

Influence of Religiosity on Adolescent Chronic Physiologic Stress

Laura P. Forero

The Ohio State University: College of Nursing

Abstract

Chronic stress in youth increases risk for poor physical and mental health, thus it is important to understand the factors that influence persistent stress in youth. Religiosity embodies support, self-worth and acceptance and has been associated with lower perceived stress levels in youth. Studies to determine the relationship between religiosity and measures of physiologic stress are necessary. The purpose of this study was to investigate the relationship between religiosity and chronic physiologic stress in adolescents. Secondary data were examined from two linked studies composed of a representative sample of 508 adolescents aged 11 to 17 years in a large Midwestern city. Participants were asked about the importance of and involvement in religious faith via three survey items using a Likert scale: (1) attendance at religious services; (2) attendance at religious youth activities; and (3) importance of religious faith in daily life. Stress levels were measured through hair cortisol, a measure of chronic physiologic stress as 1 cm of hair growth approximates the mean cortisol level for the corresponding month. Descriptive and multivariate analyses examined the relationship between religiosity and hair cortisol levels. Results for the attendance at religious services show a nonlinear association, with participants who occasionally attended religious services having the lowest levels of hair cortisol while those who attended regularly or not at all were found to have higher levels of hair cortisol. There were no significant relationships between involvement in religious youth activities and chronic stress. Participants who reported the importance of religious faith as very to extremely high had higher levels of hair cortisol than those who reported lower levels of importance of religion in their lives. These results did not support previous work that demonstrated a positive effect of religiosity on *perceived* chronic stress in adolescents. There may be differences in how adolescents perceive and report stress and

measures of chronic physiologic stress. These differences warrant additional study. Further work to establish the relationship of religiosity and spiritual health to chronic physiologic stress are necessary to understand the relationship of this aspect of holistic wellness on mental and physical health of adolescents.

Keywords: perceived stress, physiological stress, chronic stress, hair cortisol, religiosity, adolescent stress

Chapter 1

Statement of the Problem

Introduction

Nearly 3 in 5 Americans have at least one chronic disease, with the majority of individuals experiencing multiple chronic conditions (Buttorff, Ruder, & Bauman, 2017). According to the Centers for Disease Control and Prevention (CDC), chronic diseases make up 7 of the 10 top causes of death and are the most preventable of all health problems (CDC, 2012 & 2017). Chronic disease is an umbrella term for an illness or condition that is continuous or reoccurring, including illnesses and conditions that affect all and any body system (Bernell & Howard, 2016). Risk factors for developing chronic diseases include heredity, age, poor nutrition, physical inactivity, drug/alcohol use and stress (CDC, 2012). Chronic stress is the prolonged exposure to stress. A child who is exposed to stressors at a young age for a continued period of time is a great risk for experiencing chronic stress. Not only does unmanaged chronic stress place an individual at risk for chronic disease, but as a result of the early exposure to chronic stress in youth, these individuals are prone to earlier development of chronic disease. Cortisol measurement is a physiologic measurement of stress. Hair cortisol measurements allow for analysis of prolonged stress as 1 cm of hair growth approximates the mean cortisol level for the corresponding month (Short et al., 2016). For example, 3 month of hair growth collected from the scalp approximates the mean cortisol level for the prior 3 months. While the exposure to stress is not fully preventable, coping mechanisms help an individual manage the negative effects that stress has on health. Examples of coping mechanisms include exercise, meditation, support groups and religiosity. The purpose of this project is to describe the relationship between chronic physiologic stress and religiosity in adolescents.

Significance of the Study

This study examines the potential for religiosity to serve as a buffer that adolescents can engage in to decrease stress, thus reducing the risk for chronic disease. Unlike the majority of physiological cortisol studies, this study uses hair cortisol as a measurement of chronic stress. The use of hair cortisol is significant because it allows for analysis of stress over extended periods of time. This study is an important contribution to further understand the relationship between religiosity and chronic stress in adolescents, as well as a contribution to research using hair cortisol.

Conceptual Framework

The conceptual framework used for this study is the *Resiliency Theory* (Zimmerman, 2013). The Resiliency Theory is one that focuses on positive factors that influence the health trajectory of a child. Rather than a problem-focus approach, the Resiliency Theory takes a strengths-based approach, noting how positive factors act as buffers to risk exposures that face youth. Positive factors, also referred to as promotive factors, are comprised of two categories: assets and resources. Assets are defined as factors within the individual (i.e. self-efficacy, self-esteem). Resources are defined as factors outside the individual (i.e. parental support, mentors, youth programs). Analysis of these promotive factors can facilitate nurses and other health care professionals' understanding of how these risk-protective mechanisms may help youth to overcome challenges that can lead to negative health outcomes. In this study, promotive factors of religious service attendance, religious youth activities, and importance of faith are analyzed in order to understand how they may act as buffers to chronic physiologic stress levels in adolescents.

Chapter 2

Review of Literature

Stress can be defined as any uncomfortable “emotional experience accompanied by predictable biochemical, physiological and behavioral changes” (Baum, 1990, p.653). It is normal for an individual to experience stress in their lifetime. The positive aspect of stress is when it is experienced in manageable amounts which help the individual be alert, motivated, and able to plan and achieve a goal. However, when stress is excessive, unmanaged, and prolonged it can have adverse effects on the immune, cardiovascular, neuroendocrine and central nervous systems (Anderson, 1998). This unmanaged and prolonged stress can be termed chronic stress.

According to the Centers for Disease Control and Prevention (2017), chronic stress can not only lead to chronic disease but also to risky behaviors that lead to chronic disease. Risky behaviors include behaviors that contribute to unintentional injuries and violence, sexual behaviors that are related to sexually transmitted diseases, alcohol and drug use, unhealthy dietary behaviors and inadequate physical activity (CDC, 2017). Chronic diseases are “non-communicable illnesses that are prolonged in duration, do not resolve spontaneously, and are rarely cured completely. They are the leading cause of death and disability in the United States” (CDC, 2012). Chronic diseases like heart disease, diabetes, obesity, arthritis and cancer are among those that are affected by chronic stress (CDC, 2012; American Psychological Association [APA], 2017). Early intervention is necessary in order to improve the long-term health outcomes of an individual.

Intervening in chronic stress means using buffers to stress daily. Such buffers include exercise, healthy diets, healthy hobbies, meditation and social support. These activities enhance the coping mechanism of an individual through increasing self worth, acceptance and support (Koenig, 2012). The continued practice/ involvement in one of these stress-relieving methods

may provide a long-term buffer to chronic stress, rather than a temporary fix. Although religion is a sensitive and personal matter, it may be a valid form of coping with and buffering stress for many individuals due to its meditative and social aspects.

The APA (2017) reported that adolescents are experiencing high levels of stress with psychological and physical repercussions as a result. Yet, the majority of parents reported being unaware of the amount of stress their children were feeling and how unmanaged that stress was (Munsey, 2010). Adolescents are a vulnerable population for stress because of their developmental stage of finding their identity and the associated psychosocial challenges that come with this phase, as well as structural and functional changes occurring in the brain and whole body (Kuzman, 2015). Coping mechanisms aid to manage stress and are tools to decrease the risk for chronic disease. These coping mechanisms are essential to instill in youth who are undergoing unmanaged, prolonged stress (Garcia, 2009).

One type of stress coping mechanism is the individual's religiosity. Religiosity includes religion, spirituality, prayer, church attendance, church affiliation and belief in God or a higher power (Snider, 2014). The receptive nature of religiosity is a practice that teaches methods to cope with stress, thus it is worthy to investigate the extent which religiosity can act as a coping mechanism for youth against chronic stress. This study examined the relationship between religiosity and stress in adolescents, specifically focusing on chronic physiologic stress.

Religion and Perceived Stress During Adolescence

The relationship between stress and religion has been investigated in previous studies. However, most of what is known about the relationship between stress and religiosity is based on measuring perceptions of stress and less is known about physiologic measures of stress. The Perceived Stress Scale (PSS) has been widely used as a measure of stress in previous studies.

Through the use of surveys such as the PSS and the Brief RCOPE (“a 14-item measure of religious coping with major life stressors” (Pargment, Feuille & Burdzy, 2011, p.51)), a differentiation has been observed on the effects of religiosity on perceived stress. Religiosity as a coping mechanisms can be divided into positive religious coping and negative religious coping. Positive religious coping is “seeking spiritual support, reappraising the negative events in positive terms, establishing a collaborative partnership with God”. Negative religious coping is the “reframing of negative life events as punishment from God, experiencing spiritual discontent or conflict, and passively differing responsibility for oneself and one’s situation to God” (Terrerri & Glenwick, 2011).

A negative correlation between positive religious coping and stress was found in unison with a positive correlation between negative religious coping and stress (Terrerri & Glenwick, 2011; Gardner, Krägeloh, & Henning, 2014). This means that the more positive religious coping used, the less perceived stress; and the more negative religious coping used, the more perceived stress. This opens the conversation on the use of religiosity as a coping mechanism for stress. The participants in Terreri & Glenwick’s (2011) study were 9th through 12th graders. A social demographic distinction was made between male and females. In comparison to males, females demonstrated a significant positive correlation between perceived stress and religious coping (regardless of it being positive or negative religious coping). A significant positive correlation was found between perceived stress and assistance seeking in females, “signifying a tendency for females to internalize (as compared to males who tend to externalize) their responses to adversity” while also being more inclined to seek social support from religious groups (Terrerri & Glenwick, 2011, p.1199).

In addition to using the PSS and Brief RCOPE, Gardner and colleagues (2014) used WHOQOL-SRPB (World Health Organization Quality of life- Spirituality, Religiousness and Personal Beliefs). A significant positive correlation between negative religious coping and stress was also found in Gardner and colleagues' results, further supporting that the more negative religious coping used, the more perceived stress. There was moderate negative correlation between positive religious coping and stress, further supporting that the more positive religious coping used, the less perceived stress (Gardner, Krägeloh, & Henning, 2014).

With the use of the PSS and the Personal Religiosity Scale, Shiah and colleagues (2013) found a significant positive correlation between religiosity and meaning of life. This means that the greater the individual valued religion, the greater the meaning of life the participants had. A significant negative correlation was found between meaning of life and perceived stress in this study as well meaning the higher the meaning of life, the less perceived stress. Although there was a negative correlation between religiosity and perceived stress, it was not a statistically significant finding in Shiah and colleagues study (2013).

Shiah and colleagues' (2013) results are consistent with those in another study that used the General Social Survey to obtain subjective reports of stress (measured by distress reports) and religiosity (measured by religious involvement activities) (Bradshaw & Ellison, 2010). Although there was a negative correlation between religious involvement and distress (the more religious involvement, the less distress and thus the greater the religiosity, the less perceived stress), the findings were statistically non-significant (Bradshaw & Ellison, 2010).

In a study of college nursing students, Papazisis and colleagues used The Royal Free Interview for Religious and Spiritual Belief (King, Speck, Thomas, 2001) survey in conjunction with the State-Trait Anxiety Inventory (Spielberger, Gorsuch, Lushene, 1970), the Beck

Depression Inventory (Beck, Steer, Brown, 1996), and the Rosenberg Self-esteem Scale (Rosenberg, 1965) to understand the relationship between religiosity, depression/anxiety and stress. Religiosity was found to have a strong negative correlation with depression and current stress as well as a significantly negative correlation with stress as a personality trait. “This signifies that stronger religious or spiritual beliefs are associated with decreased stress levels and less depressive symptoms” (Papazisis, Nicolaou, Tsigas, Christoforou, & Sapountzi-Krepia, 2014, p.235).

Although there is evidence to support the use of religiosity as a positive coping mechanisms to decrease perceived stress, findings in the literature are not consistent, which calls for more objective measurements, such as physiologic stress measurements.

Religion and Physiologic Stress Via Cortisol

As mentioned, Baum notes that stress produces “predictable biochemical and physiological changes” (1990, p.653). In response to stress exposure, changes occur within the body in order to adapt and maintain homeostasis. A critical regulatory component of the endocrine system is the hypothalamic-pituitary-adrenal (HPA) axis, which releases cortisol in response to stress (Tsigos, Kyrou, Kassi, & Chrousos, 2016). Cortisol is a glucocorticoid, which is a type of steroid hormone. The primary function of cortisol is to metabolize glucose in order to support the body’s nutritional needs during times of stress (Stephens & Wand, 2012). Thus cortisol is a physiologic measurement of stress.

The relationship between religiosity and cortisol has been examined in a few studies through the use of blood or saliva to measure the current cortisol level at the time of collection as well as reactivity of cortisol levels collected before and after a stress related task. Tartaro and colleagues (2005) used this latter technique to study the relationship between salivary cortisol

measured at one-time point and current states of religiosity. Results demonstrated a significant negative relationship between reactivity and religiosity, signaling how religiosity could be a short term buffer to cortisol increase and potentially aid in regulating cortisol levels. The presence of religious belief alone was enough to produce significant positive results, regardless of how religious the participants reported to be or how much they practiced their religion (Tartaro, Luecken, & Gunn, 2005).

Another use of salivary cortisol is to study patterns of cortisol across the day. The expected rhythm of a healthy individual is to have an increase in cortisol upon waking that peaks 30 minutes after waking followed by a progressive decrease in cortisol throughout the day, this is the diurnal rhythmic cortisol pattern. Studies have found a positive correlation between religiosity, specifically increased frequency of religious activities, and diurnal rhythmic cortisol (Dedert, Studts, Weissbecker, Salmon, Banis, & Sephton, 2004; Assari, Lankarani, Malekahmadi, Caldwell, & Zimmerman, 2009). Specifically, the greater participation in religious activities was associated with a more regulated cortisol pattern throughout the day whereas low engagement in religious activity was associated with a flatter diurnal slope. According to these studies, religiosity helps to regulate cortisol and thus moderate physiologic stress. Although focused on the current state of stress, research supports that prolonged flattening of the diurnal cortisol pattern throughout the day is a signal of health problems and predictor of chronic disease (Dedert, Studts, Weissbecker, Salmon, Banis, & Sephton, 2004). In an intervention study that examined the use of spiritual mantram, which is the use of a spiritual word or phrase repeated silently and frequently throughout the day, a significant negative relationship between greater faith and lower daily average cortisol was found for the intervention group, but no for the control group (Bormann, Aschbacher, Wetherell, Roesch, & Redwine,

2009). At the five week follow-up post intervention, average cortisol levels were significantly lower in the intervention vs. control group, however, the strength of the effect was weaker. Salivary cortisol has also been used in longitudinal studies in a 6-10 year time frame in order to understand the long-term effects of religion on chronic physiological stress. One study followed 227 adolescents ages 15 through 21 and another study followed 1,470 adults ages 25 through 74. These studies obtained multiple samples across 1-4 days and then in a second 1-4 day period at the 6-10 year follow up (Assari, Lankarani, Malekahmadi, Caldwell, & Zimmerman, 2009; Tobin & Slatcher, 2016). In both studies, the physiologic measurement of stress through salivary cortisol produced concrete and statistically significant evidence for the negative relationship between religiosity and chronic stress.

While this technique can be used in longitudinal studies, it only gives snapshots of cortisol levels at the time the sample is taken. A limitation of salivary cortisol is that it is a short-term measure and may not fully capture long-term effects of religion on chronic physiologic stress. Therefore, this study examines chronic physiologic stress through the use of hair as a medium to measure cortisol levels as 1 cm of hair growth approximates the mean cortisol level for the corresponding month (Short, Stalder, Marceau, Entringer, Moog, Shirtcliff, Wadhwa, & Buss, 2016). Thus, 3 months of hair growth collected from the scalp approximates the mean cortisol level for the prior 3 months and a more valid measure of the average physiologic stress levels over time.

Chapter 3

Methods

Method Type of Design

The study is a secondary analysis using data from two NIH funded studies -Adolescent Health and Development in Context (AHDC) study and the Linking Biologic and Social Pathways to Adolescent Health and Wellbeing (Bio-Social Linkages) study. IRB approval was obtained. These studies link stress biomarker data with survey data among adolescents in urban Columbus, Ohio, and surrounding suburbs. The current study was a cross sectional study using the first wave of data collection from the parent studies.

Sample

A racially and socioeconomically representative sample of 508 English-speaking adolescents comprises the sample for this study. The youth ranged between 11-17 years of age.

Data Collection

The data collection took place in the home setting. The religiosity items were collected from the youth by trained interviewers using computer-assisted survey instrumentation. The hair for cortisol was collected by the interviewer from the posterior vertex region of the scalp, which has the least amount of cortisol level variation. Youth were eligible to participate in the hair collection if he or she had at least 1 cm of hair growth (Ford et al., 2016). Of the eligible sample, 91.3% of the youth provided a hair sample for cortisol- of these approximately 3.5% (n=18) had insufficient hair to cut (<1 cm) and 5.2% (n=27) refused participation in the biomarker collection overall.

Instrumentation and Measures

The measure of religiosity focused on the importance of and involvement in religious faith and was examined via three survey items using a Likert scale: (1) attendance at religious services; (2) attendance at religious youth activities; and (3) importance of religious faith in daily life. The Likert scale used for the attendance at religious services ranged from 0 to 6, with 0

indicating no attendance and 6 indicating every day or almost every day attendance. The Likert scale used for attendance at religious youth activities ranged from 1 to 4, with 1 indicating once a week or more and 4 indicating never. The Likert scale used for importance of religious faith ranged from 1 to 5, with 1 indicating extremely important and 5 indicating no importance at all.

Physiologic stress measurements were assessed using cortisol measured in scalp hair. Cortisol is leached out of hair at more distal lengths (>3 cm) due to repeated washing and environmental exposures, thus consistent with prior research only the first 1-to-3 cm of hair growth from the root end of the scalp were assayed (length and weight included as covariates in analyses (Russell et al., 2012)). Hair was assayed for the mean cortisol value at the Ford lab via adapted protocol by D'Anna-Hernandez and colleagues (2011) and Meyer and colleagues (2014). To prep for assay, the hair sample was cut, washed twice with isopropanol and then dried over 24 hours. A total of 10-75 mg of hair was placed into a microcentrifuge tube, minced, and then ground in Retsch 400 Mill. A total of 1.1 ml of HPLC-grad methanol was added to the ground sample, and then incubated for 18-24 hours at room temperature with constant agitation. The tubes were centrifuged at 5000g for 5 minutes at room temperature to pellet the powdered hair. The entire amount (~1 ml) of supernatant was transferred to a clean microcentrifuge tube and the methanol removed by evaporation using a stream of air for 6-8 hours at room temperature. The cortisol extract was reconstituted in 100ul of Salimetric immunoassay cortisol analysis diluent buffer. Samples were assayed in duplicate and hair cortisol levels expressed as pg/mg.

Survey Questions

1. In the past year about how often have you attended religious services?

2. Many churches, synagogues, and other places of worship have special activities for teenagers- such as youth groups, Bible classes, or choir. In the past 12 months, how often have you taken part in any religious youth activities?
3. How important is religious faith in shaping how you live your daily life?

Data Analysis Strategy

Descriptive analyses were conducted to examine the distribution of the survey responses and hair cortisol values. Multi-variable analysis using linear regression was conducted to examine the association between the independent variable of religiosity and the dependent variable of chronic physiologic stress (hair cortisol), controlling for hair length and weight. Hair cortisol levels were logged for analysis to normalized the distribution. The data analytic software used was the SAS Software, Version 9.4 (Carey, NC). Significant results were those with p values below 0.05.

Chapter 4

Results

Descriptive Results

Of these 508 adolescents in the study sample, 26.18% had never attended religious services in the past year. 37.20% attended religious services occasionally (ranging from several times a year or less to 2-3 times a month). 36.61% of the adolescents attended religious services frequently (weekly or more). In terms of youth religious activities, 41.34% of the 508 adolescents never attended any youth religious activities in the past year. 36.61% occasionally (less than once a month) attended youth religious activities in the past year. 22.05% of the adolescents attended youth religious activities frequently (at least once a month to weekly). In terms of importance of religion, 38.58% of the 508 adolescents said religion was not important to

them at all. 25.79% said religion was somewhat important to them. 35.63% of the adolescent said religion was very to extremely important to them (see Figure 1).

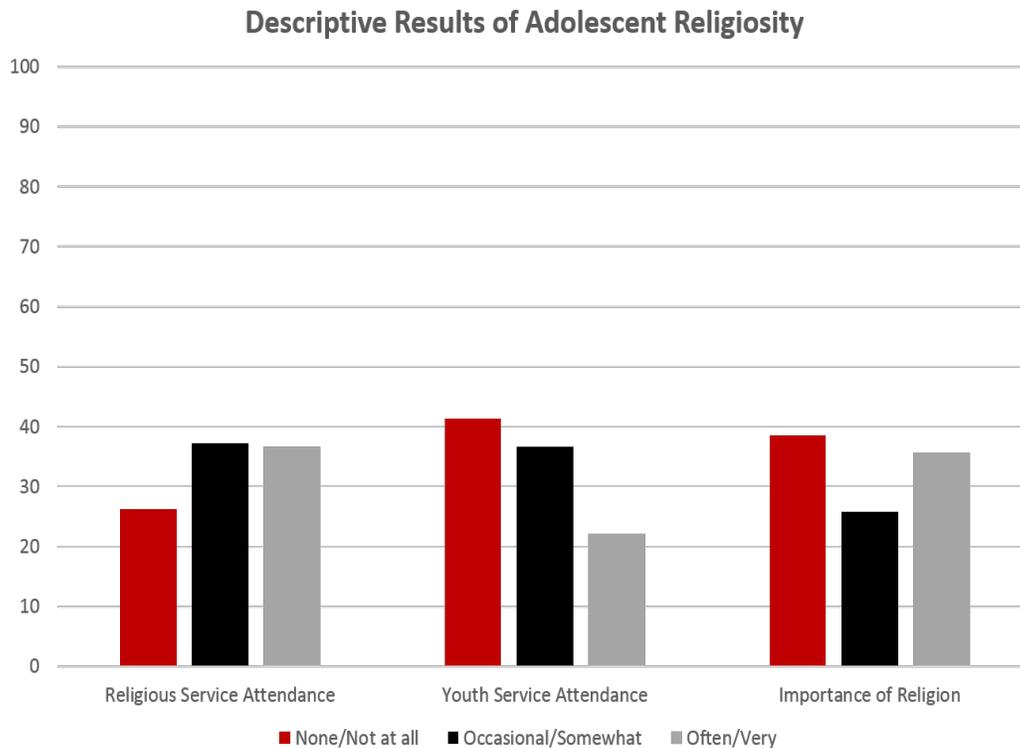


Figure 1

Multivariable Results

Table 1 presents the results of the multi-variable analysis on the associations between religiosity and logged hair cortisol levels, controlling for hair weight and length. First, in testing the association between frequency of religious service and attendance, youth who attended frequently (weekly or more) and those who never attended both had higher hair cortisol levels in comparison to youth who attended occasionally. When beta is exponentiated for those participants who attended religious services frequently, the hair cortisol levels were found to be 32% higher for those who go to religious services weekly or more (36.61% of participants- 186 out of the 508) in comparison to those who go occasionally (37.20% of participants- 189 out of the 508). When beta is exponentiated for those participants who never attended religious

services, hair cortisol levels were 31% higher for those who never go to religious services (26.18% of participants- 133 out of the 508) in comparison to those who go occasionally (37.20% of participants- 189 out of the 508). Second, no significant associations were found in the relationship between the frequency of youth involvement in religious youth activities and hair cortisol. Last, youth who reported religion to be very or extremely important to them had higher hair cortisol levels than those youth you reported religion to be somewhat important; there were no significant differences between youth who reported religion was not important to them and those who reported it to be somewhat important. Specifically, when beta is exponentiated, hair cortisol levels were 38% higher for those who reported religion is very to extremely important to them (35.63% of participants- 181 out of the 508) in comparison to those who report religion is somewhat important (25.79% of participants- 131 out of the 508). This signifies that adolescents who report a greater importance of religion have higher cortisol levels and thus higher physiologic stress levels, than those who report a moderate (somewhat important) importance of religion.

Multivariable Regression Analysis of the Relationships between Religiosity and Hair Cortisol Levels		b
Frequency of Religious Service Attendance		
Weekly or more		0.28*
Never		0.27*
Occasional (reference)		-----
Frequency of Religious Youth Group Attendance		
Weekly or more		0.34
Never		0.34
Occasional (reference)		-----
Importance of Religion to Youth		
Very to extremely important		0.32*
Not important at all		0.18
Somewhat important (reference)		-----
Controlling for hair length and hair weight *p<0.05		

Table 1

Chapter 5

Discussion, Conclusion and Recommendations

Discussion

This study analyzed the relationship between religiosity and chronic physiologic stress through surveying religiosity's influence in the lives of the participating adolescents within the past year, as well as with the measurement of chronic physiologic stress found in hair cortisol. These results suggest higher levels of involvement and greater importance of religiosity over an extended period of time are associated with increased chronic physiological stress, which is contrary to the majority of previous research that have observed a negative relationship between religiosity and stress (Terrerri & Glenwick, 2011; Gardner, Krägeloh, & Henning, 2014; Shiah, Chang, Chaing, Lin, & Tam, 2013; Bradshaw & Ellison, 2010). This may be due to how

religiosity is applied in the adolescent's personal life, whether it is used as a positive religious coping or a negative religious coping as analyzed in Terreri and colleagues' (2011) and Gardner and colleagues' (2014) studies. Increased involvement and importance of religiosity may be occurring, yet religiosity may be a cause for stress itself if one views negative life events as a punishment, which then manifests more as a negative coping mechanism. This study contrasts with previous research findings that analyze perceptions of stress rather than physiologic measure of chronic stress. This study also contrasts previous research that focused on religiosity and physiologic measures of stress (Tartaro, Luecken, & Gunn, 2005; Bormann, Aschbacher, Wetherell, Roesch, & Redwine, 2009; Dedert, Studts, Weissbecker, Salmon, Banis, & Sephton, 2004; Assari, Lankarani, Malekahmadi, Caldwell, & Zimmerman, 2009; Tobin & Slatcher, 2016), however these were done with salivary cortisol rather than hair cortisol, assessing short-term effects of religiosity on stress.

Conclusion

Chronic stress is the unmanaged, prolonged exposure to stress. Increased chronic stress can exacerbate illnesses and/or lead to long-term illnesses related to the immune, cardiovascular, neuroendocrine and central nervous systems. Thus chronic stress is a risk factor for chronic disease. This study focused on the adolescent population, as this is a vulnerable population for stress. As a result of early exposure to chronic stress in youth, the adolescent population is prone to earlier development of chronic disease. Coping mechanisms may help decrease stress in youth with unmanaged, prolonged stress. Previous research has found religiosity is a buffer for stress, yet most studies measure perceived stress specifically. The purpose of this study was to understand the relationship between religiosity and chronic physiologic stress in adolescents. Results suggest higher levels of involvement in and greater importance of religion are associated

with increased chronic physiologic stress. These results do not align with previous research, which have found religiosity as a positive coping mechanism in adolescents. As stated, previous research has measured stress as perceptions of stress, further research must be performed to understand the use of religiosity as a coping mechanism for physiologic chronic stress, as there may be different effects.

Recommendations

It is crucial for youth to be able to use effective coping mechanisms when managing chronic stress, and for health care providers to be able to educate their patients and advocate for effective coping mechanisms for stress. Research findings to support various coping mechanisms, such a religiosity for stress can lead to conversations about various treatment options and preventative measures against chronic stress. Taking measures to prevent and/or manage early exposure to chronic stress could help to decrease risk of chronic disease.

In general there is a significant gap in the literature in terms of religiosity and its relationship to stress and a more nuanced understanding of negative and positive religious coping needed. As noted in the review of literature in this study, the literature available is inconsistent and calls for further research using objective measures of stress. The use of hair cortisol as a measure of chronic physiologic stress is a new methodology, thus further research in this field is necessary in order to expand data on long-term measurements of stress within the body. Further research should also consider how social demographic characteristics, such as gender, may demonstrate different findings on the effects of religiosity on stress.

References

Adolescent and School Health. (2017, August 09). Retrieved from

<https://www.cdc.gov/healthyyouth/data/yrbs/index.htm>

Alvord, M. K., et al. (2017). Understanding chronic stress. Retrieved from

<http://www.apa.org/helpcenter/understanding-chronic-stress.aspx>

American Psychological Association. (2017). Stress effects on the body. Retrieved from

<http://www.apa.org/helpcenter/stress-body.aspx>

Anderson, N.B. (1998). Levels of analysis in health science: A framework for integrating

sociobehavioral and biomedical research. *Annals of the New York Academy of Sciences*, 840(1), 563-576.

Assari, S., Lankarani, M. M., Malekahmadi, M. R., Caldwell, C. H., & Zimmerman, M. (2015).

Baseline religion involvement predicts subsequent salivary cortisol levels among male but not female black youth. *International Journal of Endocrinology and Metabolism*, 13(4), 1-8.

Baum, A. (1990). "Stress, intrusive imagery, and chronic distress," *Health Psychology*, 9(6),

653-675.

Beck A, Steer R, Brown G. (1996). *BDI-II. Beck Depression Inventory Manual*. San Antonio, TX: Psychological Corporation.

Bernell, S. & Howard, S.W. (2016). Use your words carefully: What is a chronic disease? *Front Public Health*, 4, 159.

Bormann, J. E., Aschbacher, K., Wetherell, J. L., Roesch, S., & Redwine, L. (2009). Effects of faith/assurance on cortisol levels are enhanced by spiritual mantram intervention in adults with HIV: A randomized trial. *Journal of Psychosomatic Research*, 66(2), 161-171.

Bradshaw, M. & Ellison, C. G. (2010). Financial hardship and psychological distress: exploring the buffering effects of religion. *Social science & medicine*, 71(1), 196-204.

Buttorff, C., Ruder, T., & Bauman, M. (2017, May 26). Multiple chronic conditions in America. Retrieved from <https://www.rand.org/pubs/tools/TL221.html>

Centers for Disease Control and Prevention. (2017, June 28). Chronic disease prevention and health promotion. Retrieved from <https://www.cdc.gov/chronicdisease/overview/index.htm>

Center for Disease Control and Prevention. (2012). Mental health and chronic disease CDC Fact Sheet(pp. 1-6, Rep. No. 2). National Center for Chronic Disease Prevention and Health

Promotion. Retrieved from <https://www.cdc.gov/workplacehealthpromotion/tools-resources/pdfs/issue-brief-no-2-mental-health-and-chronic-disease.pdf>

Chronic Disease Prevention and Health Promotion. (2017, June 28). Chronic disease overview. Retrieved from <https://www.cdc.gov/chronicdisease/overview/index.htm>

Dedert, E. A. Studts, J. L., Weissbecker, I., Salmon, P. G., Banis, P. L., & Sephton, S. E. (2004). Religiosity may help preserve the cortisol rhythm in women with stress-related illness. *International Journal of Psychiatry in Medicine*, 34(1), 61-77.

D'Anna-Hernandez, K. L., Ross, R.G., Natvig, C. L., & Laudenslager, M.L. (2011). Hair cortisol levels as a retrospective marker of hypothalamic-pituitary axis activity throughout pregnancy: Comparison to salivary cortisol. *Physiology & Behavior*, 104(2):348-53.

Ford, J.L., Boch, S.J., & McCarthy, D. (2016). Feasibility of hair collection for cortisol measurement in population research on adolescent health. *Nursing Research*, 65(3), 249-55.

Garcia, C. (2009). Conceptualization and measurement of coping during adolescence: A review of the literature. *Journal of Nursing Scholarship*, 42(2), 166-185.

- Gardner, T. M., Krägeloh, C. U., & Henning, M. A. (2014). Religious coping, stress, and quality of life of Muslim university students in New Zealand. *Mental Health, Religion and Cultures, 17*(4), 327-338.
- King M, Speck P, Thomas A. (2001). The royal free interview for spiritual and religious beliefs: development and validation of a self-report version. *Psychol. Med. 31*, 1015–1023.
- Koenig, H. G. (2012). Religion, spirituality, and health: The research and clinical implications. *ISRN Psychiatry*.
- Kuzman, E. K. & Peters, R. M. (2015). Adolescent vulnerability, sexual health, and the NP's role in health advocacy. *Journal of the American Association of Nurse Practitioners, 28* (7), 353-361.
- Lavoie, J., Pereira, L. C., & Talwar, V. (2016). Children's physical resilience outcomes: Meta-Analysis of vulnerability and protective factors. *Journal of Pediatric Nursing, 31*(6), 701-711.
- Meyer, J., Novak, M., Hamel, A., & Rosenberg, K. (2014). Extraction and analysis of cortisol from human and monkey hair. *Journal of visualized experiments: JoVE.*, (83):e50882.
- Munsey, C. (2010). The kids aren't all right. *Monitor on Psychology, 41*(1), 22.

Papazisis, G., Nicolaou, P., Tsiga, E., Christoforou, T., & Sapountzi - Krepia, D. (2014).

Religious and spiritual beliefs, self-esteem, anxiety, and depression among nursing students. *Nursing and Health Sciences*, 16(2), 232-238.

Rosenberg M. (1965). *Society and the Adolescent Self-Image*. Princeton NJ: Princeton University Press.

Russell E, Koren G, Rieder M, & Van Uum S. (2012). Hair cortisol as a biological marker of chronic stress: current status, future directions and unanswered questions.

Psychoneuroendocrinology.37(5), 589-601.

Shiah, Y.J., Chang, F., Chiang, S. K., Lin, I. M., & Tam, W. C. C. (2013). Religion and health: Anxiety, religiosity, meaning of life and mental health. *Journal of Religion and Health*, 54(1), 35-45.

Short, S. J., Stalder, T., Marceau, K., Entringer, S., Moog, N.K., Shirtcliff, E.A., ... & Buss, C. (2016). Correspondence between hair cortisol concentrations and 30-day integrated daily salivary and weekly urinary cortisol measures. *Psychoneuroendocrinology*. 71,12-8.

Snider, A. & McPhedran, S. (2014). Religiosity, spirituality, mental health, and mental health treatment outcomes in Australia: A systematic literature review. *Mental Health, Religion and Culture*, 17(6), 568-581.

Spielberger C, Gorsuch R, Lushene R. (1970). *Manual for the State-Trait Anxiety Inventory*. Palo Alto, CA: Consulting Psychologists

Stephens, M. A.C. & Wand, G. (2012). Stress and the HPA axis: Role of glucocorticoids in alcohol dependence. *Alcohol Research Current Reviews*, 34(4), 468-483.

Tartaro, J. J., Luecken, L. J., & Gunn, H. E. (2005). Exploring heart and soul: Effects of religiosity/spirituality and gender on blood pressure and cortisol stress responses. *Journal of Health Psychology*, 10(6), 753-766.

Terreri, C., & Glenwick, D. S. (2011). The relationship of religious and general coping to psychological adjustment and distress in urban adolescents. *Journal of Religion and Health*, 52(4), 1188-1202.

Tobin, E. T., & Slatcher, R. B. (2016). Religious participation predicts diurnal cortisol profiles 10 years later via lower levels of religious struggle. *Health Psychology*, 35(12), 1356-1362.

Tsigos, C., Kyrou, I., Kassi, E., & Chrousos, G. P. (2016). Stress, endocrine physiology and pathophysiology. Retrieved from <https://www.ncbi.nlm.nih.gov/books/NBK278995/>

Zimmerman, M. A. (2013). Resiliency theory: A strengths-based approach to research and practice for adolescent health. *Health Education & Behavior*, 40(4), 381-383.

doi:10.1177/1090198113493782