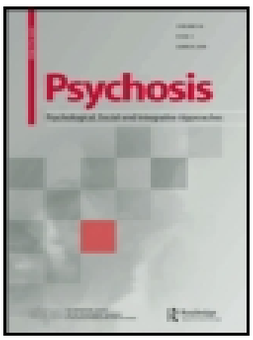

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Cognitive and personality predictors of trait resilience in young people with psychosis proneness: an exploratory study

Dagmara Mętel[a], Andrzej Cechnicki[a], Aleksandra Arciszewska-Leszczuk[b], Renata Pionke-Ubych[c], Martyna Krężołek[c], Piotr Błądziński[a], Dorota Frydecka[d] and Łukasz Gawęda[e]

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ABSTRACT

Background: Resilience has been increasingly recognized as a relevant area of research and clinical intervention in mental health. Although resilience is considered a putative protective factor against psychopathology development, its role in psychosis continuum disorders has been less frequently recognized.

Aims: To examine neurocognitive and personality underpinnings of resilience in individuals prone to psychosis.

Methods: 92 young adults were assessed with the battery of cognitive tests, TCI, CES-D, CAARMS, PQ-16, and CD-RISC-10. Linear regression was conducted to check, if resilience predicted the level of psychopathology. Correlational analysis was conducted to verify the relationships of resilience with neurocognitive and personality measures. A hierarchical multiple regression model was built to explain the predictors of resilience.

Results: Lower resilience predicted higher severity of the total CAARMS score, but was not related to positive symptoms. Cognition, personality, and depressive symptoms affected resilience. The strongest predictor of resilience was the severity of depressive symptoms.

Conclusions: Interventions buffering resilience for psychosis-prone individuals should include therapeutic work on ego-strength and tasks mastering cognitive flexibility.

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KEYWORDS
resilience; psychosis proneness; neurocognition; personality; depressive symptoms

1. Introduction

In the last decades, resilience has been increasingly recognized as a relevant area of research and intervention in mental health (Southwick et al., 2014). Resilience is a multifaceted phenomenon that is variously defined. Current definitions of resilience include three orientations: trait, outcome and process (Hu et al., 2015). Trait orientation refers to the capacity to cope with adversity and to bounce back from stressful experiences; outcome-orientation regards resilience as a set of behaviours that helps to recover from adversity, and process-orientation implies that resilience is a dynamic adaptation after negative life events (for more details see Hu et al., 2015). Resilience is also viewed as a skill that can be exercised (Leys et al., 2020), that gives hope for a better prognosis, faster recovery or even prevention of various mental health problems.

The maintenance of mental health or rapid recovery is a sign of successful coping. In addition to dealing with past and current events, resilience also indicates resistance to adversity in the future

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(Narayanan, 2008). Thus, it is legitimate to acknowledge resilience as a putative protective factor against the development of stress-related psychopathology, such as PTSD (Lee et al., 2014), anxiety (Scali et al., 2012), depression (Wingo, Wrenn et al., 2010), substance abuse (Wingo et al., 2014) or psychosis (Corcoran et al., 2002). So far, resilience has been most extensively studied in depression (Navrady et al., 2018; Poole et al., 2017; Wingo, Wrenn et al., 2010), whereas its role in the psychosis spectrum disorders has been less frequently recognized. This can be partly due to pessimistic view of psychosis as a disease that cannot be prevented. However, this view has been changed in favour of a view that supports the early detection and treatment of psychotic symptoms before transition to fully symptomatic psychosis. Such approach has been proven superior to treatment as usual in many outcomes (Correll et al., 2018). Moreover, early intervention might possibly delay or even prevent transition to psychosis, although further research is needed to draw clear conclusions about potential benefits of psychological interventions for people at risk of psychosis (Stafford et al., 2013).

Psychosis continuum encompasses a wide range of psychotic symptoms, from subclinical manifestations such as psychotic-like experiences (PLEs) and attenuated positive symptoms (APS) (Fusar-Poli et al., 2013), to clinically significant psychotic symptoms observed in individuals diagnosed with mental illness (DeRosse & Karlsgodt, 2015). Although the presence of PLEs or APS does not determine progression into psychosis (Woods et al., 2020), it may be a behavioural expression of an underlying psychosis proneness (DeRosse & Karlsgodt, 2015). This vulnerability may also entail sensitivity to trauma and negative life events (Corcoran et al., 2002), which means poor coping and lack of resilience. In turn, this may lead to the emergence of psychopathological symptoms. It has been shown that individuals at risk of psychosis are characterized by lower levels of resilience compared to healthy controls (Jingyu et al., 2016; Marulanda & Addington, 2016), and that baseline resilience is lower among those individuals at risk who convert to psychosis than among those who do not (K. R. Kim et al., 2013). Higher resilience, in turn, is associated with better psychosocial functioning (K. R. Kim et al., 2013) and lower levels of negative symptoms severity, depression and anxiety in individuals at risk (Marulanda & Addington, 2016). Therefore, resilience may be a protective factor for individuals prone to psychosis, and interventions aimed at bolstering resilience may have a positive effect on the severity of some psychopathological symptoms present in this group.

Findings to date indicate that resilience is also related to neurocognitive functioning (Bolt et al., 2019). In healthy populations, low resilience is associated with impaired neurocognition (Simeon et al., 2007), whereas its high levels are linked to enhanced neurocognition. The domains, where better performance in individuals with higher resilience is observed, include: working memory (Avci et al., 2013), non-verbal memory (Wingo, Wrenn et al., 2010), cognitive flexibility (Genet & Siemer, 2011), attentional control (Schäfer et al., 2015) and executive functioning. The latter defined as a set of cognitive processes that influence and organize cognition and behaviour in the pursuit of goals (Bagetta & Alexander, 2016) was also suggested to provide much of a capacity for human resilience (Masten & Tellegen, 2012).

Moreover, resilience is viewed as a function of personality with environmental factors (Dyer & McGuinness, 1996) and is correlated with various personality traits, e.g. emotional stability, sociability, conscientiousness (Friborg et al., 2005). The meta-analysis of resilience with the Big Five personality model revealed significant correlations with all its dimensions (Oshio et al., 2018), which indicates a strong link between resilience and personality. Strong correlations of resilience were also demonstrated for dimensions from Cloninger's Temperament and Character model (Eley et al., 2013) which identifies four dimensions of temperament (Novelty seeking, Harm avoidance, Reward dependence and Persistence) and three dimensions of character (Self-directedness, Cooperativeness and Self-transcendence).

Considering the above, the goal of the present study is to elucidate the relationships of resilience with domains of neurocognitive functioning, with regard to Cloninger et al.'s psychobiological model of personality (Connor & Davidson, 2003), and depressive symptoms in individuals with psychometric psychosis risk. To the best of our knowledge, cognitive and personality predictors of

trait resilience have not been previously studied in this population. The results could facilitate designing bespoke interventions for psychosis-prone individuals, as strategies for enhancing resilience should consider the key aspects that drive or impair it.

2. Materials and methods

2.1 Participants

The present study included 92 individuals (out of 194 in the total sample) aged 18 to 36, who participated in the online survey designed for a larger project investigating ARMS (At Risk Mental States) epidemiology in Poland. On the basis of the PQ-16 questionnaire score ≥8 participants were qualified for a face-to-face psychological and psychiatric assessment, but those who reported a history of psychotic disorders or a history of addiction to any psychoactive substances were excluded from participation. Within psychological examination learning abilities, attention, memory and verbal fluency were measured. Additionally, we asked participants to fill in a personality inventory, screening scale for depression and resilience scale. The study was approved by the bioethics board and informed consent was obtained from all participants.

2.2. Measures

2.2.1. Cognitive functioning

The domains examined were: 1) memory – as a number of correct answers in all five trails of California Verbal Learning Test (CVLT) measuring the ability to learn verbal material; 2) verbal fluency (VF) – measure of "executive functioning" which consists in generating as many animal names as possible in 60 seconds; 3) executive functions (EF) – as the results of Trail Making Test (TMT) part B (measuring cognitive flexibility from Halstead–Reitan Battery; 4) learning and processing speed – as the number of correct symbols in Digit Symbol Coding Test from WAIS-R battery; 5) attention – the results of correctly cancelled symbols in the D2 Test of Attention measuring selective and sustained attention, and visual scanning speed.

2.2.2. Temperament/character

The Temperament and Character Inventory (TCI) is a 240 true/false item tool measuring individual differences in personality. It is composed of two interacting structures: temperament (four dimensions: novelty seeking, harm avoidance, reward dependence, persistence) and character (three dimensions: self-directedness, cooperativeness, self-transcendence), derived from Cloninger's psychobiological model of temperament and character (Cloninger et al., 1993). The Polish version of TCI in Hornowska et al.'s adaptation (Hornowska, 2003), that we used in our study, provides the following Cronbach's alphas for TCI subscales: NS = 0.79, HA = 0.87, RD = 0.65, P = 0.50, SD = 0.85, C = 0.85, ST = 0.84.

2.2.3. Psychological resilience

The abridged Connor–Davidson Resilience Scale (CD-RISC-10) is a self-report tool consisting of 10 items reflecting the ability to bounce back from life adversities (Connor & Davidson, 2003). Each item is rated on a 5-point range of responses from not true at all (1) to true nearly all time (5). Scores range from 10 to 50 with higher scores indicating higher resilience. CD-RISC-10 measures resilience defined as a unidimensional personality trait. Cronbach's alpha for CD-RISC 10 in our sample was 0.91.

2.2.4. Clinical symptoms

For research purposes, we examined: 1) psychosis risk was defined as a score >8 on PQ-16 (Prodromal Questionnaire) – a self-report 16-item screening tool for psychosis risk

operationalized as a presence of PLEs (Ising et al., 2012). It assesses attenuated positive symptoms, as well as negative, disorganized and general symptoms on two scales: present vs non-present symptoms ("true" vs "false" questions) and distress associated with the experience (4-point Likert scale). PQ-16 score ≥8 was a cut-off point to qualify participants for a face-to-face examination, where CAARMS (Comprehensive Assessment for At Risk Mental States) was administered to assess severity of psychopathological symptoms, and to determine whether an individual meets the ARMS criteria. CAARMS is a semi-structured interview that examines subthreshold and non-specific psychotic symptoms by assessing their frequency, duration and recency. It contains subscales of thought content disorders, perceptual abnormalities, conceptual disorganization, motor changes, concentration and attention, emotion and affect, subjectively impaired energy and impaired tolerance to normal stress. Scores for each subscale range from 0 to 6 (Yung et al., 2005). 2) Depressive symptoms were assessed with the Center for Epidemiological Studies-Depression scale (CES-D). This is a 20-item questionnaire developed by Radloff (1977) to estimate the prevalence of depression in the general population. In the present study, we used five selected items from the scale (for details see Table 4 in supplementary materials). Cronbach's alpha for CES-D in our sample was 0.77.

2.3. Data analysis

The data were inspected for outliers, skewness and homogeneity of variance to ensure appropriateness of parametric statistical tests. First, we performed simple linear regressions to check, if resilience predicts the level of total psychopathology, as well as severity of positive symptoms. Then, we conducted a simple correlational analysis (with FDR correction for multiple comparisons) verifying the relationships of resilience with neurocognitive and personality measures. After that, the hierarchical multiple-regression model explaining resilience was built. In the first step, age and gender were included. Then, we introduced cognitive variables such as: memory, attention, verbal fluency, executive functioning, learning and processing speed. In the third step, we added personality dimensions, in order to check which of the cognitive measures would remain significant after controlling for personality dimensions. Finally, we adjusted the model for depressive symptoms, as they were quite strongly correlated with resilience, and according to previous findings, might be an important confounding variable.

The alpha was set at .05 for all inferences; however, because of a small sample size, the results of statistical tests between $p = .05$ and $p = .10$ were considered as trending toward statistical significance (Thiese et al., 2016). To perform statistical analysis, we used the Statistical Package for the Social Sciences (SPSS), 25th version.

3. Results

3.1. Participants' characteristics

Table 1 (see supplementary materials) presents demographic, clinical, cognitive and personality characteristics of the study participants.

3.2. Correlational analysis

An overview of the inter-correlation coefficients between all given variables is presented in the Table 2 in the supplementary materials. It is worth noting that lower resilience predicted higher severity of the total CAARMS score ($\beta = -.22$, $p = .039$). Association of resilience with CAARMS positive symptoms ($\beta = -.19$, $p = .075$) was weak and trending towards significance, but this result was not observed when positive symptoms were measured with PQ-16 ($\beta = -.05$, $p = .608$). However, the calculation of regression coefficients did not include FDR correction for multiple comparisons that was used in

Table 1. Characteristics of the participants.

N = 92 (51 females 55%)	M	Me	SD	Sk.	Kurt.	Min.	Max.
Age	25.36	24.00	4.99	0.63	−0.82	18.00	36.00
Resilience (CD-RISC 10)	31.97	33.00	8.364	−0.39	−0.31	10.00	50.00
Depressive symptoms (CES-D)	13.98	14.00	3.52	−0.23	−0.63	5.00	20.00
CAARMS total score	26.62	26.00	15.98	0.77	1.00	0.00	79.00
CAARMS positive score	4.47	4.00	3.40	1.01	0.85	0.00	16.00
Psychosis proneness (PQ-16)	14.55	15.00	6.12	−0.04	−0.61	14.00	37.00
Verbal fluency (VF)	23.83	23.00	5.55	0.45	0.30	13.00	40.00
Digit symbol coding (DS)	64.99	64.50	9.48	0.18	−0.39	47.00	92.00
Executive functioning (TMT part B)	56.68	53.00	18.67	0.84	0.04	25.00	103.00
Attention (D2 time in seconds)	469.80	476.00	80.81	−0.38	0.04	240.00	645.00
Verbal learning (CVLT)	62.97	64.50	7.94	−0.62	−0.14	43.00	77.00
Novelty seeking (NS)	21.12	21.00	5.54	0.17	−0.53	10.00	33.00
Harm avoidance (HA)	20.30	20.00	8.02	−0.18	−0.84	4.00	34.00
Reward dependence (RD)	14.25	15.00	3.69	−0.06	−0.59	6.00	22.00
Persistence (P)	4.78	5.00	1.83	−0.25	−0.71	1.00	8.00
Self-directedness (SD)	19.63	17.00	8.86	0.29	−0.80	2.00	39.00
Cooperativeness (C)	27.72	30.00	8.67	−0.70	−0.30	4.00	41.00
Self-transcendence (ST)	16.86	17.00	6.93	0.05	−1.07	3.00	29.00

M – mean; *Me* – median; *SD* – standard deviation; *Sk.* – skewness; *Kurt.* – kurtosis; *Min.* – minimum; *Max.* – maximum.

correlational calculations, so p-values did not overlap. The results demonstrate that cognitive and personality variables are not related. Only the relationship between Verbal fluency and Harm avoidance (−.23) was trending towards significance, but the strength of this correlation was weak. The strongest relationships of resilience were observed with Harm avoidance (HA) (−.52), Self-directedness (SD) (.47) and Cooperativeness (C) (.44). Resilience also strongly negatively correlated with Depressive symptoms (CES-D) (−.47). In terms of cognitive variables, the only relationship trending towards significance was shown for resilience and learning and processing speed measure (DS) (−.25). Despite the fact that other cognitive variables did not correlate with resilience, we decided to use them as predictors in the regression models assuming the possibility of suppression; it is an indirect effect that occur when inclusion of one or more independent variables in the regression equation causes an increase in the predictive validity of another independent variable (or set of variables), which prior to the inclusion was smaller or even insignificant, in relation to the dependent variable (Watson et al., 2013).

3.3. Regression model

Table 3 presents the multiple hierarchical regression model we built. Cognitive functions correlated with each other, but they were not correlated beyond 0.5 and VIF indicators were close to 1.

First, age and gender were included. In the absence of significant relationships, and due to a small sample size, these variables were excluded at further stages of the analysis. Second, the results of cognitive tests were introduced to the model. Without taking into account other variables, the cognitive functioning explained 17% of the resilience variance, and the strongest cognitive predictor of resilience was shorter TMT B time. Moreover, a significant relationship was also shown for the DS variable (a smaller number of encoded symbols predicted a higher resilience), D2 (a lower score was a predictor of a higher resilience) and VF (the more words generated, the higher resilience). Third, after adding selected personality variables (RD, P, ST and SD), all above cognitive variables were still relevant (except for the D2 score) and their direction of influence remained the same. In this step, higher resilience was also predicted by higher RD and SD, and the model explained 38% of the variance. In the final step, after adding depressive symptoms (more severe depressive symptoms predicted lower resilience), we observed an increase in R^2 by 0.11. The final R^2 for the whole model was 49% and the model indicated that important cognitive predictors of resilience were, surprisingly, lower scores of DS and D2 and personality characteristics of RD (β = .17, p = .046), SD (β = .19,

Table 2. Correlations between cognitive, personality and clinical variables.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1 Age																	
2 Resilience	0.14																
3 Depression	−0.11	−0.47 ***															
4 CAARMS_T	−0.14	−0.22	0.23^														
5 CAARMS_P	−0.23^	−0.19	0.13	0.72 ***													
6 PQ16	−0.23^	−0.05	0.27*	0.35 **	0.36 **												
7 VF	0.03	0.08	−0.15	−0.08	−0.07	−0.24^											
8 DS	−0.18	−0.25^	0.01	−0.13	−0.10	−0.27*	0.43 ***										
9 TMT_B	0.25^	−0.11	0.19	−0.01	−0.01	−0.05	−0.28*	−0.38 **									
10 D2	−0.12	−0.22	−0.13	0.03	0.04	0.09	0.34**	0.47***	−0.46 ***								
11 CVLT	−0.13	−0.13	−0.07	−0.10	−0.10	−0.08	0.34 **	0.30*	−0.30*	0.21							
12 TCI_NS	−0.10	0.15	−0.06	−0.13	−0.10	0.05	0.16	−0.05	−0.06	0.04	0.10						
13 TCI_HA	−0.15	−0.52 ***	0.35 **	0.40 ***	0.21	0.29*	−0.23^	0.02	0.03	0.09	−0.09	−0.28*					
14 TCI_RD	−0.04	0.28*	−0.15	−0.17	−0.06	−0.25^	0.03	0.19	−0.16	0.08	0.001	0.12	−0.20				
15 TCI_P	0.03	0.23^	0.001	−0.04	−0.09	−0.03	0.08	0.07	−0.05	−0.02	−0.14	−0.08	−0.22	0.07			
16 TCI_SD	0.12	0.47 ***	−0.36 **	−0.26^	−0.13	−0.32*	0.06	−0.004	−0.12	−0.15	0.05	−0.06	−0.67***	0.25^	0.31*		
17 TCI_C	0.11	0.44***	−0.14	−0.15	−0.12	−0.29*	0.15	0.10	−0.21	−0.04	0.05	0.07	−0.45***	0.57***	0.32*	0.59***	
18 TCI_ST	0.04	0.27*	0.07	0.13	0.19	0.21	0.06	−0.07	−0.11	−0.03	−0.10	0.26^	−0.20	0.25^	0.10	0.08	0.25^

*** – $p < 0.001$; ** – $p < 0.01$; * – $p < 0.05$; ^ – $0.05 < p < 0.1$VF – verbal fluency, DS- Digit symbol coding, TMT B – Trail Making Test version B, D2 – D2 test, CVLT -California Verbal Learning Test, TCI-NS – Temperament and Character Inventory Novelty Seeking, TCI-HA – Temperament and Character Inventory Harm Avoidance, TCI-RD – Temperament and Character Inventory Reward Dependence, TCI-P – Temperament and Character Inventory Persistence, TCI-SD – Temperament and Character Inventory Self-directedness, TCI-C – Temperament and Character Inventory Cooperativeness, TCI-ST – Temperament and Character Inventory Self-transcendence.

Table 3. Multiple hierarchical regression model.

	t	P	Beta	F	adj R^2	ΔR^2
Step 1				1.19	<0.01	0.03
Sex	0.83	0.410	0.09			
Age	1.28	0.205	0.13			
Step 2[a]				4.83***	0.17	0.22***
Verbal fluency (VF)	2.49	0.015	0.28			
Digit symbol (DS)	−2.56	0.012	−0.30			
Executive function (TMT B)	−2.98	0.004	−0.33			
Attention (D2)	−2.50	0.014	−0.29			
Verbal memory (CVLT)	−1.67	0.100	−0.18			
Step 3[a]				7.11***	0.38	0.22***
Verbal fluency (VF)	2.40	0.019	0.24			
Digit symbol (DS)	−3.22	0.002	−0.34			
Executive function (TMT B)	−2.03	0.046	−0.20			
Attention (D2)	−1.64	0.104	−0.17			
Verbal memory (CVLT)	−1.43	0.157	−0.13			
TCI_RD	2.25	0.027	0.20			
TCI_SD	3.58	0.001	0.34			
TCI_P	0.76	0.449	0.07			
TCI_ST	1.23	0.222	0.11			
Step 4[a]				9.58***	0.49	0.10***
Verbal fluency (VF)	1.96	0.054	0.18			
Digit symbol (DS)	−2.66	0.009	−0.26			
Executive function (TMT B)	−1.72	0.090	−0.16			
Attention (D2)	−2.46	0.016	−0.24			
Verbal memory (CVLT)	−1.37	0.174	−0.12			
TCI_RD	2.03	0.046	0.17			
TCI_SD	2.10	0.039	0.19			
TCI_P	1.38	0.171	0.11			
TCI_ST	2.03	0.046	0.16			
CES-D	−4.28	<0.001	−0.37			

t – test statistic; *p* – significance; *Beta* – regression coefficient; *F* – F for the whole model; *adj* R^2 – adjusted coefficient of determination; ΔR^2 – *change of* R^2; *** $p \leq 0.001$; a – model without sex and age.

Table 4. For the purpose of this study, we used the following items from CES-D.

Number of the question in CES-D	
1.	*I was bothered by things that usually don't bother me.*
3.	*I felt that I could not shake off the blues even with help from my family or friends.*
6.	*I felt depressed.*
7.	*I felt that everything I did was an effort.*
18.	*I felt sad.*

p = .039) and ST (β = .16, p = .046). In addition, such variables as better VF and shorter TMT B time remained on the border of significance.

4. Discussion

As far as we know, this is the first study investigating the relationships of resilience with neurocognitive functioning in young adults with psychometric psychosis proneness, adjusted for personality and depressive symptoms. The relationship between resilience and neurocognition remains unclear. On the one hand, resilience positively correlates with superior cognition in non-clinical populations (Fazeli et al., 2019; Simeon et al., 2007), but on the other, lack of such relationship was also demonstrated (Deng et al., 2018; Friborg et al., 2005). Our study showed that out of five cognitive predictors, only verbal memory was insignificant, but still trending towards significance. This result is in line with Genet and Siemer (2011) finding that memory capacity is not predictive of resilience. Thus, our study supports the view that resilience is related

to neurocognition, but due to the fact that in our model cognitive predictors explained to a similar extent the resilience variance (β's absolute values ranged between 0.21 and 0.33), it is difficult to state, which areas of cognitive functioning are of core importance to resilience. In our study, higher resilience was predicted by higher score of verbal fluency (VF) and lower time of TMT B, which implies that executive functions (EF), engaged in both these measurements, contribute to resilience. Moreover, it was proven that interventions aimed at improving EF could also promote resilience (Greenberg, 2006). In our study, EF predicted resilience also after including personality characteristics, but adding depressive symptoms in the last step has decreased EF significance, although they were still trending towards significance.

Other cognitive predictors of resilience were attention (D2) and processing speed (DS), which remained significant after including personality and depression predictors. In the case of D2 and DS, however, the observed negative β values were contrary to expected. Similar findings were reported only by Denckla et al. (2017), but in their study resilience was defined as "functioning at a level beyond expected", thus comparing these results with ours is not justified. We presume that due to the fact that both D2 and DS tests include time pressure, lower performance in individuals who perceived themselves as more resilient may stem from the more "at ease" attitude during the examination. In test situations, less resilient individuals tend to act in a stiff and preservative manner. Additionally, a worse performance might be attributed to lower levels of perfectionism and lower neuroticism that all were proven to have an inverse relationship with resilience (Çerkez, 2017; Leung et al., 2019; Oshio et al., 2018). The participants in our study met the criteria of psychometric proneness to psychosis, which is also related to elevated neuroticism and schizotypal traits (Cohen et al., 2020). This interpretation points to the role of personality that can also influence cognitive performance (Rindermann & Neubauer, 2001).

In our study, self-directedness (SD) was the strongest personality predictor of resilience, which is congruent with previous findings (Calegaro et al., 2019; Eley et al., 2013; J. W. K. R. Kim et al., 2013; Sivri et al., 2019). However, the differences in β values between SD and two other significant personality dimensions (RD and ST) were minimal, so each of the personality predictors explained variance in resilience to a similar extent (controlled by neurocognitive predictors). Self-directedness refers to ego-strength, maturity, self-acceptance and the ability to adapt one's behaviour to chosen goals and values (Calegaro et al., 2019). Along with other character dimensions, self-directedness can impact the interpretation of experiences (Cloninger et al., 1993), and thus influence adaptation to life challenges, which could be either positive (resilience) or negative (possibly resulting in psychopathology development including psychosis spectrum disorders).

The second personality predictor of resilience was reward dependence (RD) that refers to an emotional expression in relationship and a need for approval (Sivri et al., 2019). In the social context, RD is a tendency to positively respond to signals of social reward, which is the opposite of social withdrawal, vastly reported to be the most common symptom in individuals prone to psychosis (Lencz, 2004). Low reward dependence is one of the elements of a maladaptive personality pattern observed in individuals at risk of psychosis (Song et al., 2013) and is the opposite of a resilient individual, who makes proactive efforts to use the internal and external resources in order to cope with the stress generated by life challenges (Sivri et al., 2019).

The third personality predictor of resilience was self-transcendence (ST) which became significant after including depressive symptoms into the model. In line with this finding, Sivri et al. (2019) demonstrated a positive correlation between resilience and ST in chronic psychiatric patients. Self-transcendence is viewed as "an identification with everything conceived as essential" (Cloninger et al., 1993). It captures the degree to which an individual feels a part of nature and the universe at large. According to Cloninger's model, higher scores of ST, along with high self-directedness and cooperativeness, are characteristics of more mature personalities (Smith et al., 2008). On the other hand, ST is often listed as one of the dimensional characteristics of schizotypy (Daneluzzo et al., 2005), which is one of the risk factors for transition to psychosis (Mason et al., 2004). In its utmost form, self-transcendence may result in detachment from reality, similar to psychotic-like experiences

or psychotic states, especially in combination with low scores in self-directedness (SD) and cooperativeness (C) (Daneluzzo et al., 2005). However, in our study, resilience was predicted by both higher levels of ST and SD, which may indicate that in this combination ST is experienced in a different, more healthy way as "acceptance, identification, or spiritual union with nature and its source", as defined by Cloninger et al. (1993).

Including depressive symptoms in the last step demonstrated that they were the strongest of all resilience predictors. Higher severity of depressive symptoms meant lower resilience, as has already been shown (Hjemdal et al., 2016; Wingo, Wrenn et al., 2010). Depressive symptoms did not eliminate the effect of cognitive and personality predictors of resilience, but modified it. Adding depressive symptoms underscored the importance of attention and processing speed for resilience, but it was the lower results that predicted higher resilience, which proves that a more at-ease attitude towards a task is also of importance. Sometimes high scores in attention tests result from a pressing need for achievement and/or strong determination to win, which are both related to higher levels of neuroticism and lower resilience. Moreover, executive functioning still bordered on significance, which points to another component of resilience – cognitive flexibility, which is the ability to switch thought and/or response patterns in order to adapt to environmental demands (Powell & Ragozzino, 2017).

In conclusion, our results demonstrated that cognitive functions, personality and depressive symptoms affect resilience and that the strongest predictor of trait resilience is severity of depressive symptoms. Our results indicate that interventions buffering resilience for individuals with psychosis proneness should include both working on ego-strength and maturity, as well as tasks mastering cognitive flexibility. Strengthening resilience may potentially reduce the risk or postpone further deterioration of individuals prone to psychosis.

5. Limitations

The results of our study should be interpreted with caution due to its limitations such as a small number of participants and self-reported measures of depressive symptoms, resilience and personality that were prone to subjective bias (e.g. same-rater bias and related increased likelihood of halo effect) and situational fluctuations. Moreover, causality of the investigated relationships cannot be confirmed because of the cross-sectional design of the study. Our results point to other factors, not included in this study, that warrant further research in this area.

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