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Li, Yanqing

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Differential Emotional Abnormalities Among Schizotypy Clusters

THESIS

submitted in partial satisfaction of the requirements
for the degree of

MASTER OF ARTS

in Social Ecology

by

Yanqing Li

Thesis Committee:
Assistant Professor Elizabeth A. Martin, Chair
Professor Linda J. Levine
Assistant Professor Jenna Riis

2018

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ABSTRACT OF THE THESIS

Differential Emotional Abnormalities Among Schizotypy Clusters

By

Yanqing Li

Master of Arts in Social Ecology

University of California, Irvine, 2018

Assistant Professor Elizabeth A. Martin, Chair

Schizotypy, a multidimensional personality organization that reflects liability to develop schizophrenia-spectrum disorders, has been associated with a number of emotional abnormalities. Yet, the exact nature of any emotional abnormalities in schizotypy is relatively unclear. Using an ethnically diverse nonclinical sample ($N = 2516$), the present study identified homogenous clusters of individuals based on positive and negative schizotypy dimensions and explored three interrelated domains of emotion traits closely tied to functional outcomes and quality of life: affective experience, emotional awareness, and meta-emotions. Consistent with prior research, four schizotypy clusters were obtained: low ("nonschizotypic"), high positive, high negative, and mixed (high positive and high negative). Regarding emotion correlates of schizotypy clusters, the mixed cluster was found to be the most deviant on almost all emotion traits (e.g., heightened trait negative affect, diminished emotional clarity), suggesting that the effects of positive and negative schizotypy are additive. In addition, positive and negative schizotypy clusters were associated with differential abnormalities, with the negative cluster presenting a wider range of, and more severe, impairments compared to the low cluster (e.g., reduced trait positive affect and reduced attention to positive emotion). The current study

highlights the heterogeneity in emotional traits among schizotypy dimensions and the importance of studying the mixed schizotypy in terms of emotional dysfunction.

INTRODUCTION

Schizotypy refers to a personality organization that reflects liability to develop schizophrenia-spectrum disorders and is manifested across a broad range of conditions from individual differences to subclinical and clinical disorders (Kwapil and Barrantes-Vidal, 2012, 2015; Lenzenweger, 2006; Meehl, 1962). Schizotypy is suggested to be a multidimensional construct, with positive schizotypy and negative schizotypy being the most consistently replicated facets (Kwapil et al., 2008). While positive and negative schizotypy facets are associated with distinct etiology and symptom presentation (Siever and Davis, 2004), research suggests that these facets can co-occur at the individual level, which has been associated with greater rate of psychosis development relative to those with positive schizotypy alone (Chapman et al., 1994).

Past research has shown that positive and negative schizotypy are associated with both shared and unique emotional abnormalities (Fung et al., 2017; Martin et al., 2017). For instance, higher levels of positive schizotypy traits and higher levels of negative schizotypy traits are associated with higher trait negative affect. However, only negative schizotypy is associated with lower levels of trait positive affect (Gooding and Tallent, 2003; Horan et al., 2008). In addition, individuals with elevated levels of perceptual aberrations and magical ideation (facets of positive schizotypy) or elevated levels of social anhedonia (a facet of negative schizotypy) both report increased attention to negative emotions. Yet, only individuals with social anhedonia report decreased attention to positive emotions (Martin et al., 2011). Furthermore, positive and negative schizotypy is associated with decreased emotional clarity, but only negative schizotypy is associated with decreased affect intensity (Kerns, 2005, 2006). These results suggest that positive and negative schizotypy are associated with differential emotion abnormalities, with

individuals with negative schizotypy showing a wider range of abnormalities in both positive and negative emotion processing.

The majority of previous studies examining schizotypy traits and emotional impairments relied on correlational methodology, such that schizotypy traits (e.g., positive traits, negative traits) were correlated with or regressed on emotion facets (e.g., Berenbaum et al., 2006; Cohen and Davis, 2009; Kerns, 2006). Another common method of examining emotional dysfunction is using the extreme-group approach (Preacher et al., 2005), in which individuals are grouped on the basis of extreme scoring on positive or negative traits. Those high on both traits are often either excluded or categorized in the group based on their highest score (Kerns et al., 2008; Martin et al., 2011, 2012). Although certainly informative, studies using these methods do not capture nuances of emotion dysfunction for individuals who score high on both positive and negative schizotypy traits. Because positive and negative traits show unique emotional abnormalities, individuals who are high scoring in one trait could show different abnormalities than those high in both traits. Thus, an alternative method is needed to elucidate emotional abnormalities in people who score high on both traits.

Cluster analysis is one method able to take into account high scoring on both positive and negative traits. Previous cluster analytic investigations have consistently found clusters of individuals who were 1) low on both traits (i.e., low group), 2) high on one or the other trait (i.e., high positive group or high negative group), and 3) high on both positive and negative traits (i.e., mixed group; Barrantes-Vidal et al., 2003, 2010; Raynal et al., 2016; Suhr and Spitznagel, 2001a, 2001b; Wang et al., 2012). Testing for differences in emotion facets between the clusters could allow nuances regarding emotional dysfunction to emerge. Thus, the current study

employed this method to clarify the relationships between emotional dysfunction and specific schizotypy groupings.

Previous cluster analytic studies have examined symptom, personality, neurocognitive, and various functioning correlates of schizotypy clusters. Overall, the mixed schizotypy cluster has been found to be the most deviant on almost all measures compared to the other three clusters. For example, the mixed cluster has been associated with the greatest neurocognitive impairment (Barrantes-Vidal et al., 2003; Hori et al., 2014; Wang et al., 2012), worst social adjustment (Barrantes-Vidal et al., 2010), and lowest level of well-being (Tabak and Weisman de Mamani, 2013). At the same time, positive and negative schizotypy clusters were found to exhibit differential patterns of abnormalities generally consistent with studies using correlational and extreme-groups methods. For example, Barrantes-Vidal and colleagues (2010) reported that the negative cluster was associated with impairment in social and leisure settings, whereas impairment in the positive cluster was in academic activities and family relations. Others have reported that the negative, but not positive, cluster had marked neurocognitive (Suhr and Spitznagel, 2001b) and well-being deficits relative to the low cluster (Tabak and Weisman de Mamani, 2013). Interestingly, the positive cluster has been associated with similar performance to the low cluster on neurocognitive tasks (Hori et al., 2014; Suhr and Spitznagel, 2001b) and comparable levels of subjective health and well-being (Tabak and Weisman de Mamani, 2013).

Despite the facts that emotional abnormalities in schizotypy are widely reported (e.g., Gooding and Pflum, 2014; Martin et al., 2011), and these emotional abnormalities adversely impact functioning and outcomes (e.g., Horan et al., 2007), much is unknown regarding how these clusters compare on emotion traits. In the single previous study that examined emotional correlates of schizotypy clusters, Wang and colleagues (2012) reported that both negative and

mixed clusters were equally lower in pleasure experience compared to the low and positive clusters. However, given that emotion traits are multifaceted with important distinctions between the positive and negative valence systems (Larsen and McGraw, 2011) as well as between stages of emotion-generative process (Gross, 2013), it is still unclear whether the aforementioned pattern of findings translates to other emotion traits. Thus, the current study investigated cluster differences in two core emotional abnormalities in schizotypy, namely affective experience (i.e., trait positive and negative affect) and emotional awareness (i.e., emotional clarity and attention to emotion). Given that the mixed cluster was found to have the greatest abnormalities in psychopathology, neurocognitive, and functioning domains, which have been linked to various emotional phenomena (e.g., Cohen et al., 2015; Ochsner et al., 2012), we expected that the mixed cluster would be associated with the greatest impairment in these two emotion traits. At the same time, based on the findings from previous studies using correlational and extreme-groups methods, we expected that both positive and negative clusters would be associated with abnormalities in emotional clarity and the experience of and attention to negative emotions, while the negative cluster would be additionally associated with deficits in the experience of and attention to positive emotions.

In addition, it is unknown if abnormalities are also present in other higher-order emotion traits, such as meta-emotion and ideal affect. Similar to emotional awareness, which describes cognitions toward one's emotion (e.g., attention and clarity), meta-emotion describes the emotional reactions toward one's emotion, either negative (e.g., anger and shame) or positive (e.g., compassion and interest; Mitmansgruber et al., 2009). Meta-emotion reflects an evaluative process of one's emotion and thereby serving an important regulatory role, either automatic or controlled. In a similar vein, ideal affect describes one's goal and appraisal of emotions, which

has strong influence in the controlled regulatory process (Tsai, 2007). Previous research suggested that meta-level of emotion processing was closely related to the direct experience of emotion (Mayer and Gaschke, 1988), and these processes are important for one's psychological well-being and health-related behaviors (Mitmansgruber et al., 2009; Sims and Tsai, 2015). Thus, the current research also explored the relationship between these two emotion traits with schizotypy clusters. Due to the close ties between meta-level of emotion processing and affective experience, we also expected the mixed cluster to display the greatest impairment in these two emotion traits. Similarly, we expected that both positive and negative clusters would be associated with abnormalities in the meta-level processing of negative emotions, while the negative cluster would be additionally associated with deficits in the meta-level processing of positive emotions.

Methods

Participants

A total of 3362 undergraduate students from a West coast, public university started the online surveys. Of these, 173 individuals were excluded because they did not complete the Wisconsin Schizotypy Scales. In addition, following previous research (e.g., Barrantes-Vidal et al., 2010; Chmielewski et al., 1995; Kwapil et al., 2018; Martin et al., 2011), 673 participants were excluded because they endorsed 3 or more items on the Chapman Infrequency Scale (Chapman and Chapman, 1983), which measures careless or invalid responses. The final derivation sample included in the analyses consisted of 2516 participants (mean age = 20.60, $SD = 3.34$; see Table 1 for demographic characteristics).

Materials

Wisconsin schizotypy scales. All participants completed the brief versions of the Wisconsin Schizotypy Scales (WSS; Winterstein et al., 2011): the 15-item Brief Revised Social Anhedonia Scale ($\alpha = .75$), the 15-item Brief Perceptual Aberration Scale ($\alpha = .82$), and the 15-item Brief Magical Ideation Scale ($\alpha = .75$). Compared to the full versions of these scales (Chapman et al., 1978; Eckblad et al., 1982; Eckblad and Chapman, 1983), these brief versions have been found to have superior psychometric properties when used with non-White participants (Cicero et al., 2017).

Affective experience. Trait levels of affective experience were measured with the Positive Affect and Negative Affect Schedule (PANAS; Watson et al., 1988). The PANAS consists of 10 positive and 10 negative affective words (α s for both PA and NA = .89), to which participants rated the extent they generally feel using a 5-point scale (1 = very slightly or not at all; 5 = extremely).

Emotional awareness. Emotional awareness was assessed using the Trait Meta-Mood Scale (TMMS; Salovey et al., 1995). The 13-item Attention subscale assesses the degree to which individuals notice and think about their feelings ($\alpha = .82$). The 11-item Clarity subscale assesses the degree to which individuals report being able to understand and discriminate among their feelings ($\alpha = .88$). Participants rated each item on a 5-point scale (1 = strongly agree; 5 = strongly disagree). Participants also completed the 16-item Following Affective States Test (FAST; Gasper and Bramesfeld, 2006) to measure attention to positive and negative emotions separately. The FAST is comprised of four subscales: Focus on Positive Feelings, Ignore Positive Feelings, Focus on Negative Feelings, and Ignore Negative Feelings (α s ranged from .66 to .73). As in previous research (Martin et al., 2011), a composite score of “attention to positive emotion” was calculated by subtracting the standardized scores from the Ignore Positive subscale from the Focus on Positive subscale; a composite score of “attention to negative emotion” was calculated by subtracting the standardized scores from the Ignore Negative subscale from the Focus on Negative subscale.

Meta-Emotions. Meta-emotion was assessed by the 28-item Meta Emotion Scale (MES; Mitmansgruber et al., 2009), which is comprised of items that represent positive ($\alpha = .77$) and negative meta-emotions ($\alpha = .90$). Participants rated how true each statement was for them generally using a 6-point scale (1 = not at all true for me; 6 = completely true for me).

Ideal affect was measured with a questionnaire developed by Eid and Diener (2001). The questionnaire consists of 4 positive ($\alpha = .64$) and 4 negative affective words ($\alpha = .89$). Participants indicated how appropriate or desirable it is to experience each emotion using a 7-point scale (1 = Extremely undesirable and inappropriate; 7 = Extremely desirable and appropriate).

Procedure

The full sample in this study was formed by three different studies. In each study, participants completed a series of questionnaires administered through Qualtrics (Qualtrics, Provo, UT) after giving informed consent. As shown in Table 1, all participants completed the WSS and the FAST ($N = 2516$). Studies 1 and 2 included the TMMS, forming subsample 1 ($n = 1610$). In addition, Study 1 included the PANAS and Study 2 included the MES and ideal affect questionnaire, forming subsample 2 ($n = 874$) and subsample 3 ($n = 736$), respectively. Demographic characteristics in the subsamples were comparable to the full sample.

Statistical Analyses¹

Preliminary analyses. To test for potential covariates, we conducted a series of preliminary analyses assessing whether age, gender, and ethnicity were related to our dependent variables. As shown in Table 3, any variable that was significantly related to the dependent variables under the Bonferroni-corrected alpha level ($\alpha = .05/10 = .005$) was included as a covariate in the analysis (see supplementary material for detailed results of demographic variables).

Cluster analysis. Following Barrantes-Vidal et al. (2010), we first conducted a principal components analysis (PCA) on the three Wisconsin Schizotypy Scales using a promax rotation. The resulting positive and negative schizotypy factors accounted for 86.17% of the total variance. We then performed a K -means iterative cluster analysis on the two factors given its advantage over hierarchical agglomerative methods in handling larger data sets (Aldenderfer and

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¹ All analyses were conducted in RStudio, version 1.1.423 (RStudio Team, Boston, MA). Principal components analysis was performed using the psych package (Revelle, 2017) and cluster analysis was performed using the stats package (R Core Team, 2017).

Blashfield, 1984). We forced a four-cluster solution based on the results of prior cluster analytic studies (Barrantes-Vidal et al., 2003, 2010; Suhr and Spitznagel, 2001a, 2001b).

Comparisons of clusters on emotion traits. After deriving clusters, we computed one-way ANOVAs and, if there were relevant covariates, ANCOVAs to compare the four clusters on various emotion traits. Significant comparisons were followed up with post-hoc analyses using Tukey's HSD.²

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² Effect size estimate was calculated for each analysis of variance comparison and post-hoc analysis. Consistent with standard practice, eta-squared (η^2) and partial eta-squared (η^2_p) was reported for one-way ANOVAs and ANCOVAs, respectively, and Cohen's d was reported for comparisons of two means. Following conventions, a (partial) eta-squared value of .01, .06, and .14 represents small, medium, and large effect size, respectively; a Cohen's d value of 0.2, 0.5, and 0.8 represents small, medium, and large effect size, respectively (Cohen, 1988).

Results

Cluster Analysis

Consistent with prior studies (e.g., Barrantes-Vidal et al., 2003, 2010), we obtained four clusters: positive schizotypy ($n = 520$), negative schizotypy ($n = 525$), mixed schizotypy ($n = 182$), and low schizotypy ($n = 1289$). A multivariate analysis of variance (MANOVA) was performed to test the discriminant validity of the clusters, using schizotypy clusters as independent variable and the two PCA-derived positive and negative schizotypy factors as dependent variables. Results showed significant differences among clusters (Wilk's $\lambda = 0.089$, $p < .001$), with only 8.9% of the variance left unexplained. Regarding the positive factor score, we found a significant and large effect of cluster assignment, $F(3, 2512) = 2753$, $p < .001$, $\eta^2 = .77$. Post-hoc analyses showed that mixed > positive > negative > low cluster for the positive factor. We also found a significant and large effect of cluster assignment regarding the negative factor score, $F(3, 2512) = 1495$, $p < .001$, $\eta^2 = .64$. Post-hoc analyses showed that negative > mixed > positive > low cluster for the negative factor. This pattern was also observed for the three subsamples, indicating that the samples were comparable in cluster composition (see Table 2). Information about the demographic characteristics of the clusters can be found in the supplementary material.

Comparison of Clusters on Emotion Traits

The results for emotion traits are shown in Table 3 (descriptive statistics, F statistics, effect sizes, and relevant covariates) and Table 4 (post-hoc p values and effect sizes).

Affective experience. Overall, as can be seen in Table 4, compared to the low cluster, the positive, negative, and mixed clusters displayed increased trait negative affect, with the size of these effects being very large in magnitude for the mixed cluster, followed by a large effect for

the negative cluster, and small effect for the positive cluster. In contrast, for trait positive affect, only the negative cluster displayed decreased trait positive affect relative to the low cluster, and the size of the effect was medium in magnitude.

Emotional awareness. Overall, compared to the low cluster, the positive, negative, and mixed clusters displayed reduced emotional clarity, with the size of these effects being large in magnitude for the mixed cluster, followed by a medium effect for both the positive and negative clusters. Regarding attention to emotion, only negative and mixed clusters displayed impairments compared to the low cluster, showing a small increase in attention to negative emotions yet moderately decreased attention to positive emotions.

Meta-Emotions. Overall, compared to the low cluster, the positive, negative, and mixed clusters displayed increased negative meta-emotion. Again, the size of these effects was very large in magnitude for the mixed cluster, followed by a medium effect for both the positive and negative clusters. In contrast, the three clusters were comparable to the low cluster in negative ideal affect. At the same time, the positive cluster displayed increased positive meta-emotion, with this effect being small in magnitude, while the negative cluster displayed decreased positive ideal affect compared to the low cluster, with this effect being medium in magnitude.

Discussion and Conclusion

Using a large, ethnically diverse sample, this study is the first to systematically examine emotion traits among schizotypy clusters characterized by low, high positive, high negative, and mixed schizotypy. Overall, we found that mixed schizotypy presentation was associated with the greatest emotional abnormalities (e.g., decreased emotional clarity, increased trait NA), indicating that positive and negative schizotypy have an additive, impairing effect. At the same time, positive and negative schizotypy were associated with unique emotional abnormalities, with negative schizotypy showing a wider range of abnormalities while positive schizotypy showed fewer, and less severe, impairments in emotion traits.

Mixed Schizotypy Cluster Had the Greatest Emotional Impairments

That the mixed schizotypy cluster exhibited the most deviant outcomes supports the notion that positive and negative schizotypy wield an additive effect on emotion traits. Specifically, the mixed cluster was characterized by the most severe abnormalities in trait NA, emotional clarity, attention to emotion, and negative meta-emotion. This is consistent with prior research showing the mixed cluster reporting the greatest impairments in psychopathology, neurocognitive, and various functioning domains (Barrantes-Vidal et al., 2003, 2010; Hori et al., 2014; Raynal et al., 2016; Tabak and Weisman de Mamani, 2013; Wang et al., 2012). Further, our results are in line with Chapman and colleagues (1994), who reported that individuals with a mixed profile had a higher rate of psychosis than those with high positive schizotypy alone at ten-year follow-up. They interpreted these findings as negative symptoms (e.g., social withdrawal) preventing high positive schizotypy individuals from obtaining emotional support and validity checks from trusted others, thereby contributing to a heightened rate of decompensation. Similarly, a lack of emotional support and validity checks likely results in

exacerbated emotional symptoms and elevated confusion about emotional experiences observed in the mixed cluster. Last, the overall finding is consistent with previous work in schizophrenia that has shown that individuals with high levels of positive and negative symptoms have the worst functional outcomes (Pogue-Geile and Harrow, 1985; Rabinowitz et al., 2013).

At the same time, the mixed cluster had a trait PA level in between that of the negative and positive clusters. This is consistent with research showing negative schizotypy is associated with decreased PA while positive schizotypy is associated with similar levels of PA compared to control participants (e.g., Kerns, 2005; Martin et al., 2011, 2018). This is also somewhat consistent with a previous cluster analytic study that reported the mixed cluster had an intermediate level of openness to experience (Barrantes-Vidal et al., 2010), which is correlated with trait PA (e.g., $r = .5$; Işık and Üzbe, 2015), compared to a positive and negative cluster. Overall, while it still appears worthwhile to create "pure" schizotypy groups (i.e., a high positive and a high negative group) in order to understand unique abnormalities and treatment targets, findings from the current study suggest it is important for future studies to identify individuals with a mixed schizotypy presentation in order to more fully uncover abnormalities.

Negative Schizotypy Cluster Had Slightly Less Emotional Impairment Compared to the Mixed Cluster

As predicted, the negative schizotypy cluster was associated with wide-ranging and severe emotional abnormalities but generally to a lesser degree than the mixed cluster. With respect to affective experience and emotional awareness, the negative cluster was characterized by increased trait NA and attention to negative emotion, decreased trait PA and attention to positive emotion, and decreased emotional clarity, with the size of above abnormalities compared to the low cluster generally within the moderate to large range. This pattern of

abnormalities is consistent with prior research using correlational and extreme-groups methods (Fung et al., 2017; Horan et al., 2008; Martin et al., 2011, 2016).

With respect to meta-level of emotion traits, the negative cluster reported moderately greater negative meta-emotion while they did not differ from the low cluster in negative ideal affect. This finding, taken together with the finding of elevated trait NA, suggests that despite negative schizotypy individuals believe negative emotions to be neither desirable nor appropriate, they fail to effectively down-regulate negative emotions, possibly due to an impaired cognitive control of emotions (e.g., Hooker et al., 2014; Martin et al., 2012). This emotional reaction could, in turn, elicit further aversive reaction and evaluation, thereby forming a vicious cycle. On the other hand, the negative cluster reported moderately reduced positive ideal affect compared to the low cluster. This finding has implications for reduced trait PA, suggesting that negative schizotypy individuals might be intentionally avoiding positive-emotion-provoking situations or dampening preexisting positive emotions. At the same time, such evaluation of positive emotions places them at odds with healthy individuals, which might additionally explain why negative schizotypy is associated with social impairments (Barrantes-Vidal et al., 2010; Suhr and Spitznagel, 2001b). Future research could examine whether meta-level processing of positive emotions (e.g., beliefs about positive emotions) contributes to reduced PA and social impairment in negative schizotypy individuals, and potentially whether increasing favorable beliefs towards positive emotions ameliorates such deficits.

Positive Schizotypy Cluster Had the Least Emotional Impairments

To a lesser degree, the positive schizotypy cluster displayed similar abnormalities as the negative cluster in some emotion traits, while also exhibiting unique abnormalities in others. Similar to the negative cluster, the positive cluster was characterized by increased trait NA and

decreased emotional clarity compared to the low cluster, with the size of these abnormalities within the small to moderate range. These findings are largely consistent with prior studies (Horan et al., 2008; Kerns, 2005). Similar to the negative and mixed clusters, the positive cluster displayed moderately elevated negative meta-emotion. Thus, such negative emotional reactions and evaluations toward one's emotion highlight the ubiquitous emotional non-acceptance among individuals with schizotypy. Emotional non-acceptance has been linked to various forms of psychopathology, particularly depression and anxiety (Aldao et al., 2010). While research on emotional (non)acceptance in schizophrenia has been scant, several studies have shown that non-acceptance is related to greater levels of depressive and anxiety symptoms in schizophrenia individuals (Perry et al., 2011), while acceptance-based treatments are effective in reducing distress (Bach and Hayes, 2002; Gaudiano and Herbert, 2006).

In contrast to the negative cluster, the positive cluster reported greater positive meta-emotion compared to the low cluster, although the effect was small in magnitude. This suggests that when faced with any emotion, those in the positive cluster are more likely to respond with compassion and interest. Such emotional acceptance has been associated with various favorable outcomes, such as greater life satisfaction and psychological well-being (Mitmansgruber et al., 2009). The current finding might partially explain the disjunction previously observed in positive schizotypy individuals showing emotional experience deficits yet reporting levels of well-being comparable to that of healthy controls (Horan et al., 2008; Tabak and Weisman de Mamani, 2013).

Our finding of the positive cluster displaying both positive and negative meta-emotional reaction (and hence both acceptance and non-acceptance of their emotion) may reflect schizotypal ambivalence. Indeed, it has been suggested that people with schizotypy display

heightened ambivalence towards situations, objects, and people (e.g., Kwapil et al., 2002; Mann et al., 2008), as assessed by the Schizotypal Ambivalence Scale (Raulin, 1986). We extended prior research by showing that positive schizotypy individuals also displayed ambivalence towards their emotional experience. Nevertheless, these results are limited to self-report measures, and recently it has been suggested that some deficits in schizotypy may be limited to explicit self-report ratings (Cohen et al., 2011). Future studies are needed to examine how ambivalence towards emotional experience manifests in positive schizotypy individuals using more objective assessments (e.g., behavioral, neural, psychophysiological).

Conclusions

The current study provided support for the additive effect of positive and negative schizotypy on emotional abnormalities. The mixed schizotypy cluster was not only the most deviant group, but it exhibited unique deficits compared to when positive and negative schizotypy were considered in isolation. Thus, it is essential for future studies to identify individuals with a mixed profile and clarify such combined effects using methods beyond self-report.

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APPENDIX A

Table 1

<i>Demographic Characteristics for the Full Sample and Subsamples</i>				
	Full Sample	Subsample 1	Subsample 2	Subsample 3
	<i>N</i> = 2516	<i>n</i> = 1610	<i>n</i> = 874	<i>n</i> = 736
Survey(s) being analyzed in each sample	WSS, FAST	TMMS	PANAS	MES, Ideal Affect
Female <i>n</i> (%)	2091 (83.1)	1324 (82.2)	733 (83.9)	591 (80.3)
Age <i>Mean (SD)</i>	20.6 (3.3)	20.4 (2.9)	20.7 (2.8)	20.0 (3.0)
Race <i>n</i> (%)				
Asian	1156 (45.9)	719 (44.6)	396 (45.3)	323 (43.9)
African American	48 (1.9)	29 (1.8)	15 (1.7)	14 (1.9)
Caucasian	361 (14.3)	224 (13.9)	121 (13.8)	103 (14.0)
Latino/a	748 (29.7)	493 (30.6)	272 (31.1)	221 (30.0)
Biracial	188 (7.5)	136 (8.4)	67 (7.7)	69 (9.4)
Other	15 (0.6)	9 (0.6)	3 (0.3)	6 (0.8)

Note. WSS = Wisconsin Schizotypy Scales, FAST = Following Affective States Test, TMMS = Trait Meta-Mood Scale, PANAS = Positive Affect and Negative Affect Schedule, MES = Meta Emotion Scale

Table 2

Cluster Composition for the Full Sample (N = 2516), Subsample 1 (n = 1610), Subsample 2 (n = 874), and Subsample 3 (n = 736)

	Cluster			F Statistics	Post-hoc Comparisons
	Low	Positive	Negative	Mixed	
	Schizotypy	Schizotypy	Schizotypy	Schizotypy	
Full Sample <i>n</i> (%)	1289 (51.2)	520 (20.7)	525 (20.9)	182 (7.2)	<i>df</i> = 3, 2512
Positive dimension score	-0.58 (0.28)	0.68 (0.49)	-0.14 (0.60)	2.60 (0.96)	2753***
Negative dimension score	-0.56 (0.42)	-0.33 (0.49)	1.39 (0.82)	0.88 (1.06)	1495***
Subsample 1 <i>n</i> (%)	843 (52.4)	335 (20.8)	325 (20.2)	107 (6.6)	<i>df</i> = 3, 1606
Positive dimension score	-0.58 (0.28)	0.69 (0.50)	-0.18 (0.59)	2.59 (0.97)	1721***
Negative dimension score	-0.56 (0.42)	-0.36 (0.50)	1.40 (0.82)	0.83 (1.05)	948.7***
Subsample 2 <i>n</i> (%)	484 (55.4)	145 (16.6)	199 (22.8)	46 (5.3)	<i>df</i> = 3, 870
Positive dimension score	-0.62 (0.27)	0.63 (0.47)	-0.24 (0.55)	2.57 (0.99)	906.8***
Negative dimension score	-0.56 (0.43)	-0.31 (0.52)	1.36 (0.84)	1.01 (1.05)	525.9***
Subsample 3 <i>n</i> (%)	359 (48.8)	190 (25.8)	126 (17.1)	61 (8.3)	<i>df</i> = 3, 732
Positive dimension score	-0.53 (0.29)	0.74 (0.52)	-0.08 (0.63)	2.61 (0.97)	785.1***
Negative dimension score	-0.57 (0.42)	-0.40 (0.49)	1.45 (0.79)	0.69 (1.03)	428.2***

Note. Values reflect mean (standard deviation). Note that cluster assignments were derived from the full sample. Abbreviations: L = low, P = positive, N = negative, M = mixed schizotypy. ***p < .001

Table 3

Comparison of Schizotypy Clusters on Emotion Traits

Cluster						
	Low	Positive		Negative		Mixed
	Schizotypy	Schizotypy	Schizotypy	Schizotypy		
	<i>n</i> = 484	<i>n</i> = 145	<i>n</i> = 199	<i>n</i> = 46		
PANAS, Trait						
NA	1.93 (0.65)	2.16 (0.69)	2.52 (0.81)	2.66 (0.89)	<i>F</i> (3, 865) = 43.40***	η^2_p = .13
PA	3.37 (0.68)	3.26 (0.68)	3.01 (0.70)	3.13 (0.68)	<i>F</i> (3, 865) = 13.71***	η^2_p = .040
	<i>n</i> = 1289	<i>n</i> = 520	<i>n</i> = 525	<i>n</i> = 182		
FAST						
Negative composite score	-0.13 (1.39)	-0.06 (1.30)	0.28 (1.47)	0.27 (1.36)	<i>F</i> (3, 2507) = 14.08***	η^2_p = .018
Positive composite score	0.27 (1.61)	0.14 (1.52)	-0.60 (1.70)	-0.60 (1.83)	<i>F</i> (3, 2503) = 47.22***	η^2_p = .049
	<i>n</i> = 843	<i>n</i> = 335	<i>n</i> = 325	<i>n</i> = 107		Age, gender, ethnicity
TMMS						
Attention	3.93 (0.49)	3.95 (0.46)	3.65 (0.56)	3.75 (0.59)	<i>F</i> (3, 1605) = 31.13***	η^2_p = .056
Clarity	3.45 (0.64)	3.15 (0.59)	3.03 (0.74)	2.85 (0.74)	<i>F</i> (3, 1604) = 54.55***	η^2_p = .088
	<i>n</i> = 359	<i>n</i> = 190	<i>n</i> = 126	<i>n</i> = 61		Age, gender
MES						
Negative	2.99 (0.81)	3.42 (0.73)	3.57 (0.93)	3.96 (0.86)	<i>F</i> (3, 731) = 36.95***	η^2_p = .13
Positive	3.60 (0.67)	3.78 (0.64)	3.53 (0.70)	3.78 (0.66)	<i>F</i> (3, 732) = 4.988**	η^2_p = .020
Ideal Affect						
Negative	3.24 (1.31)	3.17 (1.32)	3.21 (1.35)	3.38 (1.47)	<i>F</i> (3, 732) = 0.38	η^2_p = .002
Positive	6.21 (0.64)	6.21 (0.62)	5.83 (0.85)	6.05 (0.78)	<i>F</i> (3, 732) = 10.67***	η^2_p = .042
<i>Note.</i> Values reflect mean (standard deviation). PANAS = Positive Affect and Negative Affect Schedule, FAST = Following Affective States Test, TMMS = Trait Meta-Mood Scale, MES = Meta Emotion Scale. *** <i>p</i> < .001; ** <i>p</i> < .01						

Note. Values reflect mean (standard deviation). PANAS = Positive Affect and Negative Affect Schedule, FAST = Following Affective States Test, TMMS = Trait Meta-Mood Scale, MES = Meta Emotion Scale. *** $p < .001$; ** $p < .01$

APPENDIX B

Supplementary Table 1

Preliminary Analyses by Age, Gender, and Ethnicity on Emotion Traits

	Age		Gender		Ethnicity	
	<i>r</i>	<i>t</i> statistics ^a	<i>t</i> statistics ^a	ES (<i>d</i>)	<i>F</i> statistics	ES (η^2)
PANAS, Trait						
NA	-.063	-0.77		0.071	4.79***	.027
PA	.057	1.99*		0.18	4.80***	.027
FAST						
Negative composite score	-.018	0.69		0.036	5.45***	.011
Positive composite score	.080***	-6.15***		0.33	13.67***	.026
TMMS						
Attention	-.009	-5.17***		0.34	3.26**	.010
Clarity	.17***	3.21 ^b		0.21	2.79*	.009
MES						
Negative	-.076*	-3.40***		0.32	1.69	.011
Positive	.089*	-2.75**		0.25	0.60	.004
Ideal affect						
Negative	.070	1.25		0.12	1.36	.009
Positive	-.007	-2.44*		0.23	2.21	.015

Note. Since we have ten dependent variables, there were ten analyses conducted for each potential covariate and consequently, the Bonferroni-corrected alpha level was .005 ($\alpha = .05/10 = .005$). Any variable that was significantly related to the dependent variables under this Bonferroni-corrected alpha level was included in the analysis as a covariate. Abbreviations: PANAS = Positive Affect and Negative Affect Schedule, FAST = Following Affective States Test, TMMS = Trait Meta-Mood Scale, MES = Meta Emotion Scale. ^a Negative sign indicates males lower than females; ^b $p = .001$; *** $p < .001$; ** $p < .01$; * $p < .05$

Supplementary Table 2

Comparison of Schizotypy Clusters on Gender and Age

	Cluster		Positive		Negative		Mixed		χ^2 Statistics
	Low	Schizotypy	Schizotypy	Schizotypy	Schizotypy	Schizotypy	Schizotypy	Schizotypy	
% Male/Female	16.4/83.6		17.7/82.3		14.7/85.3		24.7/75.3		$\chi^2(3, N = 2516) = 10.30^*, V = .037^a$ $\chi^2(9, N = 2453) = 52.23^{***}, V = .049^b$
Race <i>n</i> (%)									
Asian	534 (42.5)		277 (55.3)		244 (47.4)		101 (56.1)		
Caucasian	234 (18.6)		55 (11.0)		57 (11.1)		15 (8.3)		
Latino/a	386 (30.7)		130 (25.9)		181 (35.1)		51 (28.3)		
Biracial/Multiracial	103 (8.2)		39 (7.8)		33 (6.4)		13 (7.2)		

Note. For the comparison on ethnicity, we limited analyses to Asian, Caucasian, Hispanic, and Biracial/Multiracial participants, due to the small number of African-American participants and those coming from various other ethnicities (e.g., American Indian), which total 2.51% of the full sample. Consistent with standard practice, we reported Cramer's V (V) as an effect size estimate for Chi-square tests. Following conventions, the interpretation of Cramer's V depends on its degree of freedom (df), with $.1/\sqrt{\text{df}}$, $.3/\sqrt{\text{df}}$, and $.5/\sqrt{\text{df}}$ considered small, medium, and large effect size, respectively (Cohen, 1988).

^a Post-hoc analyses showed that the mixed cluster had greater proportion of males compared to low ($\chi^2(1, N = 1471) = 7.18, p = .007, \phi = .070$) and negative clusters ($\chi^2(1, N = 707) = 8.88, p = .003, \phi = .11$), although the sizes of the effects were small in magnitude;

^b Post-hoc analyses showed that relative to Caucasian participants, there was greater proportion of Asian participants in the positive ($\chi^2(1, N = 1100) = 22.42, p < .001, \phi = .14$), negative ($\chi^2(1, N = 1069) = 13.94, p < .001, \phi = .11$), and mixed clusters ($\chi^2(1, N = 884) = 14.46, p < .001, \phi = .13$) than in the low cluster, and greater proportion of Hispanic participants in the negative cluster than in the low cluster ($\chi^2(1, N = 858) = 13.99, p < .001, \phi = .13$), although the sizes of the effects were small in magnitude;
*** $p < .001$; * $p < .05$