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Schizotypy as a predictor for social media use and internet addiction behaviors in emerging adults

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SCHIZOTYPY AS A PREDICTOR FOR SOCIAL MEDIA USE AND INTERNET ADDICTION BEHAVIORS IN EMERGING ADULTS

by

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Dedications

I would like to dedicate this thesis to all of those who have provided me with support over the years.

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Abstract

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This study examined the unique domains/symptom clusters within schizotypy as they relate to Facebook use and internet addiction behaviors, while controlling for co-morbid disorders such as depression and anxiety. Using an online survey, this study measured electronic media use, internet addiction behavior, and schizotypy in 270 undergraduate students (aged 18-30). We expected mood symptoms of anxiety and depression to predict both internet addiction and Facebook use in this sample, and controlled for these variables accordingly. We hypothesized that schizotypy would contribute significantly to the prediction of internet addiction and Facebook use above and beyond anxiety, depression, and demographic variables and anticipated that the strongest predictor of internet addiction would be positive schizotypy, followed by negative schizotypy, and lastly disorganized schizotypy. After a model comparison utilizing hierarchical linear regression, schizotypy total scores predicted internet addiction behavior as well as frequency of Facebook use in this sample. However, contrary to our expectations, disorganized schizotypy was found to be the best predictor of internet addiction. The details of these findings are discussed in addition to a call for more research into electronic media use in this population of emerging adults.

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Chapter 1: Introduction

Onset of schizophrenia peaks in the period of late adolescence and early adulthood (American Psychiatric Association, 2013) and research has shown that stress may hasten onset (Gomes & Grace, 2017). Thus, research that includes emerging adults may be ideally suited for the identification of risk factors that contribute to schizophrenia spectrum disorders. Schizotypy, a "latent liability for schizophrenia" (Miller & Lenzenweger, 2012) refers to behavioral and experiential indicators which indicate heightened vulnerability for psychosis. As part of the diathesis-stress model (Fowles, 1992), a genetic vulnerability (diathesis) for mental illness may be activated through exposure to life stressors. Yet, the transition rate to schizophrenia is relatively low - even for individuals displaying prodromal symptoms (i.e., *ultra-high risk*; those already displaying certain clinically relevant symptoms), only 30-40% will ultimately transition to psychosis (Cannon, Cadenhead, Cornblatt, & Woods, 2014; Yung et al., 2003). Therefore, "negative emotions" may be key to understanding why some *at-risk* individuals develop schizophrenia while others do not. However, the mere fact of having clinically significant symptoms, as found in those with ultra-high risk, complicates the study of stress/negative emotion, since the symptoms themselves are often distressing. Therefore, research with non-clinical samples (e.g., college students with a range of subclinical risk indicators) may help reduce this potential confound while still shedding light on stress-symptom relationships.

One important area of research involving the diathesis-stress model examines the role of "daily stressors" or hassles in risk-for-psychosis. This area of research recognizes

that low-level stressors can become detrimental for mental health when they are persistent and overlapping (Norman & Malla, 1994). Additionally, these low level stressors are more common in individuals on the schizophrenia spectrum and are associated with increases in positive prodromal symptomology (Tessner, Mittal, & Walker, 2011). The study of such stressors is crucial to research in ultra-high-risk populations. The emergence of the internet and wide acceptance of social media platforms have clearly impacted popular culture and how we live our day-to-day lives. Given the sweeping nature of these changes, it is surprising that very little is known about how patterns of internet and social media use related to mental health. There is some suggestion that increased internet use patterns may be related to anxiety, depression, and certain clinical traits (Amichai-Hamburger, Wainapel, & Fox, 2002; Correa, Hinsley, & de Zúñiga, 2010; Lin et al., 2016; Muise, Christofides, & Desmarais, 2009; Vannucci, Flannery, & Ohannessian, 2017). However, in the realm of schizophrenia-spectrum disorders, research has primarily focused on describing the patterns and rates of technology use in adults with a clinical diagnosis (Bao & Pincus, 2015; Ben-Zeev, Davis, Kaiser, Krzsos, & Drake, 2013; Torous, 2018; Torous et al., 2014), with very little attention to how patterns of internet use may inform "daily hassles/stress" exposure. Thus, it is important to identify whether electronic media - technology which allows for communication between individuals - serves as a stressor, a protective factor, or both for those with heightened risk for schizophrenia. Furthermore, a better understanding of the relationship between technology use and risk-for-psychosis can help to inform clinical

and educational interventions aimed at improving outcomes during this developmental period of heightened risk.

Chapter 2: Literature Review

Technology Use and Internet Addiction

The emergence of the smartphone, for example, has made it easier to access the internet and social media platforms from almost any location at any point in time. This technology has the potential to assist clinicians with the monitoring of symptoms, and to act as a platform for interventions, to those at-risk for psychosis (Daker-White & Rogers, 2013; Torous & Keshavan, 2016). At the clinical end of the schizophrenia spectrum, several studies have reported that individuals with serious mental illness diagnoses often use electronic media to learn about their diagnosis and to connect with others with similar experiences (Daker-White & Rogers, 2013; Miller, Stewart, Schrimsher, Peeples, & Buckley, 2015). Further, individuals who carry a clinical diagnosis tend to report that the use of electronic media does not exacerbate symptoms (Miller, Stewart, Schrimsher, Peeples, & Buckley, 2015). Despite the positive nature of these findings, there is also evidence for harmful or disruptive use of technology in this population. Research has identified associations between schizotypal symptoms and internet addiction behaviors -- dysfunctional patterns of internet use which cause impairment in social, academic, and professional functioning (Truzoli, Osborne, Romano, & Reed, 2016). In Eastern Asia, internet addiction behavior is so prevalent that clinicians are considering a new clinical diagnosis referred to as “Hikikomori” (Watts, 2002). The symptoms of this diagnosis overlap with those of schizophrenia (specifically negative symptoms) and the two diagnoses are often co-morbid (Stip, Thibault, Beauchamp-Chatel, & Kisely, 2016;

Guglielmucci, Granieri, Munno, Zullo, & Saroldi, 2017). To date, just one study has examined the relationship between specific schizotypy symptoms and internet addiction. This study reported that impulsive non-conformity (lack of regard for social rules) and introverted anhedonia (blunted emotion and asocial tendencies) were associated with internet addiction (Truzoli et al., 2016). In other words, Truzoli et. al. (2016) helped to elucidate such relationships in adults, suggesting that positive and negative symptoms of schizotypal personality are associated with dysfunctional internet use in adults, but use in adolescents is still underrepresented in research.

Technology Use and Mood Disorders

Currently, mood disorders are the most commonly researched mental health domain associated with technology use (Kuss & Lopez-Fernandez, 2016). The DSM-5 cites mood disorders (i.e. anxiety and depression) as being increasingly prevalent in those with schizophrenia (American Psychiatric Association, 2013). Research indicates that adolescent stress contributes to schizophrenia onset (Gomes & Grace, 2017), and that individuals with schizophrenia are at an increased risk for developing co-morbid depression (Samsom, Wong, Wong, & Wong, 2010). Therefore, due to the prevalence of these mood symptoms, research seeking to examine technology use in the schizophrenia-spectrum disorders should attempt to control or isolate the influence of these symptoms from those specific related to schizophrenia. Yet, a comprehensive search of the literature did not yield any existing research that addressed concurrent mood issues in those with schizophrenia spectrum disorders as they relate to technology use. Outside the psychosis-

spectrum literature a number of studies have found that the use of social media may *exacerbate* symptoms of anxiety and depression (Vannucci, et. al, 2017) and that anxiety and depression are associated with *increased* levels of internet addiction (Lin, et. al, 2016; Akin & İskender, 2011). On the other hand, other findings appear to demonstrate benefits to technology and social media use. For example, the use of social media appears to be associated with reduced depressive symptoms in females with high neuroticism (Oberst, et. al, 2017) and may act as a buffer for individuals coping with life changes due to injury or illness (Elliot, et. al, 2013). Thus, electronic media (and by extension, social media) may serve as a double-edged sword where use has the potential to exacerbate existing mental illness, while also helping to connect individuals with mental illness who may feel alone. Given the role of negative emotions within the diathesis stress model (Walker, Mittal, & Tessner, 2008) and in the development of psychotic symptoms (Gomes & Grace, 2017), we believe it is sensible to concurrently consider the influence of mood symptoms in the examination of technology use in schizophrenia.

Technology Use and the Schizophrenia Spectrum

The current literature regarding technology use in the schizophrenia spectrum tends to focus on a clinical adult population, with very few studies examining technology use among adolescents and emerging adults exhibiting behavioral risk for schizophrenia as evidenced by schizotypy. At the individual level, this oversight could be relevant, as there is already literature which has shown associations between mental health

phenomenon that share similarities with cognitive perceptual experiences in schizotypy (Leung, 2013; Locatelli, Kluwe, & Bryant, 2012; Muise et al., 2009) and negative schizotypy (Amichai-Hamburger et al., 2002; Correa et al., 2010). Emerging adults present a unique and valuable research population for this study. These individuals are at the age of peak onset for schizophrenia (American Psychiatric Association, 2013) and utilize technology in their everyday lives. Electronic media has the potential to be both a stressor and a protective factor for at-risk individuals. The same technology which may serve as a protective factor for one individual with schizotypy may be the straw which breaks the camel's back for another individual with schizotypy. Therefore, it is imperative to better understand the nature in which emerging adults, especially those high in schizotypy, are utilizing electronic media. While elucidating relationships between schizotypy and electronic media use is good, better understanding specifics about the nature of this interaction is optimal.

Aims and Hypotheses

The overarching aim of the current study was to specifically examine social media (Facebook) exposure and internet use patterns in those with subclinical schizotypy symptoms while controlling for concurrent mood symptoms (anxiety and depression) which might confound results. This general aim can be separated into two specific components. First, we expected mood symptoms of anxiety and depression to predict both internet addiction and Facebook use in this sample (Akin & İskender, 2011; Lin et.al, 2016). Therefore, we decided to control for these mood symptoms in our statistical

model. Second, we hypothesized that schizotypy would contribute significantly to the prediction of internet addiction and Facebook use above and beyond anxiety, depression, and demographic variables. More specifically, based on the available literature with adult samples, we anticipated that the strongest predictor of internet addiction would be positive schizotypy, followed by negative schizotypy, and lastly disorganized schizotypy.

Chapter 3: Methods

Procedure

This study uses a cross sectional design. Participants completed a forty-five-minute online questionnaire through Qualtrics survey software. The survey explored participants' internet and technology use as well as their depression, anxiety, schizotypy, and well-being (Appendix B).

Participants

Participants were 270 undergraduate students from Rowan University. Participants were recruited over the course of nine months via the Rowan University Psychology Subject Pool system (SONA). Participants were compensated with research credit for their introductory psychology courses. As illustrated in Table 1, participants in the first sample varied in age (18-30), gender (135 women, 135 men), and race/ethnicity (197 White, 26 Black, 16 Hispanic, 13 Mixed Race, 13 Asian, 1 Middle Eastern, 3 Asian Indian, 1 "choose not to disclose").

Measures

Demographics and Health Questionnaire. The demographic and health questionnaire was used to attain demographic information, previous individual or familial mental health diagnoses, nicotine use, height, weight, and general health-related sense of

wellbeing. Items in the questionnaire consist of yes/no and open response and are used to glean a wide range of demographic information about the sample.

Facebook Use Scales. These scales were developed in part by the author and collaborators at Columbia University for an earlier unpublished study examining schizotypy and social media use in high school students. The exact wording was retained in order to eventually compare the high school and college samples in a separate study (not the focus of the current paper). These measures assessed the number of times per week participants use Facebook as well as the duration of their Facebook use on a typical day. The frequency scale consisted of a single item which asked: "On average, how many days a week do you use or look at Facebook (either on a computer or mobile device)?" with responses ranging from "everyday" to "Once every three months or less" and "I have never used Facebook". The quantity (duration) scale consisted of a single item which asked: "On a typical day when you go on Facebook…In total, how much time do you typically spend per day using or looking at Facebook?" with responses for this item ranging from "five minutes" to "over six hours".

Internet Addiction Test (IAT) (Young, 2009). This measure consists of 20 items that assesses mild, moderate, and severe level of internet addiction covering the degree to which individuals' internet use affects their daily routine, social life, productivity, sleeping pattern, and feelings. It uses a 5-point Likert scale anchored in

"never" and "always". The minimum score is 20, and the maximum is 100; the higher the score, the greater dysfunctional internet use. Young (2009) suggests that a score of 20–39 points is an average internet user who has complete control over their usage; a score of 40–69 signifies frequent problems due to internet usage; and a score of 70–100 means that the internet use is causing significant problems. This scale has been shown to have good internal consistency (α= 0.82-0.9) (Jelenchick, Becker, & Moreno, 2012; Widyanto, Griffiths, & Brunsden, 2011; Widyanto & McMurran, 2004) and was shown to be internally reliable in our study (α= 0.923).

Schizotypal Personality Questionnaire - Brief Revised (SPQ-BR; Cohen et al., 2010). This measure was used to measure the construct of schizotypy. This measure is composed of 32 statements that are rated on a Likert-type scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). This measure has three subscales believed to reflect important symptom domains including (1) *Interpersonal* (negative) schizotypy; higher scores reflect discomfort in social situations, difficulty expressing emotions or feeling close to others, (2) *Disorganized* schizotypy*;* higher scores reflect odd speech or eccentric behavior, and (3) *Cognitive-perceptual* (positive) schizotypy; higher scores on this subscale illustrate odd perceptual experiences, magical thinking, and suspicious beliefs. These subscales have good internal consistency (α=.80-.90) with scores from the cognitive-perceptual scale (in particular) differentiating between the relatives of those with schizophrenia vs. those with no family history of schizophrenia (i.e., evidence for

construct validity; Callaway et al., 2014). The SPQ-BR was shown to be internally reliable in our study (α = 0.932).

Generalized Anxiety Disorder 7-item Scale (GAD-7) (Spitzer, Kroenke, Williams, & Lowe, 2006). This 7-item measure assesses symptomology of generalized anxiety disorder. This measure asks participants to report how often in the past 2 weeks they experienced certain symptoms (i.e. "worrying", "restlessness", and "irritability"). The measure uses a 4-point Likert scale anchored in "not at all sure" and "nearly every day". The total score may be categorized into four severity groups: minimal/no anxiety (0–4), mild (5–9), moderate (10–14), or severe (15–21). This scale has been shown to have good internal consistency (α= 0.89-0.92) (Spitzer, Kroenke, Williams, & Löwe, 2006) and was shown to be internally reliable in our study (α= 0.887).

Personal Health Questionnaire Depression Scale (PHQ-8) (Kroenke, Strine, Spritzer, Williams, Berry, & Mokdad, 2009). This 8-item measure assesses depressive symptoms by asking participants to rate how often they experienced certain symptoms (i.e. "feeling down", "hopelessness", and "trouble sleeping") during the past 2 weeks. This measure uses a uses a 4-point Likert scale anchored in "not at all" and "nearly everyday". This scale has been shown to have strong internal consistency (α= 0.80-0.88) (Alpizar, Plunkett, & Whaling, 2017; Pressler et al., 2011) and was shown to be internally reliable in our study (α= 0.850).

Analyses

We began our analyses by obtaining descriptive (means and standard deviations) statistics for demographic variables and internal reliability (Cronbach's α) statistics for all variables while examining the database for missing data, outliers, and points of high leverage or influence. We examined assumptions of normality, independence, and homogeneity. We plotted the univariate distributions of our variables of interest (anxiety and depression symptoms, schizotypy subscales, internet addiction scores). We then created descriptive statistics for all variables, describing the demographic characteristics of the sample as well as the mean and standard deviation of total scores for all measures (Table 1). We also created a table of the bivariate correlations between all of our variables of interest (Table 2) to aid in our general understanding and interpretation of our data/findings.

In order to test our hypotheses, we constructed three hierarchical linear regression models predicting (a) internet addiction, (b) Facebook frequency (how often participants used Facebook), and (c) Facebook quantity (for how long participants used Facebook). For each model, demographic variables were entered in the first step (i.e., gender, age, and ethnicity), scores for anxiety and depression were entered in the second step, and schizotypy scores (i.e., the three subscales scores) were entered in the third and final step. This comparison of nested models allowed us to observe the predictive value of our mood variables (i.e., the second step) as well as the predictive value of schizotypy above-and-beyond all other variables. Further, the use of subscales (vs. the aggregate schizotypy

score) provided information regarding the unique influence of the individual schizotypy facets on our outcome variables through the examination of beta weights.

Chapter 4: Results

Means and standard deviations for all variables in our model are reported in Table 1. Before conducting our analyses, scales were reverse coded as needed and composite scores were calculated for depression, anxiety, internet addiction, Facebook use, total schizotypy, and all three schizotypy subscales. We plotted the univariate distributions (Appendix A) and bivariate relationships of our variables as they related to our outcome variables (Figures 1-3) and created a bivariate correlation table (Table 2). We then conducted three model comparisons using hierarchical linear regression, one regression for each outcome variable. While we found some mixed support for our full model, our specific hypotheses involving the predictive power of positive and negative schizotypy symptoms on Facebook use and internet addiction were not supported.

Table 1

Means and standard deviations for variables of interest summarized and divided by gender

	Male		Female		Overall		T-test	
Variable	M	SD	M	SD	M	SD	t	p
Age	19.540	1.606	18.860	1.009	19.200	1.381	4.176	0.000
Race (% Caucasian)	74%	-	72%	-	73%	-	-0.301	0.763
Depression	5.778	5.051	6.681	5.437	6.230	5.26	-1.415	0.158
Anxiety	6.030	5.399	7.207	5.651	6.619	5.548	-1.751	0.081
Schizotypy Interpersonal	4.261	0.731	4.287	0.772	4.274	0.751	-0.275	0.783
Schizotypy Positive	2.081	0.698	2.253	0.791	2.167	0.750	-1.893	0.059
Schizotypy Disorganized	2.869	0.813	2.778	0.868	2.824	0.841	0.895	0.371
Schizotypy total	3.071	0.640	3.106	0.697	3.088	0.668	-0.432	0.666
Internet Addiction	24.815	14.174	26.519	15.328	25.667	14.759	-0.948	0.344
FB Frequency	6.96	4.705	5.19	4.277	6.08	4.575	3.235	0.010
FB Quantity	8.11	11.388	6.90	9.245	7.50	10.370	0.962	0.337

Table 2

Bivariate Correlations of all dependent and independent variables of interest in the model comparisons examining Facebook use and internet addiction behaviors in a sample of emerging adults.

Variable	SPQ Cog.	SPQ Disorg.	SPQ Total	PHQ Total	GAD Total	Age	FB Use (Freq.)	FB Use (Quant.)	Internet Addiction
SPQ Interpersonal	.592**	.591**	.844**	.492**	.445**	.032	-.30	.086	.330**
SPQ Cognitive		.612**	.853**	.465**	.458**	-.099	-.037	.047	.317**
SPQ Disorganized			.870**	.454**	.397**	.090	-.029	.057	.342**
SPQ Total				.549**	.505**	.013	-.037	.74	.386**
PHQ Total					.748**	-.028	.012	.111	.348**
GAD Total						-.071	.071	.197	.321**
Age							-.179**	-.028	-.113
FB Frequency								.365	-.043
FB Quantity									.050

As expected, mood symptoms were found to be predictive of internet addiction (R^2= 0.139, F(264)= 8.546, p<0.001), Facebook frequency (R^2= 0.108, F(264)= 6.368, p<0.001), and Facebook quantity (R^2= 0.05, F(264)= 2.805, p=0.017) in this sample. Mood symptoms explained a good deal of additional variation in internet addiction compared to demographics alone (R^2 Δ= 0.124), but not for both types of Facebook use (R^2 Δ= 0.009 and R^2 Δ= 0.044, respectively). While our findings that mood symptoms were predictive of our outcome variables echo previous research on these stressors (Akin & İskender, 2011; Lin et al., 2016), our main focus was on the relationship between schizotypy, internet addiction, and Facebook use.

The addition of schizotypy to our model significantly predicted internet addiction behaviors in this sample (p<0.001). The model itself did explain roughly 19% of variation in internet addiction behaviors (R^2= 0.193, F(261)= 7.818, p<0.001) and schizotypy explained a fair amount of additional variation (R^2 Δ= 0.054) in the model. Additionally, disorganized schizotypy (β= 3.150, p<0.023) was the strongest predictor of internet addiction behaviors and contributed a unique variance in the model (partial correlation=0.140), contrary to our hypothesis. This predictive relationship is evident from the regression line in the residual scatterplot of this model comparison (Figure 1).

Table 3

Model summaries for the hierarchical linear regressions exploring variation in internet addiction behaviors and Facebook use in relation to demographic variables (block 1), mood symptoms (block 2), and schizotypy (block 3) for a sample of emerging adults.

Outcome Variable	Model (blocks)	R	R^2	R^2 Δ	SE	F	DF	p
Internet Addiction	1 (Demographics)	0.125	0.016	0.016	14.72526	1.418	266	0.238
	2 (Mood Sx)	0.373	0.139	0.124	13.82196	8.546	264	0.000
	3 (Schizotypy)	0.440	0.193	0.054	13.45807	7.818	261	0.000
FB Frequency	1 (Demographics)	0.314	0.099	0.099	4.367	9.707	266	0.000
	2 (Mood Sx)	0.328	0.108	0.009	4.362	6.368	264	0.000
	3 (Schizotypy)	0.335	0.112	0.004	4.376	4.116	261	0.000
FB Quantity	1 (Demographics)	0.080	0.006	0.006	10.395	0.577	266	0.630
	2 (Mood Sx)	0.225	0.050	0.044	10.201	2.805	264	0.017
	3 (Schizotypy)	0.229	0.052	0.002	10.249	1.804	261	0.077

Table 4

Coefficients, error, confidence interval, and significance (p-value) for a model comparison utilizing a three-tiered hierarchical linear regression exploring variation in internet addiction behaviors in relation to demographic variables, mood symptoms, and schizotypy for a sample of emerging adults.

Variable	β	SE	Standard β	95% CI Lower	95% CI Upper	p
Constant	25.832	13.476	-	-.703	52.367	.056
Age	-1.253	.625	-.117	-2.483	-.022	.046
Gender	.389	1.717	.013	-2.991	3.769	.821

Table 4
(continued)

Race	.220	.592	.021	-.946	1.386	.710
Anxiety	.198	.228	.074	-.251	.648	.386
Depression	.388	.248	.138	-.101	.876	.119
Schizotypy Interpersonal	2.113	1.502	.107	-.844	5.070	.161
Schizotypy Positive	.589	1.574	.030	-2.510	3.688	.709
Schizotypy Disorganized	3.150	1.376	.180	.442	5.859	.023

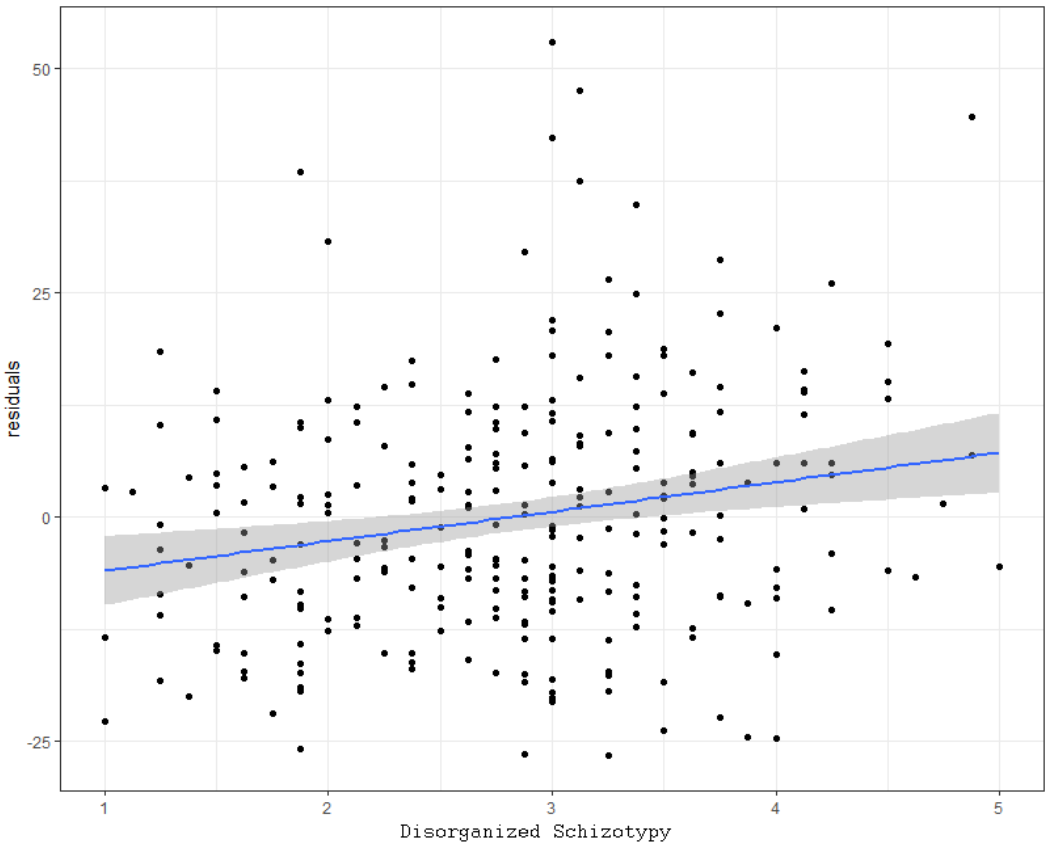

Figure 1. *Scatterplot with a regression line of disorganized schizotypy as it relates to the residual of the three-tiered hierarchical linear regression model examining Internet addiction behaviors in a sample of emerging adults.*

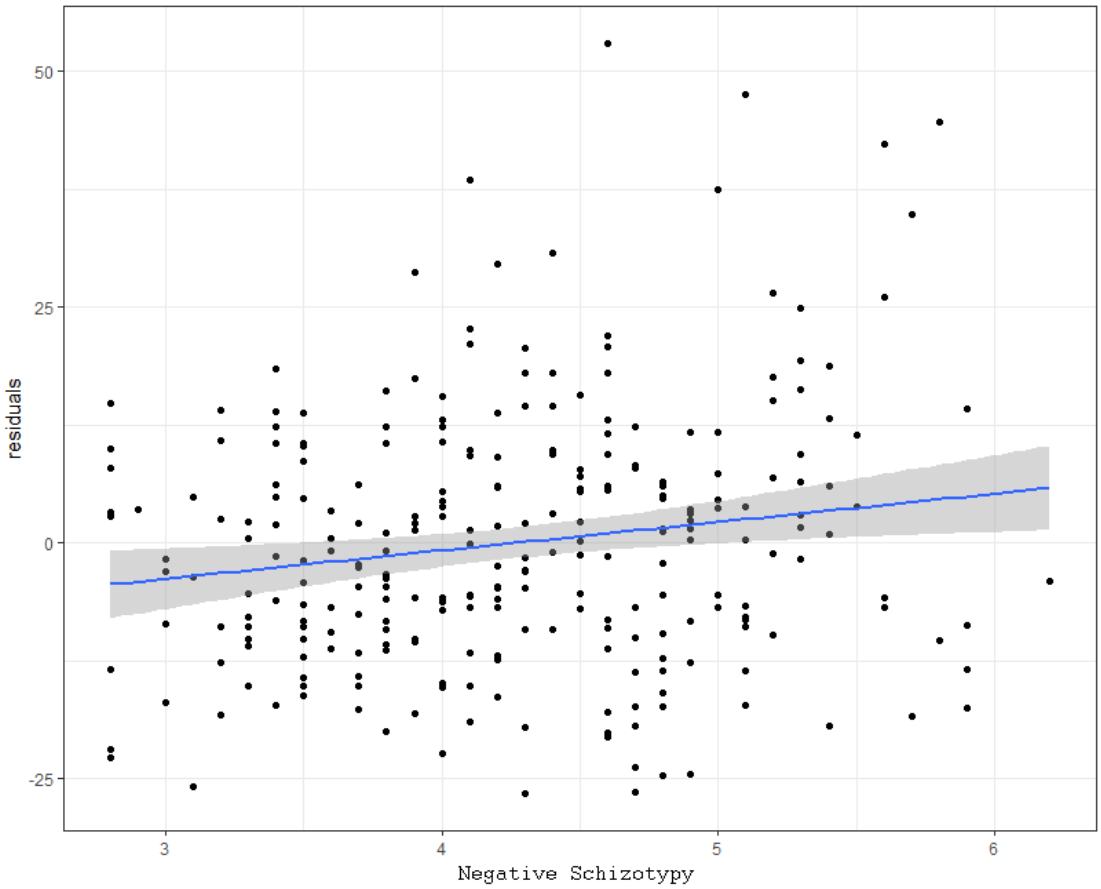

Figure 2. *Scatterplot with a regression line of interpersonal schizotypy as it relates to the residual of the three-tiered hierarchical linear regression model examining Internet addiction behaviors in a sample of emerging adults.*

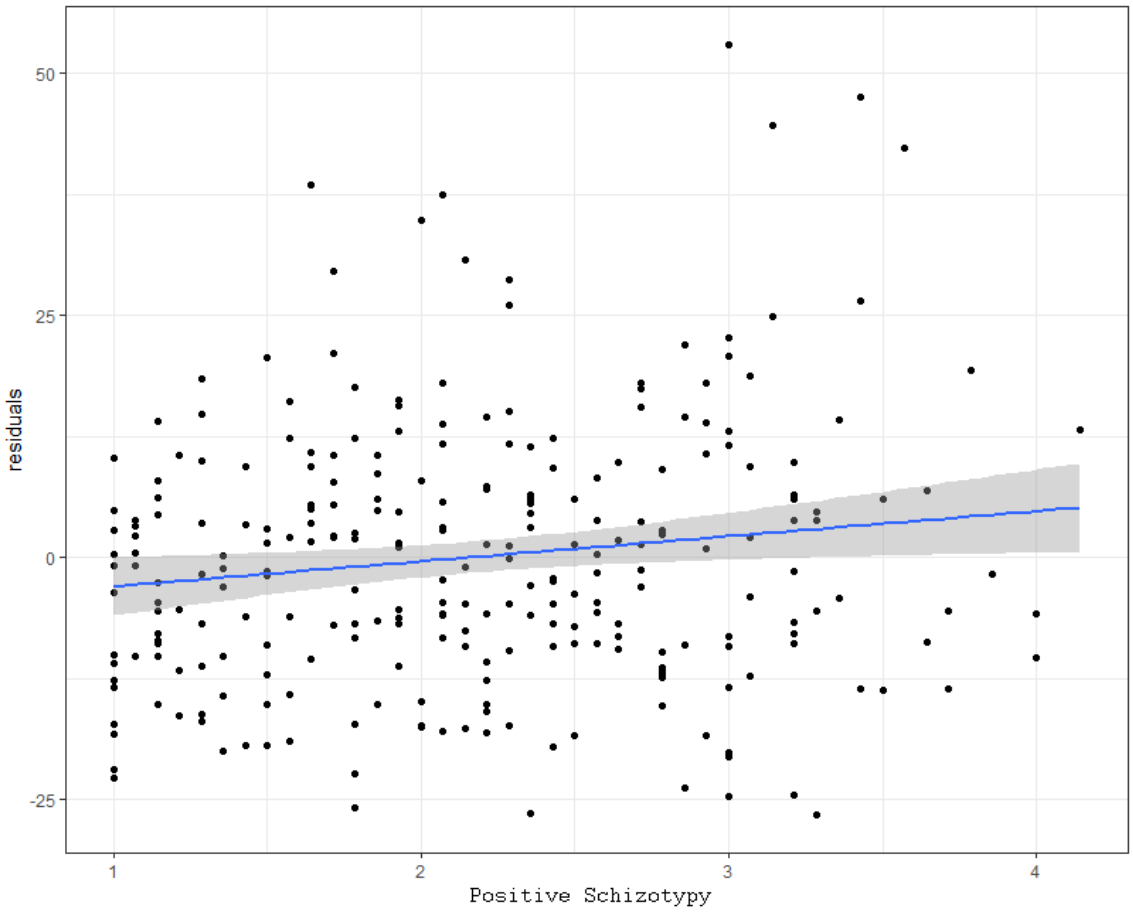

Figure 3. *Scatterplot with a regression line of cognitive perceptual schizotypy as it relates to the residual of the three-tiered hierarchical linear regression model examining Internet addiction behaviors in a sample of emerging adults.*

The addition of schizotypy to our model significantly predicted frequency of Facebook use in this sample ($p<0.001$). However, the model itself did not explain very much of the variation in frequency of Facebook use ($R^2= 0.112$, $F(261)= 4.116$, $p<0.001$) and schizotypy explained very little additional variation ($R^2 \Delta= 0.004$) in the model. While this model may be statistically significant, this does not mean the model was

clinically significant. Additionally, only gender (β= -0.774, $p<0.001$) and age (β= -2.367, $p<0.001$) significantly predicted frequency of Facebook use (R^2=0.099).

The addition of schizotypy to our model did not predict quantity of Facebook use in this sample (p=0.07). Additionally, the model itself did not explain very much of the variation in quantity of Facebook use (R^2= 0.052, F(261)= 1.804, p=0.077) and schizotypy explained very little additional variation (R^2 Δ= 0.002). Further reflections on the reasons behind our findings regarding Facebook use in general can be found in the discussion.

Chapter 5: Discussion

The present study sought to examine the predictive value of schizotypy symptoms on Facebook use and internet addiction while controlling for co-morbid disorders such as depression and anxiety. Using an online survey, we examined Facebook use, mood symptoms, and schizotypy among 270 college students at Rowan University. We hypothesized that greater schizotypy would predict internet addiction behaviors as well as overall Facebook use above-and-beyond the influence of mood symptoms and demographic variables.

Demographic Variables

Analysis of our demographic variables suggested that male participants used Facebook more frequently than female participants. Age was found to be predictive of internet addiction behaviors as well as Facebook frequency of use, with younger participants using Facebook more often and engaging in more internet addiction behaviors. Thus, our data did not reflect the stereotypical expectation that older individuals use Facebook more frequently than younger individuals. One post-hoc explanation may be that Facebook usage is viewed as more "acceptable" by parents since that platform is widely familiar to most adults. Similarly, parents may feel more capable of monitoring their child's activity on this platform (which may make the use of Facebook less appealing to young adults in college who are testing their independence). Consequently, Facebook may be the "family friendly" app that essentially acts as a "Gateway Social Media" into other (more preferred) platforms during college. It would

follow that when these children go to college and gain more autonomy, they branch out in their social media use and use Facebook less. However, this is all conjecture, and for now our focus in future research remains on parsing the complex relationships between electronic media and schizophrenia.

Hypothesis 1: Mood

The current study controlled for levels of anxiety and depression which are often related to dysfunctional internet use (Akin & İskender, 2011; Lin et.al, 2016). However, as a byproduct, we can view the $R^2\Delta$ value as a proxy for how "stress" predicts internet use. This is meaningful in our consideration of the diathesis-stress model of schizophrenia. The $R^2\Delta$ for internet addition indicated that 12.4% of additional variance was predicted by depression and anxiety, with 4.4% in Facebook quantity, and 0.9% in Facebook frequency (each technically achieving statistical significance). Similarly, when examining standard β (Table 6; Appendix A) it appears that Facebook quantity was strongly predicted by levels of anxiety. Thus, while not definitive, these findings provide some evidence that participants' internet behaviors were predicted by one of our "stress" proxy variables (Table 6; Appendix A). Further, it is also possible that these relationships are reciprocal or that increased electronic media (Facebook) use increases anxiety and/or depression in some individuals; however, we do not wish to overstate our findings. Additionally, mood symptoms of anxiety and depression predicted internet addiction behaviors (Table 4). Once again, this is reflective of previous research (Akin & İskender,

2011) and stands as a good base against which we could compare the influence of schizotypy.

Hypothesis 2: Schizotypy

While our analyses illustrate the predictive power of mood symptoms in relation to electronic media, additional variance was predicted by schizotypy above and beyond the influence of mood and demographic variables. Specifically, schizotypy accounted for an additional 5.4% of the variation in predicting internet addiction, highlighting its unique contribution to patterns of online behavior. When considered concurrently with our mood findings, the current findings shed some light on how dysfunctional patterns of technology use may function as a relevant variable within the diathesis stress model of schizophrenia. However, additional research is need to better determine if this relationship reflects attempts to manage stress (i.e., protective qualities) or whether this dysfunctional pattern of use actually exacerbates levels of stress in those with greater symptomatology. Additionally, the data did support schizotypy predicting a statistically significant amount of variation in Facebook frequency of use, but not for Facebook quantity of use. The R^2 for the overall model in frequency of use suggests a small effect size and the amount of additional variation explained by schizotypy alone was minuscule (Table 3). Our findings in this area, while technically statistically significant, were not meaningful in terms of schizotypy. Therefore, we do not want to over-interpret the ecological significance of these findings.

Our subscale level hypotheses that positive and negative schizotypy would predict internet addiction behaviors were not supported by the data, but rather of the three schizotypy subtypes, disorganized schizotypy was found to best predict internet addiction behavior. It should be noted that disorganized schizotypy contributed unique variance to the model as a whole. Our hypotheses reflected a belief that internet addiction behaviors might be related to the specialized beliefs found in individuals displaying positive symptoms (i.e. belief in the supernatural, paranoid ideation or delusions), and that electronic media could potentially act as a "social armor", buffering against interpersonal difficulties of schizotypy and general stressors as evidenced by the clinical literature (Daker-White & Rogers, 2013; Elliot et al., 2013). The fact that neither of these hypotheses were supported by the data suggests there may be an alternative relationship between schizotypy and internet addiction that we had not previously considered. Our finding that disorganized schizotypy is the strongest predictor of internet addiction in this sample may reflect a few things. First, this could reflect differences in schizotypy measurements; as this study utilized the SPQ-BR and the study on which we based our subscale level hypotheses utilized the O-LIFE (Truzoli et al., 2016). These findings could speak to our incorrectly equating Truzoli et al.'s findings on impulsive non-conformity in the O-LIFE with the positive schizotypy subscale in the SPQ-BR. Alternatively, the relationship between internet addiction scores and disorganized schizotypy may elucidate an unanticipated relation between how features of the internet interact with symptoms of schizophrenia. For example, disorganized symptoms can represent difficulty maintaining attention represented by the endorsement of items such as 'I sometimes jump quickly

from one topic to another when speaking'. Thus, this particular disorganized symptomology may also translate to length of time on the internet where what may begin as a five-minute session online turns into fifty minutes, as there are endless ways to jump from topic to topic, resulting in large spans of lost time. While this is conjecture, we did further explore our data to better elucidate this unexpected relationship.

Item Level Analysis

As a part of this exploration we conducted bivariate correlations between item-level scores from the Internet Addiction Scale and scores from the three subtypes of schizotypy (Table 3). We found that levels of disorganized schizotypy were correlated with questions regarding preoccupation with the internet, using the internet to escape real life, impairment in academics and sleep, and socialization. The last correlation is particularly interesting, as it may speak to other research (Daker-White & Rogers, 2013; Elliot et al., 2013) on the potential for electronic media to be used as a protective factor and tool for developing social relationships for those with mental illness. For those individuals with a genetic diathesis towards development of schizophrenia, the presence of social supports can be an instrumental protective factor as well as a resource to gain information and connect with others who have similar experiences (Daker-White & Rogers, 2013). As speculated before, this item level correlation may suggest electronic media offers these individuals who may otherwise isolate themselves socially the confidence and comfort needed to engage socially with peers. Further research is needed to fully elucidate this complex relationship, but this study hopefully will pave the

groundwork for studies which can parse out the intricacies of technology use in this population.

Limitations

Aside from being limited by the nature of a self-report survey and a predominately white sample (73%), our study was limited by our measurement of social media use. We limited our ability to fully examine social media use in our sample, as the distribution of Facebook use (in both frequency and quantity) were bi-modal and zero-loaded. Univariate graphing of these variables (Figures 4 and 5; Appendix A) illustrates the large proportion of participants who do not use Facebook at all, or use Facebook very infrequently. This likely reflects dynamic changes in the usage of specific social media platforms, with our current assessments unable to keep pace. In the future, we will need to utilize a more comprehensive survey of social media use which addresses all social media platforms which may be utilized by our participants as well as different mediums through which they can be accessed.

Conclusions

While the findings of this study were not fully expected, they can still help to illuminate how technology is utilized by individuals with schizotypy. It is our hope that this study will be one of the steps along the path to creating preventative technologies and interventions for individuals with schizotypy and schizophrenia spectrum disorders. It may be possible to utilize the same technologies used in a dysfunctional manner by some

individuals and turn them into protective factors for those at risk for schizophrenia. For those with the diathesis for schizophrenia and stressors in their lives, the ability to control technology and use it to benefit rather than harm these individuals is vastly important. While a significant amount of research is still needed, our ultimate goal is the development and implementation of interventions and preventative platforms which utilize technology. Technology is a part of our lives whether or not we want it to be; we can either choose to bury our heads in the sand and ignore it, or we can get ahead of the ball and find ways to utilize this resource to benefit those with mental illness. This study may be taking a small step towards better understanding the technologies we one day hope to harness, but we believe it is a step in the right direction.

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Appendix

Supplementary Tables

Table A5

Correlations between items in the internet addiction test and subtypes of schizotypy as defined by the SPQ-BR in a sample of emerging adults.

Internet Addiction Test-- Item	**SPQ-BR** *Interpersonal*	**SPQ-BR** *Cognitive*	**SPQ-BR** *Disorganized*
Do you find that you stay online longer than you intended?	0.106	0.121*	0.105
Do you neglect household chores to spend more time online?	0.145*	0.198**	0.197**
Do you prefer the excitement of the Internet to intimacy with your partner?	0.197**	0.217**	0.176**
Do you form new relationships with fellow online users?	0.078	0.167**	0.241**
Do others in your life complain to you about the amount of time you spend online?	0.147*	0.144*	0.191**
Do your grades or schoolwork suffer because of the amount of time you spend online?	0.281**	0.283**	0.289**
Do you check your email before something else that you need to do?	0.179**	0.118	0.125*
Does your job performance or productivity suffer because of the Internet?	0.190**	0.216**	0.204**
Do you become defensive or secretive when anyone asks you what you do online?	0.314**	0.295**	0.276**
Do you block out disturbing thoughts about your life with soothing thoughts of the Internet?	0.289**	0.313**	0.377**
Do you find that you find yourself anticipating when you will go online again?	0.293**	0.227**	0.293**
Do you fear that life without the Internet would be boring, empty or joyless?	0.256**	0.176**	0.216**
Do you snap, yell or act annoyed if someone bothers you while you are online?	0.282**	0.254**	0.189**
Do you lose sleep due to late night log-ins?	0.236**	0.257**	0.309**
Do you feel preoccupied with the Internet when offline, or fantasize about being online?	0.277**	0.254**	0.266**
Do you find yourself saying ‘‘just a few more minutes’’ when online?	0.166**	0.164**	0.205**
Do you try to cut down the amount of time you spend online?	0.041	0.060	0.009
Do you try to hide how long you’ve been online?	0.185**	0.233**	0.177**
Do you choose to spend more time online over going out with others?	0.368**	0.179**	0.297**

Table 5 (continued)

Do you feel depressed, moody or nervous when you are offline, which goes away when you are back online?	0.307**	0.295**	0.283**

*p<0.05, **p<0.01

Table A6

Coefficients, error, confidence interval, and significance (p-value) for a model comparison utilizing a three-tiered hierarchical linear regression exploring variation in Facebook frequency of use in relation to demographic variables, mood symptoms, and schizotypy for a sample of emerging adults.

Variable	β	SE	Standard β	95% CI Lower	95% CI Upper	p
Constant	25.810	4.382	-	17.181	34.438	.000
Age	-.774	.203	-.234	-1.174	-.373	.000
Gender	-2.367	.558	-.259	-3.466	-1.268	.000
Race	-.244	.193	-.075	-.623	.135	.206
Anxiety	.125	.074	.152	-.021	.272	.092
Depression	-.031	.081	-.036	-.190	.128	.701
Schizotypy Interpersonal	-.129	.488	-.021	-1.090	.833	.793
Schizotypy Positive	-.278	.512	-.046	-1.286	.730	.587
Schizotypy Disorganized	-.142	.447	-.026	-1.022	.739	.752

Table A7

Coefficients, error, confidence interval, and significance (p-value) for a model comparison utilizing a three-tiered hierarchical linear regression exploring variation in Facebook Quantity of use in relation to demographic variables, mood symptoms, and schizotypy for a sample of emerging adults.

Variable	β	SE	Standard β	95% CI Lower	95% CI Upper	p
Constant	12.752	10.262	-	-7.455	32.959	.215
Age	-.273	.476	-.036	-1.210	.665	.567
Gender	-1.765	1.307	-.085	-4.338	.809	.178
Race	-.253	.451	-.034	-1.140	.635	.576
Anxiety	.497	.174	.266	.155	.840	.005
Depression	-.140	.189	-.071	-.512	.232	.459
Schizotypy Interpersonal	.606	1.144	.044	-1.646	2.858	.597
Schizotypy Positive	-.664	1.199	-.048	-3.024	1.696	.580
Schizotypy Disorganized	-.180	1.048	-.015	-2.243	1.883	.864

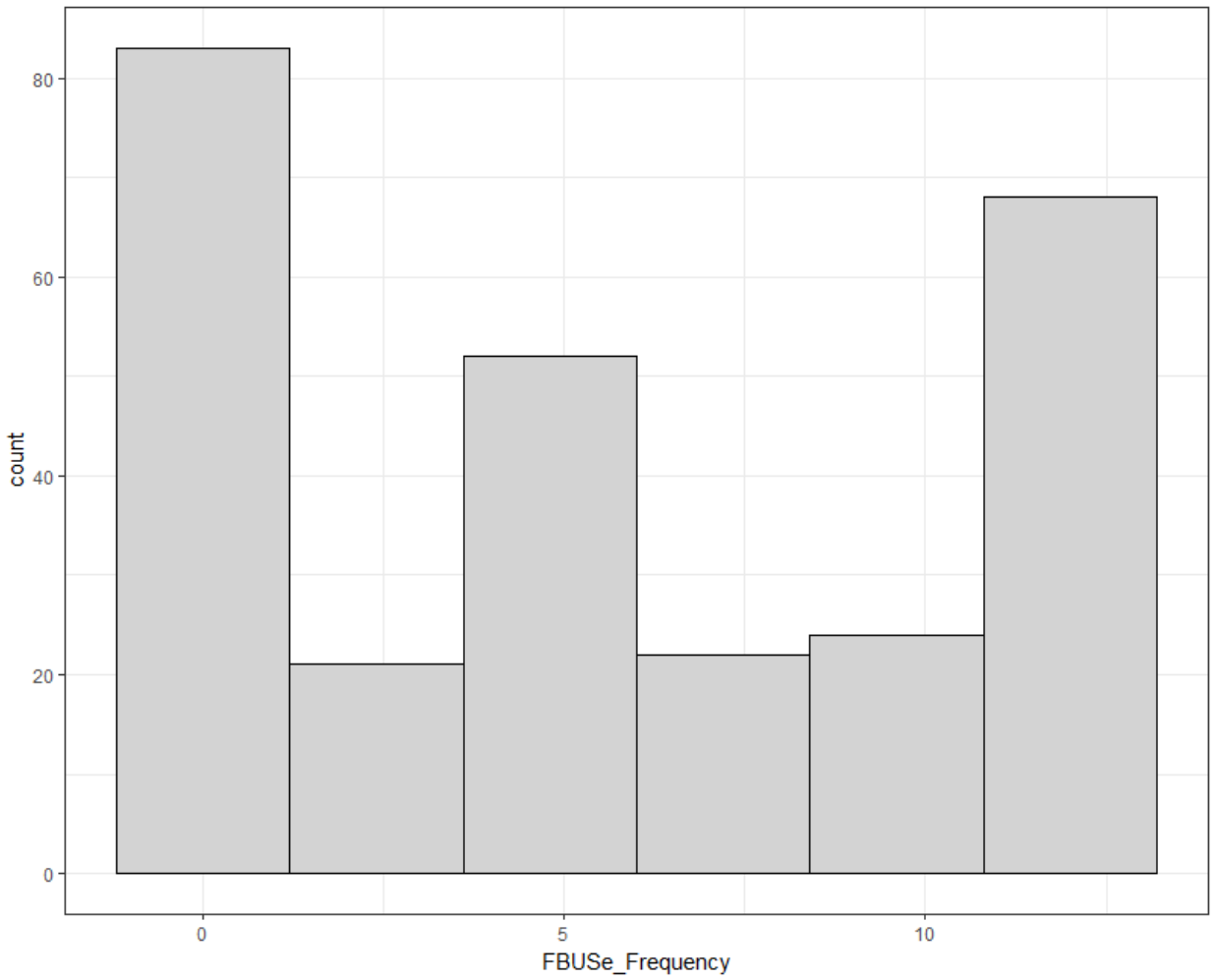

Figure A4. *Univariate distribution of the frequency (times per week) of Facebook use in a sample of emerging adults.*

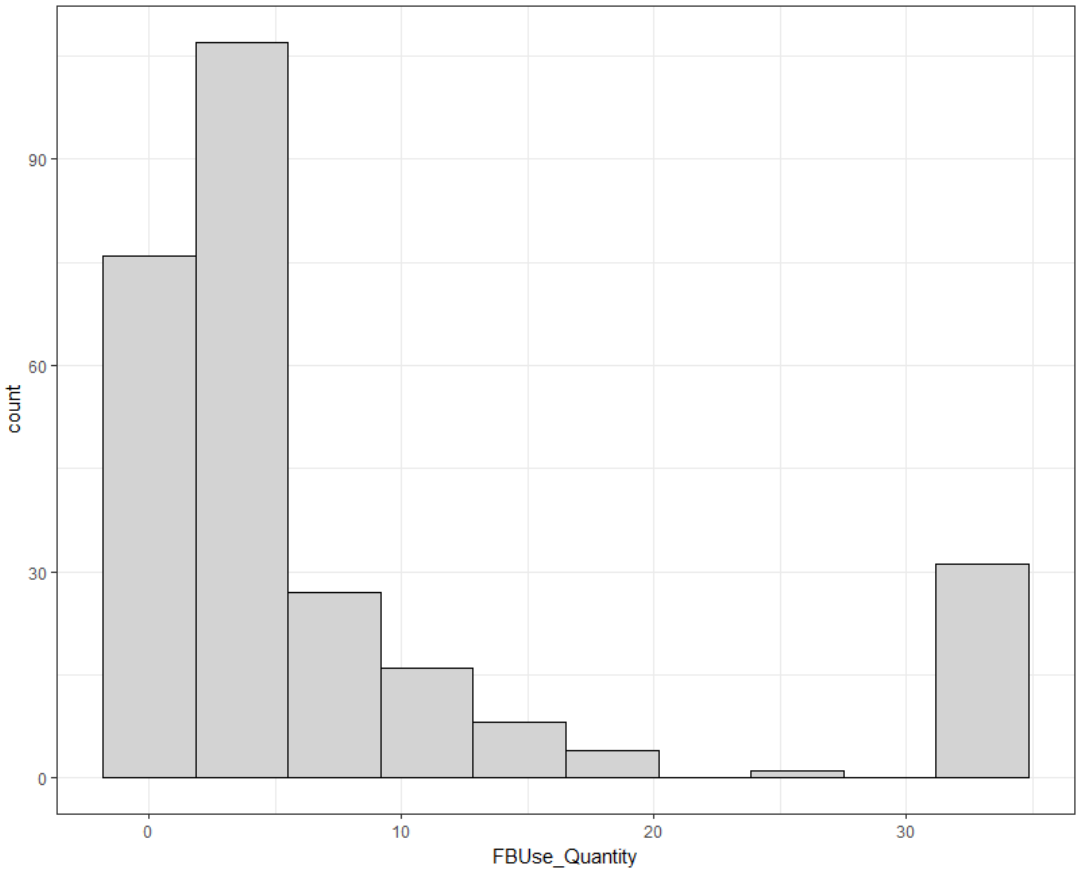

Figure A5. *Univariate distribution of the quantity (minutes per session) of Facebook use in a sample of emerging adults*