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Factors influencing health behaviors in those at risk for developing schizophrenia

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FACTORS INFLUENCING HEALTH BEHAVIORS IN THOSE AT RISK FOR DEVELOPING SCHIZOPHRENIA

by

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Dedication

I would like to dedicate this thesis to my parents and younger brother who have provided immeasurable amounts of support, love, and laughs that have made the completion of this project possible.

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Abstract

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Significant health concerns are common among those with **s**chizophrenia-spectrum disorders and are associated with an average lifespan reduction of 15-20 years compared to the general public (Saha, Chant &, McGrath, 2007). Although symptoms of the disorder can disrupt self-care and health behaviors, evidence also suggests that problematic health behaviors are present before the onset of the manifest disorder. One example includes nicotine use which is elevated in those with a family history of schizophrenia (Ferchiou et al., 2012) and in those who show subclinical signs of risk for schizophrenia (Esterberg, Jones, Compton, & Walker, 2007). Despite these findings, there is little research available about other problematic lifestyle behaviors (i.e. physical activity, nutrition) that may also be present prior to the emergence of the full clinical syndrome. Research examining the lifestyle patterns of "high risk" (subclinical) individuals may increase our understanding of *what* problematic health behaviors exist in those with risk for schizophrenia prior to the confounding effects of antipsychotic medication use and the disruptions that occur with more severe symptomatology.

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Chapter 1

Introduction

The term *schizophrenia- spectrum disorders* (SSDs) refers to a continuum of conditions ranging from the clinical diagnosis of schizophrenia[1] to subclinical indicators of risk for schizophrenia (i.e., schizotypy[2]), refer to Appendix A and B for an in-depth description. The research project discussed in this paper involves examining factors influencing physical health at the subclinical end of the spectrum, although the vast majority of the available literature involves research with clinical samples. Thus, in order to provide a context for the current study it will be necessary to review evidence across the spectrum that problematic lifestyle behaviors are associated with a greater risk for chronic health conditions (Samele et al., 2007; Chwastiak, Rosenheck, & Kazis, 2011). These conditions include, cardiovascular disease, diabetes (Castillo-Sanchez, Fabregas-Escurriola, Fernandez-San Martin, & Goday-Arno, 2015), obesity (Dickerson, Brown, Kreyenbuhl, Wohlheiter, & Dixon, 2005), and metabolic syndrome (Bly et al., 2014). Subsequently, people with schizophrenia have their life expectancy shortened by 15-20 years (Laursen, 2011; Saha, Chant &, McGrath, 2007). Research examining the lifestyle choices in those with schizotypy may lead to a greater understanding of *what* problematic

[1] Schizophrenia is diagnosed using the Diagnostic and Statistical Manual of Mental Disorders (APA, 2013). Symptoms of schizophrenia can be grouped into three main groupings (i.e., positive, negative symptoms, and disorganized symptoms).

[2] S*chizotypy* expresses the presence of atypical behaviors, experiences, and beliefs, that are not clinically impairing, yet are believed to indicate greater risk towards the later development of schizophrenia (Meehl, 1962) with approximately eight percent of individuals with schizotypy later developing clinical schizophrenia (Van Os, Linscott, Myin-Germeys, Delespaul, & Krabbendam, 2009). The subclinical symptoms seen in schizotypy resemble the three main categories of symptoms in schizophrenia.

behaviors exist during the premorbid period and may elucidate *when* these problematic behaviors first emerge. This information may ultimately inform early prevention strategies that target the identified behaviors to improve long-term health outcomes (Barrentes-Vidal et al., 2015). The evidence for factors associated with negative health outcomes is summarized in the following portion of the paper. The content is organized into four general areas titled “Weight and Nutritional/Caloric Intake” “Level of Physical Activity”, “Socioeconomic Status and Health”, and “Nicotine Use”. Each section will begin reviewing the research obtained from clinical samples and then incorporate schizotypy research when available.

Chapter 2

Literature Review

Weight and Nutrition and Caloric Intake in the Schizophrenia-Spectrum Disorders

People diagnosed with schizophrenia are approximately 3x more likely to develop obesity than those of the general population (Coodin, 2001). For example, individuals with schizophrenia have a 45-55% greater risk towards obesity than those of the general population (De Hert, Schreurs, Vancampfort & Van Winkel, 2009) and more than 80% of individuals with serious mental illness are above their normal weight range (National Institute of Mental Health, 2013). Although there are many possible contributors to obesity post-diagnosis, such medication side effects (Manu et al., 2015), problematic eating habits and poor nutrition have been well documented (Sugawara et al., 2014). Furthermore, there is less known about when these problems first arise and what issues (if any) are present in those with a lower level of symptomatology on the schizophrenia continuum. Surprisingly, the available research suggests that people who later develop schizophrenia are likely to have BMI scores in the normal (Sorensen, Mortensen, Reinisch & Mednick, 2006) or low ranges (Zammit et al., 2007; Weiser et al., 2007). Thus, premorbid BMI scores in the lower or normal ranges seem to be associated with *greater* risk towards the development of schizophrenia, especially in males (Weiser et al., 2007). This is somewhat paradoxical, since greater BMI levels (obesity) are a commonplace after the onset of schizophrenia (Fountoulakis et al., 2010). Understanding the eating habits in those with schizotypy may provide information on changes in BMI that come into existence after the emergence of schizophrenia. Knowledge of these changes is important because it may lead to a holistic understanding of the heightened

BMI in those with schizophrenia which may contribute to potential advances in health-related programs.

One factor contributing to the overall poor lifestyle habits of those with schizophrenia are dietary patterns. When compared to controls, people with schizophrenia tend to eat less fish, fruits, vegetables, and lean meats (Amani, 2007; Simonellie-Munoe et al., 2012). Diets consisting of high levels of saturated fats and low levels of fiber are also found in the diets of those with schizophrenia (Dipasquale et al., 2013), perhaps contributing to rates of obesity. Thus, obesity might be related to larger meals and extra snacking. (Roick et al., 2007; Simonelli-Munoe et al., 2012). Furthermore, there may be dietary differences related to gender as well, with evidence that women may consume higher amounts of fat and have higher obesity rates, (Simonelli-Munoe et al., 2012) while men consume greater levels of saturated fats and overall calories (Archie et al., 2007; Henderson et al., 2006). Although nutrition and caloric intake have not been examined directly in a high-risk sample, at least one longitudinal study implicated the importance of nutritional enrichment in early childhood in those with one or more risk indicators (i.e. poor psychosocial functioning & malnourishment) (Raine et al., 2003). This study found that malnourished children who participated in a structured nutritional intervention (among education and physical activity as well) from ages 3 to 5 had significantly lower levels of schizotypy at ages 17 and 23 (Raine et al., 2003). Thus, the Raine (2003) study provides some support that premorbid eating patterns may be an influential factor in the emergence of clinical levels of symptomatology. Furthermore, the findings from the Raine (2003) study suggest that further information is needed on premorbid eating patterns.

With regards to the amount of calories consumed, findings have been mixed (Henderson et al., 2006; Strassing, Brar & Ganguli, 2003). There is some evidence that people with schizophrenia consume fewer total calories, carbohydrates, proteins, sodium, and alcohol than controls (Dickerson et al., 2005), suggesting that the dietary concerns within this population may involve the intake of particular foods, rather than the amount of food consumed (Henderson et al., 2006). In contrast, other findings suggest that people with schizophrenia may consume more total calories than controls while displaying similar food choices (Strassing et al., 2003). Considering these conflicting findings, it seems essential that other factors be considered concurrently to fully understand the development of obesity and long-term health risks. Although levels of physical activity may not contribute to the extent of other lifestyle factors (i.e. dietary habits) when examining increased BMI, it seems to be particularly relevant within the schizophrenia population, because low levels of activity are linked to higher BMI scores in those with schizophrenia (Beebe & Harris, 2013; Vancampfort et al., 2011).

Levels of Physical Activity in the Schizophrenia-Spectrum Disorders

Levels of physical activity may also be an influential factor in the health outcomes of those with SSDs. According to the World Health Organization (2016) the recommended level of physical activity for adults in the United States is 150 minutes of moderate-intensity activity, 75 minutes of vigorous-intensity, or an equal value through moderate and vigorous levels of activity per week. As a secondary suggestion, it is recommended that adults engage in at least 10 minutes of continuous cardiovascular training (World Health Organization, 2016). Findings from the existent literature suggests that people with schizophrenia are less likely to obtain adequate levels of exercise when

compared to the general population (Vancampfort et al., 2011). In one study, over 45% of those with schizophrenia reported an absence of physical activity engagement (Roick et al., 2007). However based off of data from the Center for disease control and prevention (2017) these findings are not particularly discrepant when compared to the general population with only 49% of adult individuals meeting the adequate aerobic physical activity guidelines. In another study it was suggested that those with a serious mental illness such as schizophrenia were significantly less likely to engage in the recommended physical activity levels and were more likely to participate in walking as a main source exercise (29% VS. 10%) in comparison to the control group (Duamit et al., 2005). These findings demonstrate that people with schizophrenia are less likely to engage in strenuous activities as a form of exercise then the general population. Although strenuous levels of activity are not needed to meet physical activity requirements (WHO, 2016), this study denotes the physical activity differences between those with schizophrenia and the general population. Components influencing the lack of physical activity in those with schizophrenia include poor motivation, lack of knowledge, and psychotic symptoms (Abed, 2010). However, interventions that encourage greater physical activity in those with schizophrenia often report reduced symptomatology, especially in the negative symptom dimension (Gorczynski & Faulkner, 2010). This suggests potential auxiliary benefits (i.e. lower levels of symptomology) for increasing physical activity in those with schizophrenia.

While there is no direct research on levels of physical activity of those with levels of schizotypy, the Raine et al., (2003) study suggests that improved nutrition in youth may be a factor that contributes to decreased schizotypy in young adulthood, thus

providing indirect evidence. In addition to enriched nutrition, this program also provided 2-years of structured exercise activities to children beginning at age 3. Malnourished children who received this environmental enrichment had fewer symptoms of schizotypy at ages 17 and 23. Additionally, research has been conducted on anhedonia and physical activity (Leventhal, 2012), suggesting that higher levels of anhedonia were related to lower levels of physical activity in undergraduate students. Although the Leventhal (2012) study was not examining levels of schizotypy in undergraduate students, the results suggest that experiencing subclinical levels of (negative) symptoms may be predictive of lower levels of physical activity.

Socioeconomic Status and Health

In addition to the variables mentioned above (dietary choices, total caloric intake, physical activity, gender), socioeconomic status (SES) is another factor that may be related to higher BMI in individuals with schizophrenia. For example, individuals experiencing symptomatology may experience difficulties attaining and maintaining employment. In one study, up to 72.9% of those with schizophrenia were unemployed and not looking for a job (Rosenheck et al. 2006), suggesting widespread economic difficulties within the population. This relates to overall health choices because access to resources may impact the quality of food consumed and the ability to engage in exercise/physical activities (Lo et al., 2009). Occupation, income, and education are predictive measurements of socioeconomic status (Green, 1970). Education has been suggested as a measurement of socioeconomic status with the greatest influence on health outcomes, especially cardiovascular disease (Winkleby, Jatulis, Frank &, Formann, 1992). Premorbid socioeconomic status may be related to the development of problematic

patterns of health behaviors seen in those with manifest schizophrenia, indicating that those of higher socioeconomic status may have greater opportunities to engage in healthier lifestyle choices such as gym memberships and a variety of healthy foods. These findings are relevant to the current study because it has previously been suggested those living in rural areas (suggesting being of a lower SES) were more likely to express subclinical levels of psychotic symptoms than those who did not come from a lower SES area (Wiles et al., 2006). Therefore, based off of the literature it is likely SES may influence initial presentation of subclinical symptoms and therefore impact the health-related choices among this group of people. Additionally, a recent study suggests that having a lower social status may be related to consuming a greater number of calories (Cardel et al., 2016, in press). Therefore, socioeconomic status may be an associated factor in the health-related risks of individuals with schizophrenia such as obesity and diabetes.

Nicotine Use in the Schizophrenia-Spectrum

In addition to poor nutrition and low levels of physical activity, smoking has been identified as a factor leading to mortality within this population (Brown, Inskip, & Barraclough, 2000). Smoking rates are at approximately 71% among those with schizophrenia vs.17% in the general population (Ziaaddini, Kheradmand & Vahabi, 2009). In one study, (Kelly et al., 2009) adult smokers with schizophrenia displayed significantly greater mortality rates due to cardiac complications in comparison to non-smokers. This suggests that smoking is a health behavior influencing the shortened life expectancy in those with schizophrenia.

Nicotine use is one of the few areas where there is a good deal of research within schizotypy. Rates of smoking are much higher among those "at risk" (Esterberg et al., 2007). For example, in one study, first degree relatives of those with schizophrenia were almost twice as likely to engage in nicotine use and displayed greater nicotine dependence than those without a first degree relative with schizophrenia (Ferchiou et al., 2012). In regards to subclinical symptomology and nicotine use, individuals with elevated rates of nicotine use also displayed greater levels of positive and disorganized schizotypy symptoms (Stewart, Cohen, & Copeland, 2010). Similarly, a longitudinal study, found that individuals who reported nicotine use were twice as likely to experience subclinical psychotic symptoms than those who did not (Wiles et al., 2006), suggesting that poorer lifestyle choices are present before the onset of a schizophrenia-spectrum disorder. In another schizotypy study, symptoms of disorganization were a predicative factor of nicotine use (along with cannabis use and alcohol consumption) in college students (Esterberg, Goulding, McClure-Tone & Compton, 2009). These findings are of importance because they provide evidence that at risks individuals are engaging in harmful lifestyle behaviors, which may suggest an underlying vulnerability to the development of schizophrenia.

As previously stated, people with schizophrenia display poorer health behaviors that increase their risk in developing a range of chronic health conditions (McNamee, Mead, MacGillivray, & Lawrie. 2013). People at risk for developing schizophrenia tend to display greater nicotine dependence, yet there is a paucity of information about other potentially problematic health behaviors or influences (i.e. nutrition, physical activity, and SES) that may be present in the prodromal period or among those with high levels of

schizotypy. Understanding the health behaviors of those with elevated levels of schizotypy may lead to greater knowledge of the importance in developing early health prevention programs for those at-risk and in first-episode schizophrenia.

Aims of the Current Study

The current thesis project aims to examine the lifestyle habits across levels of schizotypy (e.g. dietary habits, physical activity, BMI, gender, socioeconomic status, and nicotine use) with the purpose of gaining insights into the possible origins of problematic health outcomes in schizophrenia-spectrum conditions. Based on the previous literature, several specific hypotheses have been developed. First, we seek to replicate previous empirical schizotypy literature. Therefore, for our first hypothesis we anticipated that higher overall levels of schizotypy would be associated with lower BMI scores. Secondly, we hypothesized that higher levels of positive and disorganized symptoms would be related to greater nicotine use. Additionally, extrapolating from the schizophrenia literature, we anticipated that higher levels of schizotypy (especially negative and disorganized schizotypy) would be predictive of poorer health behaviors involving poorer dietary habits (e.g. high caloric consumption and poor quality nutrition) and lower amounts of physical activity. Finally, as an exploratory aim, we anticipated that higher SES would be predictive of healthier nutritional choices, more physical activity and less nicotine use, while lower socioeconomic status would be predictive of poorer nutrition, less physical activity, and more nicotine use. We anticipated that both SES and levels of schizotypy would independently contribute to the prediction of health behaviors. In order to better understand the relationship of our study variables we developed hierarchical multiple regression models to examine the unique and shared

contribution of both socioeconomic status (SES) and levels of schizotypy to our dependent variables: physical activity, dietary habits, BMI, and nicotine use.

Chapter 3

Methods

Participants

Participants were undergraduate students recruited at mid-sized university in southern New Jersey. Students were required to select from a wide variety of voluntary research projects, or to complete an alternative assignment, as part of an introductory psychology class. Inclusion criteria included enrollment in the introductory psychology course, being 18 years of age or older, and providing consent. Individuals were excluded if they did not meet these requirements. We had 115 students enroll in this study.

Measures and Materials

Measurements of schizotypy. Two measurements of schizotypy used in this study.

Schizotypal Personality Questionnaire–Brief. The 32-item brief version of the schizotypal personality questionnaire (SPQ-BR; Cohen et al., 2010) was used to measure our independent variable of schizotypy. The SPQ was initially developed by Raine (1991) and is based on the Diagnostic and Statistical Manual-III-R schizotypal personality characteristics. The items of this measure are categorized into three subgroups such as cognitive-perceptual, interpersonal, and disorganized. For example, on a five-point Likert scale subjects were asked to rate the degree to which they agree or disagree with the statement "I am not good at expressing my true feelings by the way I talk and look" (Cohen et al., 2010). The subscales of the SPQ-BR have been shown to have an internal validity ranging from .74-.76 (Axelrod, 2001; Callaway et al., 2014).

Oxford-Liverpool Inventory of Feelings and Experiences–Short Version. In addition to the SPQ-BR, we used the Oxford-Liverpool inventory of feelings and experiences short- version (sO-LIFE). The short version of the scale consists of 43 questions with four sub-scales such as unusual experiences, cognitive disorganization, introvertive anhedonia, and impulsive nonconformity (Mason, Linney, & Claridge, 2005), with questions formatted for a yes or no response. The unusual experiences subscale examines unusual or bizarre thinking patterns in addition to hallucinations. An example of a question on the unusual experiences subscale includes, "I have noticed sounds on my records that are not there at other times". The cognitive disorganization subscale looks at deficits in memory and attention, while the 13 introvertive anhedonia subscale measures satisfaction with ones' social life, and finally the impulse nonconformity scale measures eccentric behaviors as a result of lack in self-control (Dembinska-Krajewska & Rybakoski. 2014). The sO-LIFE displays ordinal alpha scores between .78 to .87 (Fonseca-Pedrero, Ortuno-Sierra, Mason, & Muniz, 2015)

Measurement of diet and physical activity. This study involved two measures of dietary patterns. These measures included a 24-Hour Recall and several dietary questions that were asked during a brief interview. In order to measure physical activity a self-reported questionnaire was used.

24-hour diet recall. In order to get an in-depth example of dietary habits, subjects completed a 24-hour diet recall log. The log is a modified version of multiple food record/ portion size example of a recall downloaded from the NCI. The recall includes listing food, beverages, where the food was consumed, portion sizes, and whether it was eaten as a snack or meal. This measure was used to demonstrate eating patterns in

relation to daily dietary recommendations based on individual differences such as weight, and level of physical activity. Nutritional totals (calories, saturated fat, sugar, protein, and carbohydrates) were found using Fatsecret.com which is a website that provides nutritional information. Total caloric intake was developed by adding the calorie values from Fatsecret. Calculator.net is an online website that can calculate dietary needs based on height, weight, gender, and physical activity. This website was utilized to examine carbohydrate and caloric consumption. For sugar, a score was derived based on the daily recommendations of sugar consumption which is 25 grams per day for Females and 37.5 grams for males (American Heart Association). Protein was calculated by multiplying .36 by an individual's weight (NAP, 2005). Saturated Fat scores were categorized based off of the American Heart Association's recommendations for grams of Saturated Fat consumed per day, which suggests 5-6% of calories should derive from saturated fats. The rating systems for each category is further explained in Appendix C.

Dietary habits interview. As an additional measurement of dietary habits, participants were interviewed about specific foods they have consumed over the past week and their general dietary habits. The questions included in the interview were based on three dietary assessments and the past literature on the dietary habits of individuals with schizophrenia. Please see Appendix D for further information and interview questions.

***Portion examples*.** To gain greater accuracy, a sheet of paper with pictures and examples of serving sizes were handed to each participant at the start of the study. For example, a picture of one cup of cereal was displayed to give subjects a sense of the

amount of food consumed. Pictures of serving sizes were based on images downloaded from the internet.

Nutrition calculator. The information from the 24- hour diet recall was calculated by Calculator.net. Calculator.net is a free website that calculates caloric and carbohydrate needs in relation to individual differences (height, weight, gender, age and levels of physical activity). Specifically, Calculator.net uses the Mifflin equation (Calculator.net, 2017) to calculate an individual's calories. This calculator provided nutritional ranges for each participant that assisted in the overall total scores for the recall.

Global physical activity questionnaire. In order to measure our second dependent variable physical activity, we use the Global Physical Activity Questionnaire (GPAQ). The GPAQ is a 16-item self-report measure developed by the World Health Organization, measuring physical activity in three domains (Armstrong, 2006). These domains consist of physical activity at work such as manual labor, transportation such as walking to and from locations, and recreational or leisure time activity like attending a class at the gym. For example, a question asking about manual labor includes, "In a typical week, on how many days do you do moderate intensity activities as part of your work?" Based off of these scores the GPAQ categorizes results into high, moderate, or low intensity levels. High intensity physical activity suggests arduous activity three days a week reaching 1500 metabolic equivalent tasks (MET) per week or seven days of moderate or arduous activity reaching 3000 MET per week. Inclusion criteria for moderate activity includes three or more days of vigorous activity for twenty minutes a day or multiple activities for five or more days reaching 500 MET per week. Low intensity physical activity is suggested when the criteria for high or moderate intensity is

not met. Additionally, the GPAQ classifies physical activity into being sufficiently active or inactive. Being sufficiently active involves thirty minutes of moderate intensity activity for at least five days a week or 20 minutes of vigorous activity achieved in at least three days a week, whereas inactivity suggests the above criteria has not been met (Chu, Ng, Koh & Muller- Riemenschneider. 2015). The GPAQ displayed a concurrent validity of r= 0.65. With regards test-retest reliability the GPAQ ranges from r=.83-.96 for short-term reliability and r=.053-.083 for long-term test-retest reliability. (Herrmann, Heumann, Ananian, & Ainsworth, 2013).

Measurement of socioeconomic status. Measurement of socioeconomic status was accomplished using the Childhood Environment and Resources Interview which was developed by the authors of this paper. This measure consists of 15 questions that address parental (or caregiver) income, education and occupation, which are all considered indicators of socioeconomic status. We defined a primary caregiver as an individual who was of greatest influence financially and emotionally. In order to identify primary caregivers (parents, aunts, uncles etc.), the interview starts by asking about the participants "living situation" while growing up. A living situation includes aspects of life such as, parental marital status, who an individual lived with, and number of siblings. Once primary caregiver/ parents are identified the interview proceeds with questions about caregiver occupation, income and achieved education. The interview concludes with questions regarding the influence of socioeconomic on nutritional choices and physical activity. For example, "How was nutrition approached in your childhood household? Did you receive guidance on "healthy eating practices?", or "How often would your parents exercise on average per week?" A total SES score was developed that

comprised of parental/ caregiver income and education. This score was developed by converting scores into one standardized z-score. Additionally, a score was developed for the influence of childhood resources on physical activity and nutrition. These scores were developed by combining the questions geared towards these influences. Higher scores indicated a negative influence or a lack of influence. After combining these variables one score was given to each of the participants for both nutrition and physical activity. Individual variables from the measure were also used to examine relationships between childhood environment and indicators of schizotypy.

Measurements of lifestyle, health and demographics. There was one measure on overall lifestyle behaviors and one measure on basic demographic information.

Lifestyle and habits questionnaire. The lifestyle and habits questionnaire-brief was used to measure subjective views of dependent variables such as physical activity and nutrition in addition to lifestyle habits in regards to an individual's quality of life and stress (LHQ-B; Dinzeo, Thayasivam, & Sledjeski, 2014). The LHQ-B is a self-report questionnaire consisting of 42-questions in eight lifestyle categories. These categories are social concern, psychological health, sense of purpose, physical health and exercise, substance use, nutrition, environmental concern and accident prevention. Each domain consists of statements that are rated on a 5-point Likert scale, from strongly disagree to strongly agree. For example, the Health and Exercise subscale states "I participate in muscle-strengthening exercise at least several times a week". Scoring of the LHQ-B is based on normative data and results are categorized into bottom, middle or top ranges. The eight domains of the LHQ-B have demonstrated an internal consistency ranging from .65-. 91 (Dinzeo, Thayasivam, & Sledjeski 2014). Our analyses specifically focused on

the health and exercise, nutrition, and substance use subscales of the LHQ-B. This measure was used to measure correlations between lifestyle behaviors of interest and levels of schizotypy and as a dependent variable in our regression models. Specifically, we used the Health and Exercise, Nutrition, and Substance Use subscales as dependent variables in our models to gain an understanding of subclinical symptoms predicating poorer lifestyle habits.

Demographic and health questionnaire. A demographic and health questionnaire was given to ask basic demographic questions such as age, gender and racial/ ethnic identity, nicotine use and individual and family mental health history. In order to measure BMI, we asked for height and weight. Additionally, questions about overall health, attitudes towards health and fitness were taken from the Sample Questionnaire: Diabetes (Stanford Patient Education Research Center). Although the sample questionnaire was intended for the use of those with diabetes, the selected questions were deemed general enough to be appropriate for our sample. For example, "How much in the past month, was your health a worry in your life?" (Stanford Education Research Center). The participant then answered the question by filling in a Likert scale of 1-5. The purpose of including these questions is to gain an understanding of our samples perceived outlook on health and fitness. Furthermore, the inclusion of these questions provides subjective data on one's view of their own health. Collecting data on subjective views of personal health was thought to add rich information on the accuracy of one's actual and perceived health.

Measurement of social desirability. The study consisted of one measure of social desirability.

The social desirability scale. A measurement of social desirability was included to assess the accuracy of data collected. Measuring social desirability enables researchers to examine the accuracy of one's response. Social desirability was assessed using *the social-desirability scale* developed by Crowne and Marlow (1960). This self-report 33-item true or false questionnaire asks questions about how likely an individual behaves based off of social desirability. For example, "I never resent being asked to return a favor" or "I am always courteous, even to people who are disagreeable". Scores are interpreted as low (0-8), average (9-19), or high (20-33). A low score indicates behaving in a socially undesirable manner, while an average score signifies following the normal standard for socially desirable behavior and, a high score suggests high levels of social desirability. Subject data was excluded from the study after receiving a score above 19. The social desirability scale has an internal consistency of .88 and a test-retest reliability of .89 (Crowne & Marlowe, 1960).

Procedures

Participants were recruited from an undergraduate *Essentials of Psychology* course using an online system that allows students to participate in a range of potential research studies (i.e., the SONA system) as a part of a course requirement. Students that selected our project based on a brief description, were scheduled to attend a face-to-face meeting with a research assistant. Prior to participation all participants were provided in-depth information about the nature of the study and asked to provide consent for participating. If consent was provided, subjects completed several questionnaires and two interviews, which took approximately 70 minutes (total) to complete. The first activity involved with participation is the Dietary Habits Interview, taking 20-30 minutes to

complete. Interview questions were answered through verbal responses. Immediately after the Dietary Habits Interview, the 24-hour diet recall was administered. During the 24-hour recall participants were instructed to write all of the foods and beverages consumed within the past 24-hours. Following the recall participants answered surveys on Qualtrics.com. Qualtrics.com is a survey website where all self-reported questionnaires were administered. Each survey took no longer than 5-10 minutes to complete. The final activity of participation involved the Childhood Environment and Resources (socioeconomic) Interview. The interview took approximately 10 minutes to complete. Responses were verbally articulated. Time varied due to interview responses. Upon completion, subjects received credit towards their Essentials of psychology course requirement.

Statistical Analysis

This study used a cross-sectional mixed methods design. Basic descriptive statistics were run to describe our sample (i.e. age, gender, and ethnicity). Quantitative measures were attained through surveys given on Qualtrics. Data from interviews contained a mixture of quantitative and qualitative responses. Qualitative responses from our SES interview were transformed into standardized z-scores. This was accomplished by subtracting an individual's score from the group mean and then dividing this number by the standard deviation ($z= [x- M]/SD$). Total SES was computed by summing z-scores from income, mom education, and dad education into one score. Prior to analyses quantitative data was examined for missing data. Data were re-examined to account for the influences of social desirability. This was done by excluding participant data if they had a score higher than 19 on the social desirability questionnaire or endorsed two or

more infrequency items. Infrequency items were taken from the Chapman & Chapman (2002) Infrequency Scale and added to each questionnaire. Endorsing an infrequency item would suggest one was clicking through the questionnaire without thought. To test for potentially confounding variables like age and gender, independent-samples t-tests and chi-square tests were conducted. All item distributions were examined for normality. The internal consistency of our questionnaire items was examined via Cronbach Alpha coefficient. The following section breaks down each hypothesis and lists the statistical analyses and measures used to examine each of our questions.

H_1 Higher overall levels of schizotypy would be associated with lower BMI scores.

- Pearson's Correlations (demographics questionnaire- BMI and Subscales of LHQ-B- Schizotypy and O-LIFE-Schizotypy)
- One-way ANOVA (demographics questionnaire BMI, subscales of SPQ-B-Schizotypy)
- Bonferroni Corrections

H_2 Higher levels of positive and disorganized symptoms would be related to greater nicotine use.

- Pearson's Bivariate Correlations (Nicotine use- demographics questionnaire, SPQ-B- schizotypy, and O-LIFE-schizotypy)

H_3 Higher levels of schizotypy would be predictive of poorer health behaviors involving poorer dietary habits and lower amounts of physical activity.

- Hierarchical multiple regression (LHQ-B-Lifestyle habits, SPQ-B-schizotypy, O-LIFE- schizotypy)

- Bivariate correlations (Dietary Questions- dietary habits, SPQ-B- schizotypy, O-LIFE- schizotypy)
- One-way ANOVA's (24-hour recall- dietary habits, SPQ-B- schizotypy, O-LIFE- schizotypy)
- Bonferroni Corrections

H_4 Higher SES would be predictive of healthier nutritional choices, more physical activity, and less nicotine use while lower SES would be predictive of poorer nutrition, less physical activity and more nicotine use.

- Hierarchical multiple regression (Childhood environment and resources interview- SES, SPQ-B- schizotypy, O-LIFE- schizotypy)
- Bivariate Correlations (GPAQ- physical activity, Childhood environment Questionnaire-SES, SPQ-B- schizotypy, O-LIFE- schizotypy)
- One-way ANOVA (Childhood environment and resources interview- SES, SPQ-B- schizotypy, O-LIFE- schizzotypy)
- Bonferroni Corrections

For all analyses, SPSS 23 (IBM, 2015) and 24 (IBM, 2016) (systems were updated during analyses) were used to analyze data. While several of our general hypotheses are directional, we used a more conservative approach and use two-tailed p-value of .05 to note significance.

Chapter 4

Results

Data distributions were examined for normality (including excessive skew and kurtosis) and the presences of potential outliers. All scores were within normal ranges. Based off of descriptive analysis our sample consisted of 115 undergraduate students (52% female, 47% male, and .9% identified as other). The demographic information of our sample is displayed in Table 1. As displayed in Table 1, 71.3 % of our participants identified as White / Caucasian. No significant gender or ethnicity differences were found in through independent samples t-test or Chi-Square tests. Due to the lack of significant differences our regression models did not account for gender or ethnicity differences. Schizotypy was divided into three groups low, medium, and high. This was accomplished by assessing the frequency of scores and dividing the distribution into three groups. The means scores and Cronbach alphas of our measures are displayed in Table 2.

Table 1

Demographic Information

Variable	*M* (*SD*) or %	Range
Age	19.33 (2.016)	18–35
Female	52.2%	
White/Caucasian	70.7%	
Hispanic/Latino	11.2%	
Black/ African American	11.2%	
Asian/Pacific Islander	5.2%	
Other	0.9%	

Note. $n = 115$.

The mean scores of our measures are displayed in Table 2. With regard to SES scores, total SES and income were normally distributed across the sample. These distributions are displayed in Figures 1 and 2.

Table 2

Mean Scores and Internal Consistency

Variable	*M* (*SD*)	α
SPQ–Total	79.9 (19.7)	
• Cognitive perceptual	26.1 (8.5)	.884
• Disorganized	20.5 (5.9)	.865
• Interpersonal	23.4 (7.2)	.862
sO-LIFE Total	12.1 (6.4)	
• Unusual experiences	3.5 (2.6)	.760
• Cognitive disorganization	4.7 (2.9)	.780
• Introverted anhedonia	1.9 (1.6)	.550
• Impulse nonconformity	1.9 (1.5)	.550
Social desirability	17.1 (5.1)	.781
LHQ–Health and Exercise	19 (5.5)	.874
LHQ–Substance Use	33.9 (5.2)	.822
LHQ–Nutrition	11.2 (2.5)	.560

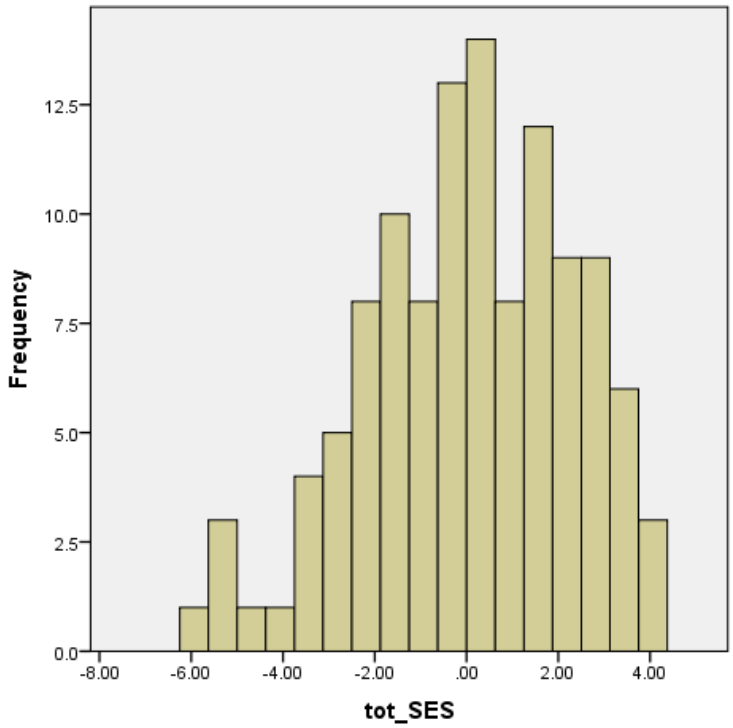

Figure 1. Total SES *z* scores across sample. *M* = 5.46E-5; *SD* = 2.282; *N* = 115.

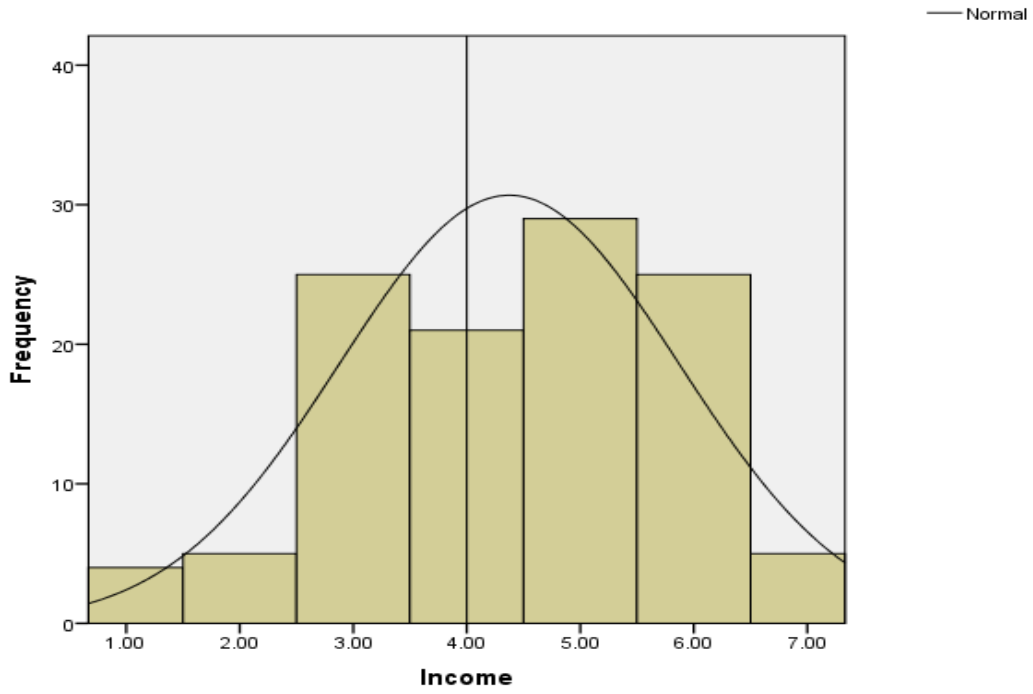

Figure 2. Total household income levels across sample. 1 = 23,000–Below (poverty); 2 = 24,000–32,000; 3 = 32,500–60,000 (lower middle); 4 = 61,000–99,000; 5 = 100,00–149,000 (upper middle); 6 = 150,000–249,000 (5%); 7 = 250,000–Above (1%). *M* = 4.37; *SD* = 1.495; *N* = 115.

Main Findings

With regards to hypothesis one, there were no significant correlations between levels of schizotypy and BMI. Contrary to expectations, the results of our one-way ANOVA suggested a trend (Nonsignificant) between *higher* BMI and increased levels of schizotypy (see Figure. 1). When examining nicotine use and levels of schizotypy for hypothesis two, no significant relationships were found.

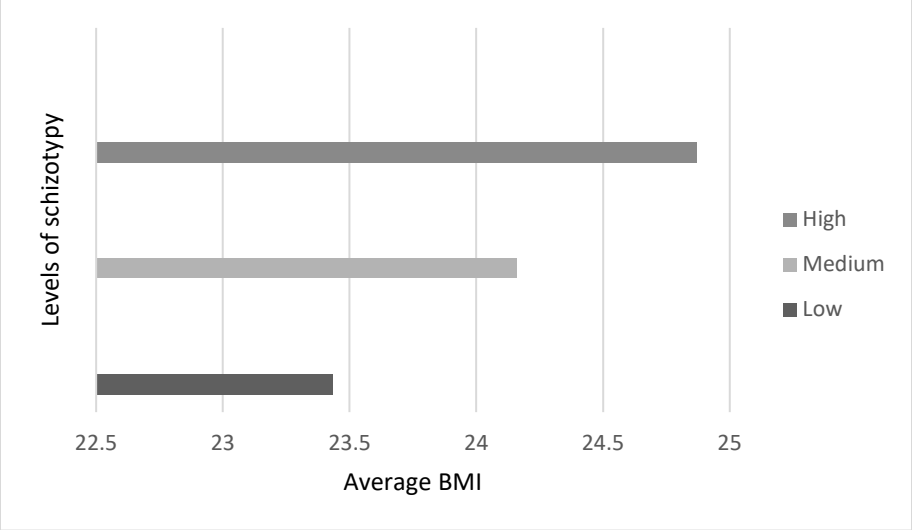

Figure 3. Average BMI across schizotypy.

Table 3

SPQ Predictors of Health and Exercise for Limited Sample

	Model 1			Model 2		
Variable	*B*	*SE B*	β	*B*	*SE B*	β
Total SES	0.301	.228	.123	0.284	.215	.116
Interpersonal				-2.980	.746	-.416*
Cognitive perceptual				1.388	.861	.175
Disorganized				-0.134	.710	-.020
R^2		.015			.152	
F for change in R^2		.189			.001	

Note. $n = 85$.

*$p < .05$.

Table 4

sO-LIFE Predictors of Health and Exercise for Limited Sample

	Model 1			Model 2		
Variable	*B*	*SE B*	β	*B*	*SE B*	β
Total SES	0.301	.228	.123	0.189	.200	.078
Introverted anhedonia				-0.652	.288	-.203*
Cognitive disorganization				-1.061	.190	-.524**
Impulse nonconformity				0.370	.310	.111
Unusual experiences				0.570	.216	.266*
R^2		.015			.276	
F for change in R^2		.189			.000	

Note. $n = 85$.

*$p < .05$. **$p < .01$.

With regards to hypothesis four total SES was not predictive of health behaviors even after accounting for social desirability. However, at a correlational level we found that individuals lacking positive childhood models for engagement in physical activity also reported lower current engagement in exercise (LHQ-B health and exercise; r=-.216, *p*=.047), lower levels of current physical activity (GPAQ; r=-.265, *p=.014),* and greater negative schizotypy symptoms (SPQ-Interpersonal; r=.238, *p=.028*). However, when childhood variables were entered in to a regression our models were not significant.

Table 5

SES Across Levels of Schizotypy

Variable	Total SES *z* score
High schizotypy	0.0724
Medium schizotypy	0.01365
Low schizotypy	-0.2282

Note. Differences not statistically significant. $n = 115$.

Chapter 5

Discussion

The aim of this project was to examine how levels of schizotypy are related to current health behaviors and childhood socioeconomic environment. In this section, we consider the evidence for, and against, our original predictions and weigh in on some of the possible implications of these findings. This discussion will largely be organized by the order of our initial hypotheses.

With regards to the mean scores, our sample on the SPQ-BR measure were relatively high in comparison to normative data (Cohen, Matthews, Najolia, & Brown. 2010, Callaway, Cohen, Mathews, & Dinzeo. 2014). According to Cohen et al., 2010 study, the average means to the SPQ-BR are 17.69 for positive symptoms (cognitive perceptual), 15.40 for negative symptoms (interpersonal), and 15.41 for symptoms of disorganization. The means for these subscales in the current study were 26.2 (cognitive perceptual), 24.6 (interpersonal), and 21.0 (disorganized). One possible explanation for these differences may involve the procedures of the Cohen (2010) and Callaway (2014) studies in comparison the current study. For example, both of the studies (Cohen 2010, & Callaway 2014) were given through an online survey. Although the participants in the current study also completed the SPQ-BR via an online survey software this was done so in a face-to-face meeting with a study staff present which could have influenced our findings. Additionally, another possible explanation for the heightened mean scores of the SPQ-subscales may be involve potential regional differences.

Contrary to our predictions, elevated schizotypy was not associated with lower BMI. In fact, there was some evidence for the opposite relationship between schizotypy

and BMI when taking social desirability into account (i.e., greater negative and disorganized symptoms were marginally associated with greater BMI). While these findings were not anticipated, they actually are quite consistent with the clinical literature where greater symptomology is generally associated with greater rates of obesity. Our participant sample had relatively high SPQ means compared to other college samples. So, there is a possibility that this may have a role in our unexpected finding. From a clinical perspective, it makes sense that individuals experiencing levels of cognitive disorganization could experience deficits in healthy meal planning and preparation leading to unhealthy choices. Additional research seems warranted to further explore the link between factors starting prior to the onset of illness (i.e., subclinical negative and disorganized symptoms) and BMI. If additional research confirms this link, these findings would imply that weight gain is not simply due to the side effects of antipsychotic medications.

With regards to symptoms and nicotine use, we did not find a relationship between levels of positive or disorganized symptoms and smoking. This is surprising considering that this is one of the more consistent relationships reported in the literature. However, only three participants acknowledged smoking. Thus, our sample was significantly below the typical percentage of college student smokers which is approximately 29% (Sutfin, et al. 2012). We believe that students may have under reported smoking, perhaps due to social desirability. This may have been exacerbated by the title of study which included the term *health behaviors* ("factors influencing health behaviors"). Since smoking has gained more of a negative stigma in recent years, students may have not wanted to acknowledge this specific behavior. Alternatively, it

may be possible that the individuals who signed up for this study are those that find health to be an important aspect of their lives which, lead to an influx of non-smokers signing up for the study.

There was some limited support for hypothesis three where increased levels of negative schizotypy (on both the O-LIFE and SPQ measures) were predictive of fewer health and exercise behaviors. These findings are consistent with the clinical literature where negative symptoms are associated with decreased functioning. Students with higher levels of these symptoms may be less likely to engage in activities involving others (i.e. sports, fitness classes, & weight lifting), and a lack of anticipatory pleasure from these experiences. However, no relationship was found between levels of negative schizotypy and patterns of eating or substance use. Similarly, the significant findings were generally limited to the health/exercise behaviors measured by the LHQ and not our other (more direct) measures (i.e. Global Physical Activity Questionnaire). One possible explanation for this may involve an overall lack of knowledge and attention placed towards health behaviors, which could influence individuals to either under or overestimate health behaviors. Finally, the introverted anhedonia subscale of the sO-LIFE had low internal consistency (α= .55) thus, findings related to this subscale should be considered with caution.

However, if subsequent research confirms a connection between negative subclinical symptomatology and health behaviors, this would be a potentially important finding since this would suggest that specialized health plans might be designed to encourage engagement in physical activity even in the presence of negative and disorganized symptoms. For example, if individuals are socially withdrawn they may not

want to attend athletic classes, or join a gym, but may be more inclined to engage in home workout routines such as DVD's or online programs that require no social interactions with others. One possible explanation for the relationship between cognitive disorganization being predictive of poorer scores on the health and exercise subscale of the LHQ-B may be related to difficulties in organizing and scheduling physical activities that require planning and structure. As with negative symptoms, these findings may also imply the importance of developing structured plans that incorporate healthy meal prepping and times for physical fitness activities in an individual's life.

In contrast to our expectations, we found that the unusual experiences subscale of the sO-LIFE (considered a "positive symptom") was predictive of healthier behaviors on the health and exercise subscale of the LHQ-B. These findings may be understood through the nature and influence of positive symptoms which can be associated with greater levels of creativity and pursuit of one's interest in activities (Michalica & Hunt. 2013). Thus, subclinical positive symptoms may enhance one's range of interests, and pursuit of those interests, without decreasing psychosocial functioning (Stouten, Veling, Laan, Helm, Gaag, 2017). For example, within the health and exercise scale of the LHQ-B, participants are asked to endorse participation in exercise such as "dance class" and "playing competitive sports" which involve engagement with others and a sense of creativity. These findings should be taken with consideration, because the positive subscale of the SPQ-BR was not predictive of either healthier or poorer behaviors. This suggests that there may have been particular questions on the sO-LIFE that influenced the scores. For example, "Does a passing thought ever seem so real it frightens you?" or "Do ideas and insights sometimes come to you so fast that you cannot express them all?" are

items on the unusual experience subscale of the sO-LIFE that may be reflective of normal human experiences especially when faced with stressors or in the presence of common diagnoses such as Attention Deficit Hyperactivity disorder.

With regards to our correlational findings that negative symptoms were inversely related to eating salad (r=-.192, p=.05) and the number of times eating out per week (r=-.216, p=.05), we believe that these findings could be explained by the nature of subclinical symptomology as well. For example, negative symptoms represent a diminishment in activity or functioning, often linked to issues such as lowered motivational states or social anxiety. Thus, the correlation between negative symptoms and eating less salad might imply that those at risk for the development of schizophrenia may be less inclined to make healthy food choices which are often *more effortful* (e.g., needing to purchase the components of a salad when eating at home), *less pleasant* (as compared to high sugar/carb/fat food options), and more expensive. This finding may suggest a need towards educating at-risk individuals who display these negative symptoms on the importance of making healthy lifestyle choices despite the effort required, especially if they are ultimately prescribed antipsychotic medications during the course of treatment since these are particularly linked to weight gain.

The inverse relationship between negative symptoms and eating out, at first glance, may appear to be a healthy choice. However, there is also a reason to suspect that this may be reflective of social withdrawal rather than an active effort to avoid restaurants due to nutritional concerns. For example, individuals that score higher on introversion and anhedonia may be less likely to engage in social interactions involving others. These findings imply that additional research is needed to clarify the relationship of health

behaviors and specific manifestations of schizotypy since the directionality of findings may not be fully linear. This nuanced approach may be more effective since it emphasizes that clinicians should place a greater emphasis on daily functioning and specific health goals while taking into account the difficulties associated with specific types of symptoms.

When looking at the relationship between levels of schizotypy and dietary patterns, we found limited evidence. For example, differences between cognitive disorganization and protein scores were the only differences found. However, these results should be taken with caution due to the minimal findings on increased protein use and lower levels of cognitive disorganization. One possible explanation for this finding may involve the level of preparation (i.e. defrosting) and time needed when cooking foods high in protein. Thus, individuals with lower levels of cognitive disorganization may be more inclined to devote time in preparing certain types of foods containing protein.

With regards to the results of our fourth hypothesis, overall SES was not predictive of poorer health behaviors or correlated with current health behaviors in those at risk for developing schizophrenia. However, at a correlational level, we found that income on the childhood environment and resources interview was positively correlated with the health and exercise subscale of the LHQ-B. These findings are congruent with previous findings from Kim & So. (2014) which suggest a relationship between physical activity and socioeconomic status. Although these variables have little to do with our main variables of schizotypy they were deemed necessary to include because they display a link between our main measure of SES and health behaviors. When looking at

childhood influences on physical activity, nutrition, and schizotypy we found correlations between negative symptomology and a negative/ lack of influences on physical activity as a child. These findings are congruent with those from the Raine et al. (2003) study, which suggest early childhood development can influence the expression of sub-clinical symptoms in early adulthood. From a clinical perspective, these results are interesting because they indirectly support the benefits of exercise and good nutrition beginning at a young age. Future research might use longitudinal & experimental approaches to further explore the mental health benefits of incorporating healthy lifestyle choices at both small (i.e. educating parents on healthy family practices), and large levels (i.e. incorporating above the standard health practices in our school systems). Viewed in a different way, these findings may also provide some support for the idea that the negative health choices typically seen at clinical levels may not simply be the result of medication side effects or premorbid lifestyle choices but may be the result of negative influences that started in a period beyond their control.

Limitations

The current study had several limitations that should be addressed. The first limitation involves the cross-sectional design (vs. longitudinal) of the study. Thus, we cannot specifically make statements about how our study variables specifically relate to the development of specific symptomology or long-term health conditions. An additional limitation involves self-reported responses for anthropometric information. Self- reports of height and weight are a limitation because we are unable to ensure accurate results. This is a particular limitation because BMI was a variable in our main hypothesis thus may limit the accuracy of our results. In addition to these limitations, the authors of this

paper developed one of the measures used in this study. As a result, the interview used in this study have no previously reported psychometric properties. Furthermore, we did not use the main measure of this study as previously anticipated. Further limitations involve the demographic characteristics of our sample (i.e., primarily young Caucasian college students). Thus, our findings may not fully generalize to those in the general community.

Future Research

Future research would benefit from expanding the nature and limitations of this study in addition to examining the consistency of our findings. With regards to expanding the study it is believed that future research should use a sample that includes both college and non-college students. This would be beneficial because it may decrease biases within variables such as SES, and cognitive abilities which influence the presence of subclinical symptoms. With regards to limitations that should be addressed it is believed that taking anthropometric measurements on site would be a mechanism for greater accuracy in our samples BMI scores. In addition, it is also believed that the use of technology such as electronic applications that allow for dietary tracking would also increase the accuracy of foods reported by participants. At the start of the study we anticipated the use of smartphone technology. However, shortly after the start of the study the usage of applications such as myfitnesspal.com became difficult because we would have to create separate emails for each participant. This could not be addressed by using the emails of our participants because we were not approved to do so. Thus, in the future having participants sign up for a free account using their own email may address accuracy issues because we would then be able to use these applications as a source of data collected over a period of time rather than longer interviews. With regards to testing for consistency it is

believed that our findings warrant the need for replication and further exploration. For example, due to our findings that negative and disorganized symptoms were predictive of poorer general behaviors but not specific behaviors, it is important to examine if others find this as well or if this was potentially due to the measures used in this study. Finally, it is believed that future research should test for the reliability and validity of the interview developed for this study.

Conclusion

The findings from this study provide some evidence that subclinical levels of disorganized and negative symptoms may be predictive of poorer health behaviors in college-aged students. These findings provide the importance of developing preventative strategies towards poor health behaviors in a clinical setting and educating those with manifest disorder on the significance of upholding health behaviors. In closing this study supports the idea that a great deal of future research is needed in this area.

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Appendix A

Schizophrenia-Spectrum Continuum and Symptomatology

Schizophrenia-spectrum disorders (SSDs) are viewed on a severity continuum. Thus, this continuum involves clinical and subclinical expressions of schizophrenia. On the clinical end, individuals experience significant impairments in daily functioning. These expressions are currently recognized through six diagnoses within the Diagnostic and Statistical Manual of Mental Disorders (APA, 2013). On the subclinical (low) end of the continuum the term *schizotypy* expresses the presence of atypical behaviors, experiences, ad beliefs, that are not clinically impairing, yet believed to indicate greater risk towards the later development of schizophrenia (Meehl, 1962). These subclinical symptoms seen in schizotypy resemble the three main categories of symptoms in schizophrenia- spectrum disorders such as positive symptoms, negative symptoms, and symptoms of disorganization (American Psychiatric Association. 2013). At clinically significant levels, *positive symptoms* include extra sensory (hallucinatory) experiences and delusional beliefs. At the subclinical level, these symptoms would be present in an attenuated form where the individual may have milder, more fleeting, anomalous sensory experiences (e.g., occasionally hearing one's name called when no one is around) or beliefs (e.g., the sense someone is after you) that are considered without total conviction. At the clinical level, *negative symptoms* involve impairments such as diminished reward pursuit (avolition), lack of sensitivity towards pleasure (anhedonia), or dampened emotional expression (flat affect). In schizotypy, milder, negative symptoms involve poor interpersonal relationships and constricted affect. At clinical levels, symptoms of disorganization may resemble jumbled speech or irregular body movements (American

Psychiatric Association. 2013). While at the lower end of the spectrum (subclinical) these would be expressed as “odd” and eccentric behaviors.

Appendix B

Schizotypy and Risk for Schizophrenia

The presence of schizotypy is believed to represent an indication for a latent vulnerability towards schizophrenia, with approximately eight percent of individuals with schizotypy later developing clinical schizophrenia (Van Os, Linscott, Myin-Germeys, Delespaul, & Krabbendam, 2008). Furthermore, having a biological risk towards schizophrenia may translate to an approximately 15-fold increase in risk (Meyer & Weaver, 2007). Thus, gaining a heightened knowledge of potential factors that contribute to the development of schizophrenia in those with schizotypy may lead to a greater understanding in the health behaviors of those with manifest symptomatology (i.e., those diagnosed with schizophrenia).

Appendix C

24-Hour Recall Scoring System

Calories
1= within normal ranges
2=More than recommended (500 calories greater than recommended)
3= significantly more than recommended (1000 calories greater than recommended)
4= Less than recommended (500 calories less than recommended)
5= significantly less than recommended (1000 calories less than recommended)

Sugar
1= equal to recommended value (+/- 4)
2= more than recommended (less than 20grams more)
3=Twice the recommended daily value
4= less than recommended
5= Consumed less than 2 times the daily value

Saturated Fat
1= 5% or less of daily calories in saturated fat
2= 6% or less of daily calories in saturated fat but more than 5%
3= Greater than recommended value

Protein
1= Recommended Value (+/- 20)
2= above recommended
3= below recommended

Carbohydrates
1= within normal ranges (Based off of caloric consumption)
2= More than recommended
3= significantly more than recommended
4= Less than recommended
5= significantly less than recommended

Appendix D

Dietary Habits Interview

The dietary habits interview was developed based on three dietary measures and the schizophrenia literature. These measures include the Eating Habits Questionnaire (Dana Farber Institute), the Dietary Screener Questionnaire (National Cancer Institute, 2009) and the Percentage energy from fat screener (NCI, 2000). Questions inquired about typical dietary choices or those that occurred in the last week.

Typical Dietary Choice Questions

1. How many meals do you typically eat a day?

2. How long after you first wake do you have your first meal?

3. When you go out to eat how often do you finish your entire meal?
    - Always
    - Sometimes
    - Never

4. Do you snack after 8 PM?

5. When eating chicken how often do you keep the skin on?
    - Always
    - Sometimes
    - Never

6. When preparing meals at home, how much of the visible fat do you remove before eating?
    - All of the visible fat
    - Most of the visible fat
    - A small amount of the visible fat
    - None of the visible fat

7. When you go out do you typically ask for modifications in your meals that involve healthier alternatives? For example, asking for a side salad instead of French fries; requesting salad dressing on the side so you can control the amount you use?
    - No
    - Yes

Past Week Questions

1. Over the past week how many times did you eat out?

2. During the past week, how often did you drink regular soda or pop that contains sugar including diet drinks? **Do not include sugar-free items.**

   Circle the frequency that corresponds with response
   0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 + **(Specify)**

3. During the past week, how often did you eat chocolate or any other types of candy? **Do not include sugar-free candy.**

   Circle the frequency that corresponds with response
   0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 + **(Specify)**

4. During the past week, how often did you eat cookies, cake, pie, or brownies? **Do not include sugar-free items.**

   Circle the frequency that corresponds with response
   0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 + **(Specify)**

5. During the past week, how often did you eat pastries such as doughnuts, sweet rolls, Danish muffins, pan dulce (Mexican/ Latin American Pasty) or pop tarts? **Do not include sugar free items.**

   Circle the frequency that corresponds with response
   0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 + **(Specify)**

6. During the past week, how often did you eat fruit? Include fresh, frozen, or canned fruit? **Do not include juices.**

   Circle the frequency that corresponds with response
   0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 + **(Specify)**

7. During the past week, have you eaten any tomato's string beans, broccoli, cabbage, cauliflower, or Brussel sprouts?

   Circle the frequency that corresponds with response
   0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 + **(Specify)**

8. During the past week, how often did you eat green leafy or lettuce salad, with or without vegetables?

   Circle the frequency that corresponds with response
   0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 + **(Specify)**