,000 were found to be victims of child maltreatment (Graf et al., 2022). Childhood neglect and abuse can have long-term consequences including negative impacts to physical health, psychological and emotional well-being, and cognitive functioning (Graf et al., 2022). Additionally, child maltreatment may also result in PTSD and depression (Vranceanu et al., 2007). Furthermore, children who are victimized may also experience problems with crime and violence; further victimization; substance abuse; feelings such as confusion, fear, anger, and distress; and difficulties with work, school, family members, or friends (Turanovic & Pratt, 2019). More specifically, 68% of victims

of violent crime (ages 12 or older) experienced socio-emotional challenges and 96% reported emotional distress for a month or more. These symptoms were exacerbated if the perpetrator of the violent crime was someone the child knew (Turanovic & Pratt, 2019). Moreover, adolescents experiencing violent victimization are more likely to get married to or cohabitate with a romantic partner at 17 years of age. Unfortunately, victimized youth in these early unions have been found to be at an increased risk of experiencing intimate partner violence (IPV; Turanovic & Pratt, 2019).

Additionally, children who grow up in adverse environments die younger than their counterparts (Graf et al., 2022). This could be due to the stress-related wear and tear that victims may experience as a result of childhood adversity such as maltreatment, which could lead to an acceleration of aging (Graf et al., 2022). Those who experience adversities (e.g., child maltreatment, poverty, poor parenting, exposure to IPV) have an earlier onset of puberty at a rate disproportionate to their counterparts (Mendle, 2014). This is significant because the gendered deviation hypothesis suggests that early-maturing girls and late-maturing boys have the highest risk of harmful outcomes because they deviate from the norm in terms of being early or late in their physical development (Ullsperger & Nikolas, 2017).

Overall, adverse events include a wide range of experiences, from natural disasters to repeated sexual assault, among others. Further, there are a variety of potential effects following traumatic events, including socio-economic challenges and mental health disorders such as PTSD. It is important to study the impacts of trauma due to its high prevalence in everyday life, but there is more work that needs to be done. A specific area needing additional research focus is the interaction between human biology and trauma, including differences between men and women/boys and girls related to types of trauma experienced and later challenges to overall

health. More specifically, the current study will be contributing to the literature by investigating possible associations between normative biological processes (i.e., puberty) and psychological symptomatology. Given that puberty is a markedly stressful transition during the lifespan and youth do not have fully developed coping skills to help them through traumatic experiences, this research could provide the framework for future programs targeting youth going through puberty who experience trauma (Mendle, 2014; Turanovic & Pratt, 2019).

Puberty

Physical Changes

Aside from experiencing adverse childhood experiences that could impact their future trajectory (DiPietro, 2021), children may also begin undergoing puberty which has been found to be associated with mental distress (Mendle, 2014). Puberty is characterized as a physiological process where boys and girls undergo growth in height, size and viability of genitals, and areas that grow hair. Development of acne as well as voice changes occur, as well as the onset of menstruation for girls (Breehl & Caban, 2022). These physiological changes in puberty begin with the Gonadotropin-releasing hormone (GnHR) neurons in the hypothalamus. The GnRH neurons lead to the secretion of various other hormones, including the luteinizing hormone (LH), and the follicle-stimulating hormone (FSH) from the gonadotropic cell of the anterior pituitary gland which affect cells in the testes and ovaries (Breehl & Caban, 2022). Other hormones from the adrenal cortex are responsible for adrenarche (the increased secretion of hormones such as adrenal androgen precursors dehydroepiandrosterone [DHEA] around the ages of six to eight which will eventually lead to pubarche).

While these hormonal changes occur, boys and girls experience different developmental milestones (Breehl & Caban, 2022). For girls, the milestones include ovarian development

(gonadotropins cause the ovary to produce estradiol leading to secondary sexual characteristics, growth of reproductive organs, fat redistribution to hips and breasts, and bone maturation; the ovarian size also increases), followed by thelarche (breast growth; first sign of puberty, occurring around nine to 10 years of age), pubarche (growth of pubic hair; appears around six months after thelarche), and menarche (the first menstrual period; occurs either one to three years after thelarche or 12 to 13 years of age) (Breehl & Caban, 2022). The next milestone is uterus size. The increase in estrogen production influences the shape of the uterus shape from teardrop to pear-shaped. The uterine body increases in length and thickness. The final milestone is vaginal changes (an enlargement of the labia majora and minora; discharge may be visible before menarche) (Breehl & Caban, 2022).

For boys, the first milestone is testicular size (typically the first sign of puberty; growth of the testes and scrotum; scrotal skin becomes thinner and darker), followed by pubarche (growth of pubic hair at the penile base), then penis size (the penis grows in length and width while the glans penis and corpus cavernosum also grow). Spermarche (the first ejaculation) occurs a year after the growth of the testes and fertility follows a year after that (Breehl & Caban, 2022).

While many developmental milestones vary by sex, other critical milestones can be seen in both developing boys and girls. In fact, both sexes experience a growth spurt, leading to the deepening of a male's vocal pitch, as well as adrenarche which is responsible for the later pubarche (occurs around ages 6-8; apocrine odor, oiliness of hair and skin, and acne) (Breehl & Caban, 2022). Overall, while development may look different in boys and girls, there are some similarities that all adolescents must experience to reach sexual maturity.

Emotional/Psychological Changes

Aside from physiological changes, puberty can also bring about emotional changes and stress (Breehl & Caban, 2022). For example, the increases of estrogen and testosterone bind receptors in the limbic system, resulting in both an awakening of the sex drive and an increase in emotional volatility and impulsivity (Breehl & Caban, 2022). In addition, adolescents exhibit more intense, unstable emotions, including unstable negative emotions linked to depression (Bailen et al., 2019). Adolescence is associated with an increased risk for mental health difficulties which may result from the frequency, intensity, instability, and clarity of emotions compared to other age groups. These emotional changes lead to a susceptibility for mental health disorders including mood and anxiety disorders (Bailen et al., 2019).

According to Mendle (2014), puberty is a time of emotional distress and rapid increases in clinical symptomatology. This increase is seen in boys and girls, and includes increased aggression, deviancy (rule breaking and conduct challenges), irritability, self-injurious behavior, and substance abuse. Additionally, the body dissatisfaction among adolescent girls is associated with reports of dieting in about half of the sample and an increase from 10% in middle adolescence to 14% to middle young adulthood of engaging in binging or purging behaviors (Neumark-Sztainer, 2011). In the middle young adulthood sample of boys, extreme weight control behaviors increased from those in middle adolescence (Neumark-Szatiner, 2011). However, there are some gender-specific differences in type of symptom-increase during puberty. In girls for example, undergoing puberty is associated with an increase in depressive symptoms, social uncertainty, anxiety, and decreased body satisfaction (Mendle, 2014). On the other hand, boys tend to exhibit more externalizing behaviors (e.g., conduct problems and aggression) (Mendle, 2014). Additionally, early-maturing boys are at an increased risk of getting

involved with deviant activities (e.g., minor delinquency, and truancy) and problems at school than late-maturing boys (Ge et al., 2001).

Aside from gender differences, there are also racial differences when analyzing an increase in symptomatology. For example, social anxiety disorder, generalized anxiety disorder, major depression, as well as symptoms of oppositional defiant disorder, attention deficit disorder, and conduct disorder are associated with pubertal status and timing in an African American sample (Ge et al., 2006). In Mexican adolescents, girls who have completed their first menstrual cycle report challenges with body image, lower self-esteem, symptoms of depression, and more externalizing behavior than their counterparts who have not had a menstrual cycle (Benjet & Hernández-Guzmán, 2002). To highlight the severity of these symptoms, 31% of these girls reached a clinically severe level of depression within six months of their first period (Benjet & Hernández-Guzmán, 2002).

Gender and racial differences are not the only characteristics impacting the symptomology increase during puberty. Pubertal timing and tempo also play an important role. Puberty timing is defined as the timing in which adolescents reach specific milestones in comparison to their peers (Mendle, 2014). For girls, earlier pubertal timing can predict depression, suicidality, panic attacks, body dissatisfaction, disordered eating, delinquency, substance use and abuse, academic challenges (Mendle, 2014). Additionally, early menarche and child abuse are associated with intimate partner violence (IPV) (Foster et al., 2008). Conversely, childhood physical/sexual abuse increases the risk of early menarche (Foster et al., 2008). For boys, it was previously seen as beneficial to have an earlier pubertal timing (Mendle, 2014). However, in more recent research, early pubertal timing in boys is associated with similar symptomatology as girls when considering internalizing and externalizing behaviors (Mendle,

2014). Pubertal tempo, on the other hand, is the pace at which these milestones are achieved. While puberty spans for an average of four years, the variability in tempo can make it range from one to seven years (Mendle, 2014). Research shows a more rapid tempo is associated with increased depression, substance use, and peer conflict compared to a slower tempo (Mendle, 2014).

In addition to the symptoms that may be exhibited by adolescents going through puberty, there can also be more long-term effects. Girls typically exhibit internalizing symptoms during puberty, especially for those who matured earlier than their peers (Mendle, 2014). Early-maturing girls show elevated rates of depression and suicidality into early adulthood (Natsuaki et al., 2009). Unfortunately, findings for boys are not as concrete. Some research shows that early- and late-maturing boys also exhibited higher levels of depressed mood (Natsaki et al., 2009) - contradicted by another study conducted by Graber et al (2004).

Overall, puberty is an inevitable transition from childhood to adulthood. It is a time of trying physiological and psychological changes spurred by the secretion of hormones. Research shows puberty is associated with mental health difficulties, further impacted by pubertal timing and tempo, race, and gender (Mendle, 2014). Therefore, it is important to consider the role of the emotional states of these adolescents when determining the cause of their behavior as they are more susceptible to impulsivity and may experience difficulties controlling their intense and overwhelming emotions.

Summary and Current Study

Given the available literature, the current study investigated potential interactions of the variables: puberty and trauma. For the purpose of this research, we will be examining trauma

using two scores, multiplicity and severity, offered by the Maltreatment and Abuse Chronology of Exposure (MACE) Scale. Multiplicity can be defined as the endorsement of at least one instance of a specific subtype of trauma occurring between the ages of 0 and 18. If "yes" is reported for at least one question in this subtype of trauma, the subtype is scored as a "1." If no questions were answered with a "yes," this subtype is scored with a "0." Severity can be defined as the number of instances of a specific subtype of trauma and is determined by how many questions within that subtype were answered with a "yes." Severity is cumulative so the more questions answered with a "yes," the greater the score.

Gap #1:

Previous research shows that puberty is associated with mental health difficulties (Mendle, 2014). Additionally, a study conducted by Stenson et al. (2021) found that the relation between trauma exposure and anxiety are partially mediated by pubertal timing, but that these findings are sex-specific in a sample of Black children ages eight to 13 years old. However, previous research has not studied the effects of puberty on the symptoms during young adulthood resulting from childhood trauma. Given that puberty and trauma both come with an increased risk of mental health difficulties (Mendle, 2014) and the fact that youth have coping skills still in development (Turanovic & Pratt, 2019), those who have experienced trauma prior to puberty may face greater risk for mental health difficulties while undergoing puberty compared to those without trauma experiences.

Research Question #1:

Does the developmental period (i.e., puberty) during which trauma occurred moderate the relation between adverse events and trauma symptomatology in young adulthood?

Hypothesis 1:

Trauma occurring within the pubertal developmental period was expected to moderate the relation between the multiplicity and severity scores of adverse events (predictor) and trauma symptoms (outcome). Specifically, trauma occurring in puberty was expected to strengthen the relation between adverse events and trauma symptoms.

Gap #2:

Previous research shows that rural communities may not have access to mental health care facilities, and Primary Care Physicians (PCP) may not believe that trauma could occur in their area (McCall-Hosenfeld et al., 2014). However, previous research has not studied the effect of not having mental health care access following a traumatic event using the Trauma Symptom Checklist (TSC-40). Given that those from rural populations may not have access to mental health services to work through their traumatic events, those from rural areas that experienced trauma may exhibit an increase in trauma symptoms.

Research Question #2a:

Does the geographic location where one lives impact receiving and reporting mental health treatment? To determine if they received mental health services, this was based on their responses to the question: have you ever received mental health services? If they said yes, they would classify as having received services. If they responded no, they would be classified as not having received services. On the other hand, the data used for reporting mental health services was based on the same question as the received but also included "prefer not to respond" responses. Specifically, if participants responded "yes" they were classified as reporting their mental health services. If they responded "no" or "prefer not to respond" they were classified as not reporting their mental health services.

Research Question #2b:

Does treatment moderate the effect on adverse events (trauma) and trauma symptomatology between those from urban vs rural regions?

Hypothesis #2:

Based on previous research suggesting that fewer than half of children with mental health disorders receive help (Merikangas et al., 2022), it was predicted that non-metropolitan (e.g., rural and suburban) participants indicating a traumatic event, would (a) not have received mental health care services during their youth, and (b) would have greater scores on the Trauma Symptom Checklist (TSC-40) compared to their metropolitan (i.e., urban) counterparts.

CHAPTER 2

METHOD

Participants

Participants were recruited through the Georgia Southern University SONA Systems, an online recruitment system. All participants were college students in psychology courses, ages 18 and above. Participants received class credit as an incentive to complete the survey. A total of 405 students participated in this study. However, only 364 participants' data were analyzed (see more below regarding data cleaning). The participants represented a range of socioeconomic statuses (SES), geographic regions, races/ethnicities, and gender identities (see Table 1 for demographic information).

A priori power analysis (using G*Power (Faul et al., 2007) with guidelines (80%) suggested by Brysbaert, 2019) indicated 395 participants were required to ensure adequate power for the analyses. However, only 364 participants were included in the analyses. Participants' data were excluded if they did not complete the survey (16 participants), completed the survey in a duration less than 300 seconds (one participant), did not include their puberty age (three participants), did not pass all three attention checks (five participants), or did not consent to having their data included in the analyses when asked during the debriefing procedure (30 participants). Therefore, a total of 55 participants were excluded from the analyses.

Participants were between the ages of 18 and 64, the average age was 20.76 ($SD = 5.07$) years. Most participants (281; 77.2%) identified as a woman, 62 (17%) identified as a man, nine (2.5%) identified as two or more genders, five (1.4%) identified as genderqueer or gender fluid, five (0.14%) participants identified as agender, non-binary, or transgender, and the remaining two (0.6%) participants chose not to respond or identified as another gender. Table 1 includes

other reported demographic information for the sample including race/ethnicity, sex at birth, their first language, marital status, whether they have dependents, and the geographic region as a child as well as current geographic region.

Table 1

Demographic Information of the Retained Sample

Variable	Frequency	Percentage
Race/Ethnicity		
White	240	65.9%
Black	15	4.1%
African American	19	5.2%
Asian	4	1.1%
Hispanic	8	2.2%
Latino/a/Latinx	2	0.5%
Native Hawaiian or Pacific Islander	1	0.3%
Biracial	58	15.9%
Multiracial	14	3.8%
Another	1	0.3%
Prefer not to respond	2	0.5%
Sex at Birth		
Male	67	18.4%
Female	296	81.3%
First Language		
English	339	93.1%
Afrikaans	1	0.28%
Tagalog	2	0.55%
Vietnamese	1	0.28%
Yoruba	1	0.28%
Cantonese	1	0.28%
Danish	3	0.83%
Finnish	1	0.28%
German	1	0.28%
Japanese	1	0.28%
Patois	1	0.28%
Romanian	1	0.28%
Spanish	10	2.75%
Marital Status		
Single	195	53.6%
Dating	9	2.5%

Demographic Information of the Retained Sample - Continued

Variable	Frequency	Percentage
Living with your partner	7	1.9%
Engaged	18	4.9%
Married	116	31.9%
Divorced	9	0.8%
Two or more categories	16	4.4%
Dependents		
Yes	40	11%
No	322	88.5%
Childhood Geographic Region		
Rural	44	12.2%
Small town	133	36.7%
Small city/micropolitan	96	26.5%
Urban/metropolitan	89	24.6%
Childhood Geographic Region Population		
> 50,000	113	31%
10,000-49,999	168	46.2%
< 10,000	83	22.8%
Current Geographic Region		
Rural	50	13.7%
Small town	149	40.9%
Small city/micropolitan	112	30.8%
Urban/metropolitan	52	14.3%
Current Geographic Region Population		
> 50,000	106	29.1%
10,000-49,999	201	55.2%
< 10,000	57	15.7%

Materials

Retrospective Pubertal Questionnaire

Puberty was assessed using a puberty questionnaire designed for this study. Participants recalled pubertal experiences during adolescence on an 11-item measure. The measure included the following definition: "Puberty is defined as a time of physical change occurring during adolescence (the teen years). During this time, many physical changes occur, including growth in height, viability of genitals, and pubic hair growth, pimples/acne, and armpit sweat. For those

assigned female at birth, the menstruation cycle begins (you have your period), breast growth, and changes in the fatty deposits in the bodies (more rounded hips and buttocks) occur. For those assigned male at birth, deepening of the voice, muscle development, and facial hair growth occurs." Questions included, "Using the definition of puberty presented above, at what age did you start puberty?" and "Do you believe you started puberty at a younger age than your peers and friends? Please type "yes," "no," or "unsure" with a brief description of why you chose that answer." The measure also contained sex-specific questions related to pubertal development milestones. For the full measure, please refer to Appendix A.

Maltreatment and Abuse Chronology of Exposure (MACE) Scale

Trauma symptomatology was assessed using the MACE (Teicher & Parigger, 2015). The MACE consists of 52 questions, examining 10 different types of maltreatment and abuse, including emotional neglect, non-verbal emotional abuse, parental physical maltreatment, parental verbal abuse, peer physical bullying, physical neglect, sexual abuse, and witnessing interparental and sibling violence (Teicher & Parigger, 2015). The ten forms are further organized into seven sections. The first five sections refer to groups of people (family, non-family, peers, or significant others), and the last two sections ask whether events happened during childhood and whether statements were true regarding certain events occurring during childhood (Teicher & Parigger, 2015). The survey begins with simple directions for each section mentioned above. For example, section one starts with: "Sometimes parents, stepparents or other adults living in the house do hurtful things. If this happened during your childhood (first 18 years of your life) please provide your best estimate of your age at the time(s) of occurrence. Please check all ages that apply." Example events include: "Swore at you, called you names, said insulting things like your "fat", "ugly", "stupid", etc. more than a few times a year,"

"Intentionally pushed, grabbed, shoved, slapped, pinched, punched or kicked you," and "Made inappropriate sexual comments or suggestions to you" (Teicher & Parigger, 2015).

This measure has two ways of computing the data. The first way is by conducting the multiplicity score. This score measures whether at least one instance of that specific subtype of trauma occurred (e.g., did you experience one event of sexual abuse?) If it occurred a "1" is given for that subtype, but if there were no instances of that subtype, a "0" is given. On the other hand, the severity score looks at how many different instances or events of that one subtype occurred between the ages of 0 and 18 (e.g., did you experience five different events of sexual abuse within the measure?). This score is cumulative in that, the more events that are reported, the greater the severity score for that subtype up to a total score of 10.

The MACE was created in response to limitations in other questionnaires related to child maltreatment. The MACE has strong test-retest reliability (Severity: $r = 0.908$; Multiplicity: $r = 0.879$; Teicher & Parigger, 2015). It has an overall test-retest reliability score of $r = 0.91$ (Teicher & Parigger, 2015).

Trauma Symptom Checklist (TSC-40)

Trauma symptoms were measured using the Trauma Symptom Checklist (TSC-40; Briere & Runtz, 1989). The TSC-40 includes six subscales: Dissociation, Anxiety, Depression, Post-Sexual Abuse Trauma, Sleep Disturbance, and Sexual Problems (Neal & Nagle, 2013). The TSC-40 includes 40 questions, such as "How often have you experienced each of the following in the past month" followed by symptoms such as: "headaches," "insomnia," "weight loss (without dieting)," "stomach problems," and "feeling isolated from others" (Rizeq et al., 2020). It has a Cronbach's alpha value of .92 for the total score, and .60 to .83 for the subscales among

undergraduate students (Neal & Nagle, 2013). For the current sample, Cronbach's alpha was a value of .93.

Demographics

Participants provided basic demographic information. Specifically, participants reported their age, race/ethnicity, sex, gender, intended major, rurality (urban, rural, suburban) of their hometown during adolescence, their first language, marital status, and if they have any dependents. Questions regarding rurality were based on Miller (2022).

Procedures

Undergraduate psychology students were recruited through Georgia Southern's SONA Systems. On this site they can see the qualifications, description, and length of the study. Once they volunteered to be a part of the study, participants read an informed consent screen describing their rights as a participant and indicated if they agreed to participate/confirmed they were at least 18 years of age. Participants who declined to consent to participate or indicated they were younger than 18 were thanked for their time and the study ended. For those over 18 who consented to participate, study measures (The Retrospective Pubertal Questionnaire, MACE scale, and TSC-40 were presented in random order followed by the demographics questionnaire. After completing the study, participants were thanked for their participation and provided information for on-campus mental health resources if needed.

Participants will be organized into five groups for analyses based on the study conducted by Marshall (2016): infancy-preschool includes ages 4-5 years after birth, grade school includes ages 2-6 years prior to menarche and spermarche, puberty consists of three years before and the age of pubertal onset, post-puberty includes ages that occur two years after menarche and spermarche. Additionally, one group was added to account for the sample data. A fifth group

which will be called "secondary school" will consist of ages that occur after the post-puberty group through 18 years of age. Individuals will be classified into groups based on their most frequently reported trauma age relative to the age of pubertal onset as defined by Marshall's (2016) grouping strategy. A Moderation Analysis will be conducted using SPSS. Within this analysis, adverse events serve as the predictor, trauma symptomatology is the outcome variable, and the developmental period in which the trauma occurred is the moderator.

CHAPTER 3

RESULTS

Preliminary Data Organization

Participants were classified into groups based on the most frequently occurring age reported in the MACE relative to the age of pubertal onset as defined by Marshall's (2016) grouping strategy. Specifically, participants were organized into five groups for analyses: infancy-preschool includes ages four to five years after birth, grade school includes ages two to six years prior to menarche and spermarche, puberty consists of three years before and the age of pubertal onset, and post-puberty includes ages that occur two years after menarche and spermarche. One group was added to account for the sample data. A fifth group, called "secondary school," consisted of ages occurring after the post-puberty group through 18 years of age. For example, if the participant reported the onset of puberty at 12 years old and the age they most frequently reported trauma was age 16, they would be placed in the "secondary school ages" group. However, if they reported their onset of puberty to be at 14 years old and the most frequently reported trauma age on the MACE was 10 then they would be in the "grade school ages" group. For a visual representation of the grouping, see Table 2.

Table 2

Corresponding most frequently occurring age in the MACE in relation to age of pubertal onset based on Marshall (2016)'s grouping strategies.

Age of Puberty	Most Frequent Age on the Maltreatment and Abuse Chronology of Exposure (MACE) Scale				
	Infancy- Preschool Ages	Grade School Ages	Puberty Ages	Post-Puberty Ages	Secondary School Ages
10 years old	0-4	5-6	7-10	11-12	13-18
11 years old	0-4	5-7	8-11	12-13	14-18
12 years old	0-4	5-8	9-12	13-14	15-18
13 years old	0-5	6-9	10-13	14-15	16-18
14 years old	0-5	6-10	11-14	15-16	17-18

Research Question #1

Multiplicity Score Predicting Trauma Symptoms

To test hypothesis one that puberty would moderate the relation between adverse events during childhood and adolescence and trauma symptoms in young adults, a PROCESS moderation model was examined. Regression statistics are shown in Table 3. Overall, the main and interactive effects accounted for 24% of the variance in trauma symptoms in young adults, $F(3, 320) = 33.66$, $p < .001$. Within the model, the main effect for adverse events using the multiplicity score of the Maltreatment and Abuse Chronology of Exposure (MACE) Scale was statistically significant ($b = 3.50$, $p < .01$). The main effect for the developmental period during which most of the adverse events were experienced was not statistically significant ($b = 3.48$, $p = .10$). At a multivariate level, the adverse events x developmental period interaction ($b = .01$, $p = .97$) was not statistically significant. Overall, the model was not found to be statistically significant, meaning that puberty or, more generally, developmental period does not moderate the relationship between the multiplicity score for experiencing adverse events and trauma symptoms in young adults.

Severity Score Predicting Trauma Symptoms

Regression statistics are shown in Table 4. Overall, the main and interactive effects accounted for 25% of the variance in trauma symptoms in young adults, $F(3, 320) = 36.75, p < .001$. Within the model, the main effect for adverse events using the severity score of the Maltreatment and Abuse Chronology of Exposure (MACE) Scale was statistically significant ($b = .65, p < .01$). The main effect for the developmental period during which most of the adverse events were experienced was also statistically significant ($b = 4.56, p < .01$). At a multivariate level, the adverse events x developmental period interaction ($b = -.03, p = .57$) was not statistically significant. Based on these findings, developmental period did not moderate the relation between experiencing adverse events and the severity of traumatic symptoms experienced in a sample of college students.

A follow-up one-way ANOVA between groups analysis of variance (ANOVA) was conducted to investigate the statistically significant differences in Trauma Symptom Checklist (TSC-40) Score means between the groups as indicated by the main effect of developmental period in the PROCESS moderation model used. Levene's statistic was non-significant, $F(4, 319) = 2.24, p = .07$ which indicated that the assumption of homogeneity of variance was not violated. The ANOVA was statistically significant, suggesting that the mean of TSC-40 scores were influenced by the grouping participants were placed in based on their most frequently reported age, $F(4, 319) = 11. 98, p < .001, \eta^2 = .13$.

Post-hoc analyses with Tukey's HSD (using an α of .05) illustrated that participants who experienced trauma during the infancy-preschool ages grouping ($M = 19.69, SD = 12.40$) had statistically significantly lower TSC-40 scores than participants who reported experiencing the majority of their trauma symptoms during any other age grouping (Grade

School Ages: $M = 34.64$, $SD = 16.88$, Puberty Ages: $M = 39.56$, $SD = 19.47$, Post-Puberty Ages:

$M = 38.56$, $SD = 16.04$, Secondary School Ages: $M = 47.68$, $SD = 17.73$). Effect sizes for the

four comparisons were $d = $ -0.36, -0.59, -0.51, and -0.76, respectively. Additionally, the post-hoc

results indicated that those who experienced most of their traumatic events during the secondary

school ages reported statistically significantly greater symptoms compared to the other age

groupings. Effect sizes for the four comparisons were $d = $ 0.76, 0.38, 0.34, and 0.32 respectively.

Figure 1 graphs these mean differences.

Table 3

Regression Statistics for Adverse Events - Multiplicity Score, Developmental Period, and

Trauma Symptoms

Variable	b	Std. Error	t	p	LLCI	ULCI
Constant	6.46	6.94	.93	.35	-7.20	20.12
Adverse Events - Multiplicity Score	3.50	1.27	2.76	.02	1.00	6.00
Grouping	3.48	2.15	1.63	.10	-.72	7.69
Interaction Effect	.015	.37	.04	.97	-.71	.75

Table 4

Regression Statistics for Adverse Events - Severity Score, Developmental Period, and Trauma

Symptoms

Variable	*b*	*Std. Error*	*t*	*p*	*LLCI*	*ULCI*
Constant	7.04	5.85	1.20	.23	-4.47	18.54
Adverse Events - Severity Score	.65	.20	3.29	.00	.26	1.04
Grouping	4.56	1.72	2.66	.01	1.19	7.94
Interaction Effect	-0.31	.05	-.57	.57	-.14	.08

Table 5

Tukey's HSD Post-Hoc Results for Adverse Events - Severity Score, Developmental Period, and

Trauma Symptoms

Grouping	*M*	*SD*	Infancy-Preschool Ages	Grade School Ages	Puberty Ages	Post-Puberty Ages	Secondary School Ages
Infancy-Preschool Ages	19.69	12.34		-14.94*	-19.87*	-18.87*	-27.99*
Grade School Ages	34.64	16.88	14.94*		-4.92	-3.93	13.05*
Puberty Ages	39.56	19.47	19.87*	4.92		1.00	-8.12*
Post-Puberty Ages	38.56	16.04	18.87*	3.93	-1.00		-9.12*
Secondary School Ages	47.68	17.73	27.99*	13.05*	8.12*	9.12*	

* $p < 0.05$

Figure 1

Plot Chart Illustrating Differences in TSC Score Means for Each Group

Mean TSC Score Based on Grouping
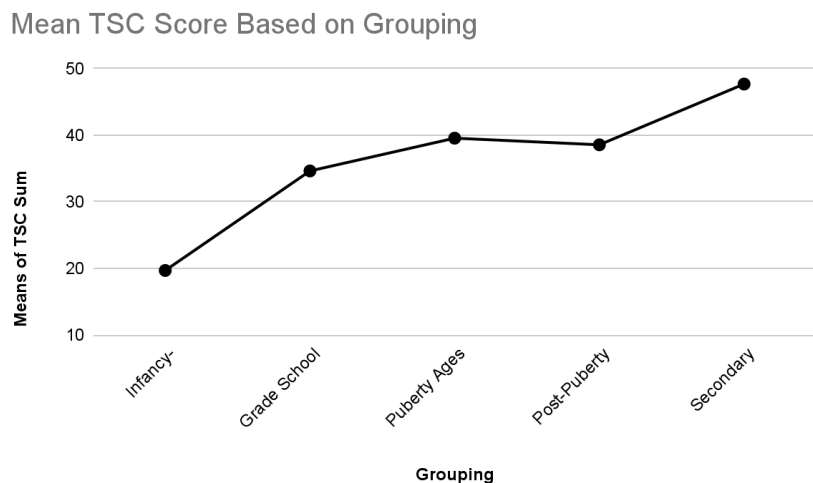
Research Question #2a

A chi-square Test for Independence was performed to analyze the relation between received mental health services (i.e., yes, no) and geographic region (i.e., rural, small town, small city/micropolitan, urban/metropolitan) during childhood. The two variables were shown to be independent, indicating no statistically significant differences in receiving mental health treatment based on geographic region, $X^2(3, N = 355) = .50, p = .912$. Crosstabulation statistics are reported in Table 6.

Additionally, another Chi-Square analysis was conducted to examine the relationship between reporting mental health services (i.e., yes, no) and geographic region during childhood (i.e., rural, small town, small city/micropolitan, urban/metropolitan). There were also no statistically significant differences in reporting mental health treatment based on geographic region, $X^2(3, N = 362) = .65, p = .89$. Crosstabulation statistics are reported in Table 7.

Table 6

Crosstabs Analysis for Chi-Square on Geographic Region and Receiving Mental Health Services

Group	Received Mental Health Services			
	Yes		No	
	n	%	*n*	%
Rural	23	52.3%	21	47.7%
Small Town	66	50.8%	64	49.2%
Small City/	49	52.7%	44	47.3%
Micropolitan Urban/	42	47.7%	46	52.3%
Metropolitan Total	180	50.7%	175	49.3%

$X^2(3) = .50, p = .92$

Table 7

Crosstabs Analysis for Chi-Square on Geographic Region and Reporting Mental Health Services

Group	Reported Mental Health Services			
	Yes		No	
	n	%	*n*	%
Rural	21	47.7%	23	52.3%
Small Town	64	48.1%	69	51.9%
Small City/ Micropolitan	44	45.8%	52	54.2%
Urban/ Metropolitan	46	51.7%	43	48.3%
Total	175	48.3%	187	51.7%

$X^2(3) = .65, p = .89$

Research Question #2b

To test hypothesis 2b, a between-groups two-way Analysis of Variance (ANOVA) was conducted to investigate the relation between geographic region, receiving mental health treatment, and symptom severity in young adults. Participants were divided into four groups based on their childhood geographic region (Group 1: rural, Group 2: small town, Group 3: small city/micropolitan, Group 4: urban/metropolitan); mental health treatment was answered with "yes" or "no." The interaction effect between receiving mental health treatment and geographic

region was not statistically significant, $F(3, 347) = .54$, $p = .66$. The main effect for rurality was also not found to be statistically significant, $F(3, 347) = 1.05$, $p = .37$; however, there was a statistically significant main effect for mental health services received $F(1, 347) = 20.57$, $p < .001$. The effect size, η^2 was small, .06. Regression statistics are reported in Table 8. Participants reporting receiving mental health services had higher scores on the Trauma Symptom Checklist (TSC-40; M: 44.25, SD: 19.27) compared to those who did not receive mental health treatment (M: 33.93, SD: 18.37). Means and standard deviations for trauma symptom severity between the groups is reported in Table 9 and illustrated in Figure 2.

Table 8

ANOVA Statistics for Geographic Region during Childhood, Receiving Mental Health Services, and Trauma Symptoms

Source	SS	df	MS	F	p	η^2
MH Services Received	7311.58	1	7311.58	20.57	<.001	.06
Childhood Geographic Region	1119.93	3	373.31	1.05	.37	.01
MH Services Received x Geographic Region	573.16	3	191.50	.54	.66	.01
Error	123323.62	347	355.40			
Total	674897.00	355				

Note. R Squared = .083 (Adjusted R Squared = .064)

Table 9

Means and Standard Deviations for Trauma Symptoms as a Function of Geographic Region and

Receiving Mental Health Services

Group	Received Mental Health Services - Yes		Received Mental Health Services - No	
	M	*SD*	*M*	*SD*
Rural	39.52	20.92	33.61	20.74
Small Town	46.56	18.41	35.92	16.71
Small City/ Micropolitan	45.57	19.03	31.65	19.53
Urban/ Metropolitan	41.93	19.91	34.17	18.41
Total	44.25	19.27	33.93	18.37

Figure 2

Means of Reported Trauma Symptom Severity, Childhood Geographic Region, and Receiving

Mental Health Services
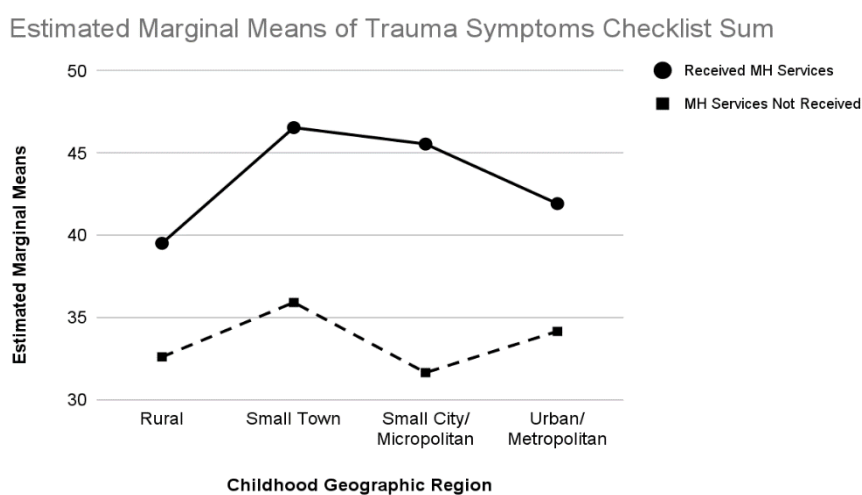
CHAPTER 4

DISCUSSION

Purpose

The purpose of the current study was to investigate how different developmental periods might moderate the effect of experiencing abuse or maltreatment and the severity of trauma symptoms during young adulthood in a college population. More specifically, I examined how experiencing abuse during puberty could increase trauma symptoms in adulthood when compared to the other groups analyzed. Additionally, this study sought to inspect how geographic region impacted participants' rates of reporting and receiving mental health treatment. Finally, this study explored how geographic region could impact trauma symptoms in young adults where receiving mental health treatment served as the moderator. By completing this study, I aimed to illustrate the dire need for better access to mental health services for everyone, not just children and adolescents. I also intended to improve awareness of the severity of abuse and maltreatment during childhood and adolescence.

The current study aimed to answer the following questions: (1) Does the developmental period (i.e., puberty) during which trauma occurred moderate the relation between adverse events and trauma symptomatology in young adulthood? We predicted that participants who indicated experiencing most of their traumatic events during puberty would have greater scores of trauma symptoms severity on the TSC-40. The results in this study did not support the hypothesis. The findings suggested that developmental period, namely puberty, does not moderate the relation between the multiplicity or severity scores of adverse events and trauma symptom severity in young adults. However, the main effect of the multiplicity and severity scores were both statistically significant meaning those who experience an adverse event are

more likely to report symptoms on the TSC-40. Interestingly, in the severity analyses, the main effect for grouping was statistically significant. Participants who were in the infancy-preschool age group had a statistically significantly lower TSC-40 mean scores compared to the other age groups. There are several possible explanations for this finding. One possible explanation is that this group may not remember the trauma as thoroughly as those who experience it in older ages. This could also suggest that there are external factors exacerbating the symptoms experienced such as hormonal changes during puberty, or peer pressure experienced by school children. Contrastingly, participants who were in the secondary school ages group had significantly higher TSC-40 mean scores compared to the other age groups. This could suggest that more recent adverse events may not have been appropriately addressed for some of these participants at the time they participated in this survey. Another possibility may be that, for some participants, major life changes may have occurred around the same time as the trauma (e.g., going to college, moving away from home, etc.), exacerbating the symptoms from the trauma.

For hypothesis 2a, we examined whether the rurality of where one lives impacts receiving and reporting mental health treatment. We predicted that participants who lived in rural regions would have lower rates of receiving mental health care compared with those who grew up in more urban regions. Similar to the previous hypothesis, the results did not support the hypothesis. The findings of this study, contrary to available literature, suggested that childhood geographic region is independent of receiving and reporting mental health treatment; they do not relate to one another.

For hypothesis 2b, we examined whether treatment moderated the effect on adverse events (trauma) and trauma symptomatology between those from urban vs rural regions. Finally, while the interaction between geographic region and receiving mental health services was not

found to be significant, participants who reported experiencing greater symptom severity also had greater reports of receiving mental health services. This suggested that there may be a threshold of severity that motivates people to seek mental health treatment.

Moderated Effects of Trauma Symptoms and Developmental Period

The results from this study suggest that developmental period does not moderate the relation between exposure to traumatic events during childhood and adolescence and trauma symptoms experienced by young adults. However, these findings are contrary to the available literature. A study conducted by Ogle et al. (2013) suggests that traumatic events occurring early in the lifespan are associated with an increased negative impact on psychological health and psychosocial functioning in adults than trauma occurring later in life. Additionally, Marshall (2016) found that trauma during puberty increases the risk of past-year anxiety diagnoses for girls. Additionally, trauma occurring during the grade school period increased the risk of past-year depressive disorder diagnoses (Marshall, 2016). Finally, Dunn et al. (2017) found that participants exposed to childhood maltreatment during early childhood had higher rates of depression and PTSD symptoms compared to those who experienced maltreatment in later developmental stages. Moreover, participants exposed to maltreatment, including interpersonal violence, had more depressive symptoms than those first exposed to maltreatment during adulthood.

However, similarly to the findings in this study, experiencing trauma is associated with greater PTSD symptoms than non-exposed peers (Dunn et al., 2017). The study conducted by Dunn et al. (2017) is similar in its findings as it established that experiencing trauma during the early lifespan is associated with experiencing trauma symptoms in young adulthood. The findings of this current study also suggest that the developmental period during which most of

the adverse events occurred may relate to trauma symptoms. This aligns with Marshall's findings (2016) that developmental period (primarily grade school and pubertal periods) increases the risk for developing psychopathology symptomatology.

Considering the findings of the current study contradict some of the available literature, the methodological differences among the studies may account for the disparity in findings. In addition, some of the limitations of the current study (see below) may help explain the differences between the current findings and previous research.

Geographic Region and Receiving and Reporting Mental Health Services

This study did not find any statistically significant differences in receiving and reporting mental health care services when controlling for geographic region. These findings are contrary to the current available literature. To explain, a study conducted by Hauenstein et al. (2007) suggests that those who reside in metropolitan areas receive greater mental health treatment compared to those living in rural areas. Rurality was further shown to be a hindrance to those who require mental health services in a study conducted by Morales et al. (2020). Further, Sturm et al. (2003) found that, when comparing mental health needs and services among 13 US states, there is inequality in using mental health services associated with the region in which the child resides. This effect was greater than race/ethnicity and income (Sturm, 2003). One possible explanation for the findings of this study do not align with the current literature is possibly due to the questions asked about mental health services. These questions relied on the participants' willingness to share if they received mental health services which may not be the most reliable measure. Additionally, reporting mental health services is similar to receiving mental health services in that the only difference is the inclusion of participants who did not want to report whether they received services. These questions should be rephrased in future studies.

Contrastingly, the current study did find that the main effect of receiving mental health treatment was statistically significantly associated with reported trauma symptoms. Specifically, the mean for individuals who received mental health services was significantly higher on the TSC-40 when compared with those who did not receive mental health treatment. Based on these findings, we propose that there is a threshold of severity after which people will seek out mental health services. This hypothesis is supported by a study conducted by Brown et al. (2014) that explains that clinical factors including severity and complexity influence one's motivation to seek out informal and formal help.

Implications

There are several implications of this study. The findings of this study support previous research on the prevalence of trauma symptom severity (Stupar et al., 2021), which increases evidence for the need to promote awareness of trauma and other mental health services needed to help improve the lives of our youth. Additionally, all of the participants in this study were included if they indicated some traumatic experience throughout their lifespan. This suggests that trauma occurred across my participants throughout their childhood and adolescence, an important time with crucial developmental changes and challenges. Therefore, colleges should ensure adequate availability and quality of therapeutic services for students, given the high percentage of participants in the current study who endorsed significant trauma-related symptoms.

Limitations

This study has several limitations. The first limitation concerns the sample of participants used in this study. All participants attended the same university and were enrolled in a psychology course at the time of their participation. The current findings may not generalize to

other students or other populations. Additionally, due to their age, participants answered the questions included in this study's survey based on their memory of the age at which they started puberty and when they may have undergone the traumatic experiences included in the questionnaires. Individuals may vary in their ability to recall events in their lives and no additional reporters were available to confirm or disconfirm participants' recall.

The second limitation concerns the sample size of the study. A priori power analysis suggested 395 participants were needed for the proposed analyses. However, data from only 364 participants were available for hypothesis 1,355 participants for hypothesis 2a, and 362 participants for hypothesis 2b. It is possible that the smaller than projected sample sizes may have inhibited the detection of significant findings for some analyses.

The third limitation concerns the measures used to assess the study's variables. The Maltreatment and Abuse Chronology of Exposure (MACE) Scale is a relatively new scale and, therefore, does not have a significant amount of research to attest to its validity. Additionally, I created a retrospective pubertal questionnaire for participants to answer questions about the age in which they underwent puberty, what they experienced, if they believed they experienced puberty earlier than their peers and other related information. Despite this measure being created based on other measures meant for children currently undergoing puberty, it has not been previously tested.

Due to the limitations explained in the above section, researchers should continue to investigate the research questions proposed in this study. Due to the sample included in this study, future research should include a sample that is more representative of the population. One possibility would be completing a longitudinal study following participants from the ages of three to 22. This would eliminate participants from having to remember traumatic events from

years prior and a more accurate age of puberty could be assessed. Another method would be to use parent or medical reports to get pubertal timing information if the sample includes participants beyond the age of puberty.

Additionally, due to the small sample size, further research regarding how developmental period impacts the relation between traumatic experiences and trauma symptoms experienced in young adulthood should be conducted. This would allow for better accuracy in the data analyses as these findings were underpowered. One possibility would be to (a) complete a longitudinal study as previously mentioned while recruiting an additional 10% of participants than is required for the power analysis, and (b) advertising the study in diverse ways such as school districts, after school programs such as the boys and girls club, and on parent groups located on social media platforms such as Facebook.

The fourth limitation regards the first exploratory analysis examining the relation between reporting mental health services and geographic region. In order to ascertain data for reporting mental health services, an extra variable was created following the end of data collection. If participants reported receiving mental health care, they received a "1." However, if they did not report or indicated that they would prefer not to answer, they were given a "0" in this new variable. This, along with their reported childhood geographic region are the variables included in the Chi-Square analysis. However, the variables for receiving and reporting mental health services are very similar data points; seven participants were added to the reporting mental health services that are not included in the receiving services analysis. This may indicate that error was introduced by the way this new variable was defined. The definition for this variable was based on whether participants reported that they received mental health treatment. Future studies should ask a question such as "would you be willing to share whether you received

mental health services." Additionally, this new variable assumed that if participants said "no" when asked if they received mental health services, they did not want to report receiving these services. This is erroneous because it assumes that every participant who reported "no," was not comfortable reporting services that they received.

Future Directions

Future research should continue to examine the relation between developmental period and adverse experiences through the lifespan. Children with a developing brain tend to exhibit negative impacts to brain systems such as the limbic system (Plumb et al., 2016). Researchers should consider examining how adverse experiences affect those who have a fully developed limbic system and prefrontal cortex. Additionally, this study illustrates that children experience adverse events. Therefore, future studies should investigate which supports or resources are most effective in mitigating negative effects of these experiences. Studies should examine different interventions to examine how coping skills help children navigate and move beyond their experiences. One way to do this would be to collect data from elementary schools that offer SEL (Social-Emotional Learning) classes as an afterschool program compared to those that do not. Another way to do this would be to compare schools that talk about mental health as part of their gym requirement versus those that stick to the general curriculum of a gym class.

Conclusion

The purpose of this study was to examine how puberty could impact young adults' severity of trauma symptoms and how mental health treatment may help inhibit some symptoms. The study utilized two moderation analyses to evaluate the extent to which developmental period served as a moderator in the relation between traumatic experiences and trauma symptoms in young adults. The other moderation evaluated how receiving mental health treatment would

serve as a moderator between experiencing traumatic experiences and later trauma symptoms. Finally, a chi-square test for independence was utilized to investigate how geographic regions related to receiving and reporting mental health treatment. No interaction effects were found to be significant which leads to questions regarding the validity of the methodology utilized in this study. Future research should publish a pilot study prior to the start of the publication of the finalized study and should use children as the primary participants.

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APPENNDIX A

RETROSPECTIVE PUBERTAL QUESTIONNAIRE

For the next nine questions, please refer to the definition of puberty as defined here:

Puberty is defined as a time of physical change occurring during adolescence (the teen years). During this time, many physical changes occur, including growth in height, viability of genitals, and pubic hair growth, pimples/acne, and armpit sweat.

For those assigned female at birth this includes:
- menstruation cycle begins (you have your period)
- breast growth
- changes in the fatty deposits in the bodies (more rounded hips and buttocks)

For those assigned male at birth this includes:
- deepening of the voice
- muscle development
- facial hair growth

1. **What age did you start puberty?**
   Please type in the age using numbers below.

2. **Based on your previous answer, what led you to believe you started puberty at that time?**
   Please type your reasoning in the textbox below.

3. **Do you believe you started puberty at a younger age than your friends and peers?**
   Please select "yes," "no," or "unsure" below.
   a. Yes
   b. No
   c. Unsure

4. **Based on your previous answer, what led you to believe you started puberty before your friends and peers?**
   Please type your reasoning in the textbox below.

5. What was your assigned sex at birth?
Please select "male," "female," or "intersex" below.
    a. Male
    b. Female
    c. Intersex

6. When did your menstruation (period) cycle begin?
Please type in the age using numbers below.

7. Do you have female siblings?
Please select "yes," or "no" below.
    a. Yes
    b. No

8. When do you think you started puberty in comparison to your other female siblings?
Please select "earlier," "around the same time," or "later" below.
    a. Earlier
    b. Around the same time
    c. Later

9. What age did you have your first ejaculation?
Please type in the age using numbers in the textbox below.

APPENDIX B

DEMOGRAPHICS QUESTIONNAIRE

1. **What is your age?**
    Please type in your age using numbers below.

2. **What is your race/ ethnicity?**
    Please select all that apply.
    a. White
    b. Black or African American
    c. American Indian or Alaskan Native
    d. Asian
    e. Native Hawaiian or Pacific Islander
    f. Another
    g. Prefer not to answer

3. **What is your race/ethnicity?**
    Please type your answer in the textbox below.

4. **What was the sex assigned to you at birth?**
    Please select "male," "female," or "intersex" below.
    a. Male
    b. Female
    c. Intersex

5. **What is your gender?**
    Please select "male," "female," "non-binary," "transgender," or "prefer not to say" below.
    a. Male
    b. Female
    c. Non-binary
    d. Transgender
    e. Prefer not to say

6. **What is your major?**
    Please type your major in the textbox below.

7. What is your first language?
Please select "English," "Spanish," "Chinese," or "Another" below.
  a. English
  b. Spanish
  c. Chinese
  d. Another

8. What is your first language?
Please type your answer in the textbox below.

9. What is your marital status?
Please select the option that best describes your marital status below.
  a. Single
  b. Dating
  c. Living with your partner
  d. Engaged
  e. Married
  f. Divorced

10. Do you have any dependents?
Please select "yes," or "no" below.
  a. Yes
  b. No

11. I consider my hometown to be more:
Please select the choice that best describes your childhood geographical region.
  a. Rual
  b. Small town
  c. Small city/micropolitan
  d. Urban/metropolitan

12. How many people currently reside in your hometown?
Please select the choice that best describes your childhood geographical region.
  a. >50,000
  b. 10,000-49,999
  c. <10,000

13. I consider the town in which I currently live to be more:

Please select the choice that best describes your current geographical region.

    e. Rual

    f. Small town

    g. Small city/micropolitan

    h. Urban/metropolitan

14. How many people reside in the town in which you currently live?

Please select the choice that best describes your current geographical region.

    a. >50,000

    b. 10,000-49,999

    c. <10,000

15. Have you ever received mental health treatment?

Please select "yes," "no," or "prefer not to answer" below.

    a. Yes

    b. No

    c. Prefer not to answer