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ORIGINAL ARTICLE

Self-Reported Cognitive Functions Predict the Trajectory of Paranoid Ideation Over a 15-Year Prospective Follow-Up

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Abstract

Background This study investigated whether self-reported cognitive functions (i.e. task orientation, distractibility, persistence, flexibility, and perseverance) predict the trajectory of paranoid ideation over a 15-year prospective follow-up in adulthood.

Methods The participants came from the population-based Young Finns study ($N = 1210-1213$). Paranoid ideation was assessed with the Paranoid Ideation Scale of the Symptom Checklist-90 Revised (SCL-90R) in 1997, 2001, 2007, and 2012. Self-reported cognitive functions were evaluated in 1997 with the Task orientation, Distractibility, Persistence, and Flexibility scales of the DOTS-R (the Revised Dimensions of Temperament Survey) and the Perseverance scale of the FCB-TI (the Formal Characteristics of Behaviour – Temperament Inventory). The data was analyzed using growth curve models that were adjusted for age, sex, and socioeconomic factors in childhood and adulthood.

Results Low self-reported task orientation, low persistence, high distractibility, low flexibility, and high perseverance predicted higher level of paranoid ideation over the 15-year follow-up.

Conclusions Self-reported cognitive functions seem to predict paranoid ideation over a long-term follow-up. Promoting cognitive functions in early interventions may have long-term protective influences against the development of paranoid ideation in non-clinical populations.

Keywords Paranoid ideation · Subclinical · Cognition · Cognitive functions · Every-day functioning · Longitudinal

Introduction

Paranoid ideation refers to an unjustified suspiciousness towards others so that others' motives are supposed to be malevolent (APA 2013). Paranoid ideation can be regarded as a continuum, from mild and subclinical levels to severe paranoid ideation (e.g. Freeman et al. 2005; Freeman and Garety 2014; Van Os 2003). Mild paranoia includes, for example, transient and uncertain ideas about negative rumors circulating around the self (Freeman and Garety 2014). More severe paranoia, in turn, may refer to paranoid personality disorder that includes stable and convincing beliefs that others are deliberately trying to cause significant harm to the self (Freeman and Garety 2014). Most severe paranoid ideation may be manifested as persecutory delusions and, thus, reach the level of psychosis (Van Os 2003).

Paranoid ideation has aroused significant interest because of its relatively high prevalence and societal disadvantages. Specifically, the prevalence of mild paranoid ideas is about 10% in China (Chan et al. 2011) and even in 40% in the UK

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(Freeman et al. 2005). The lifetime prevalence of psychotic-level persecutory delusions is estimated to be approximately 5−8% (Freeman and Freeman 2008; Mohr et al. 2008; Rutten et al. 2008). Additionally, paranoid ideation is related to substantial psychiatric comorbidity with, for example, depression, anxiety, post-traumatic stress disorder, substance abuse, and even suicidality (Alsawy et al. 2015; Chen et al. 2003; Freeman et al. 2011).

Importantly, paranoid ideation is noted to be linked to stigmatization and low symptom awareness that, in turn, may hinder from seeking help and also disturb with the formation of psychotherapeutic alliance (Świtaj et al. 2009; Wright et al. 2012). Traditionally, individuals with paranoid ideation have been provided with heterogeneous interventions, including psychodynamic therapy, cognitive analytic therapy, day program interventions, or self-dialogical methods (Bartak et al. 2011; Bornstein 2005; Dimaggio et al. 2006; Kellett and Hardy 2014). However, even though these psychotherapeutically oriented treatments typically require a long time span with number of sessions, the results about their effectiveness have been inconclusive (Bartak et al. 2011; Karterud et al. 2003).

Consequently, there has been an urgent need for novel interventions for paranoid ideation. Generally, recent emphasis has been directed on early interventions for subclinical symptoms (McGorry 2010; Scott et al. 2013). Moreover, there has been increasing interest in maladaptive cognitive functions of paranoid ideation and cognitive remediation interventions. In a variety of psychiatric populations, the most significant deficits seem to occur in executive functioning, working memory, and inhibitory control (Brewer et al. 2006; Koutsouleris et al. 2011; Rock et al. 2014). For example, longitudinal studies in high-risk populations have demonstrated that high levels of cognitive functioning (i.e. attention, vigilance, working memory) predict a lower risk for psychosis over a 6-month follow-up (Barbato et al. 2013), over a 1-year follow-up (Keefe et al. 2006), over a follow-up of a few years (Seidman et al. 2016), and even over a 7-year follow-up (Lin et al. 2011). Taken together, executive functioning seems to play a critical role in the transition from subclinical stage to more severe symptomatology.

However, to the best of our knowledge, there have been no longitudinal studies investigating whether cognitive functions predict the course of paranoid ideation. To date, there exist cross-sectional studies suggesting that frequent perseveration correlated with higher paranoid ideation in high-risk individuals (Berry et al. 2015; Valmaggia et al. 2007) and in clinical patients (Peer et al. 2004). Additionally, an impulsive cognitive style is found to be related to paranoid symptoms (Freeman et al. 2002). In particular, paranoid ideation is related to specific cognitive biases such as "jumping to conclusions" (i.e. an impulsive style to draw conclusions), an external-personal attribution style (i.e. attributing some external events to the self in a biased way), and an elevated sensitivity to direct attention to threat-related information (Bentall et al. 2001; Freeman 2014). Furthermore, it has been suggested that deficits in cognitive inhibition may lower one's ability to control unjustified interpretations about others' behavior and, in that way, to increase the risk for paranoid beliefs (Freeman et al. 2002).

Previous intervention studies have mostly evaluated the level of cognitive functions using neuropsychological test patterns or observations by health care professionals, while evidence is lacking whether *self-experienced* cognitive functions might be associated with paranoid ideation. There is, however, evidence that impairments in executive functioning commonly result in a variety of self-reported challenges in social and every-day functioning that result in lower quality of life (Addington et al. 2008; Niendam et al. 2007). On the other hand, it has been reported that psychiatric patients may compensate their neurophysiological deficits in some brain regions by hyperactivating adjacent brain regions (Cooper et al. 2014). There is also evidence for compensatory cognitive capacities in healthy individuals during test situation (Strobach et al. 2012) and in schizophrenia patients (Holthausen et al. 2002). Hence, all cognitive deficits may not necessarily be detected in neuropsychological tests. Along with this, previous studies have found that the correlation of neurocognitive tests with every-day level of functioning is only moderate (Chaytor and Schmitter-Edgecombe 2003; Odhuba et al. 2005). Hence, it has been emphasized that cognitive functions should be investigated also with self-reports in order to gain insights into practical every-day functioning (Løvstad et al. 2012).

Previously, it has been found that there is a decline in the level of paranoid ideation over age (Saarinen et al. 2018b). This study investigated whether different levels of self-reported cognitive functioning predict different trajectories of paranoid ideation over a 15-year prospective follow-up. We used the population-based Young Finns data that provided exceptional possibilities to investigate the trajectories of paranoid ideation in a population-based and non-clinical sample. Cognitive functions were evaluated with participants' self-reported levels of task orientation, distractibility, persistence, flexibility, and perseverance that have essential roles for every-day functioning.

Methods

Participants

We used data from the prospective Young Finns Study. The participants were selected randomly from six age cohorts (born between 1962 and 1977) from the population register of the Social Insurance Institution. The Social Insurance

Institution covers the whole population of Finland. The original sample included 3596 participants in the baseline measurement in 1980 (when participants were aged 3−18 years). The participants have been followed since then so that the latest follow-up measurement was in 2012 (participants were aged 35−50 years). The study was carried out in accordance with the Declaration of Helsinki. Furthermore, the design of the Young Finns Study was approved by all the Finnish universities with medical schools. Before participation, all the participants or their parents (for participants aged below 12 years) provided informed consent after the nature of the procedures had been fully explained. The design of the Young Finns Study is described with more detail elsewhere (see Raitakari et al. 2008).

For this study, paranoid ideation was evaluated in 1997, 2001, 2007, and 2012; cognitive functions in 1997; participants' socioeconomic factors in 2011; and parents' socioeconomic factors in 1980. In the analyses, we included all the participants with data available on the study variables (i.e. full data available on age, gender, and socioeconomic factors; data available on paranoid ideation in at least one of the measurement points; and data available on each cognitive function in 1997). Other participants (e.g. participants who did not have data available on cognitive functions in 1997) were excluded. The final sample included 1210−1213 participants in the analyses.

Measures

Self-Reported Cognitive Functions

Self-reported cognitive functions included flexibility, task orientation, persistence, distractibility, and perseverance. Flexibility refers to the ability to adapt one's behavior to unexpected changes of the situation or circumstances. Task orientation is defined as the disposition to work in a goal-oriented way and to self-regulate one's behavior to achieve the goals. Persistence refers to the disposition to continue working toward the goals despite temporary frustration or challenges. Distractibility refers to disposition to become interrupted by irrelevant internal and external stimuli and to easily direct attention away from the task along with other stimuli. Perseverance is defined as the disposition to response repetition or the inability to undertake set shifting in line with the circumstances (e.g. rethink previous decisions or get stuck into a working phase).

Flexibility, task orientation, persistence, and distractibility were evaluated with the DOTS-R (the Revised Dimensions of Temperament Survey) (Windle and Lerner 1986). The scale of task orientation includes 9 items and two subscales, namely distractibility (4 items, e.g. "When I'm concentrating on a task, any environmental stimuli cannot catch my attention") and persistence (3 items, e.g. "I usually continue working until I have completed the task"). The scale of flexibility included 6 items (e.g. "Changes in my plans make me nervous"). All the items were responded with a 5-point scale (1 = totally disagree; 5 = totally agree). In this study, the internal consistencies of the scales were adequate for the scales of task orientation (Cronbach's $\alpha = 0.79$), distractibility ($\alpha = 0.79$), and flexibility ($\alpha = 0.69$). Internal consistency of persistence was lower ($\alpha = 0.59$) that may partly result from the low number of items. Furthermore, the stability of the scales is shown to be adequate (Windle and Windle 2006).

Perseverance was measured with the FCB-TI (the Formal Characteristics of Behaviour—Temperament Inventory) (Strelau and Zawadzki 1993). The scale of perseverance consists of 20 items (e.g. "After completing a time-taking task, I shortly stop thinking about it" or "Usually I do not start rethinking about the decisions that I have made previously" [reversed]) that were responded with no (score 0) or yes (score 1). The internal consistency of the scale was adequate (Cronbach's $\alpha = 0.70$). Furthermore, previous studies have confirmed the validity, stability, and internal reliability of the scale (e.g. De Pascalis et al. 2000; Strelau and Zawadzki 1993, 1995).

We calculated the mean scores of flexibility, task orientation, persistence, distractibility, and perseverance for all the participants who had responded to at least 50% of the items.

Paranoid Ideation

Paranoid ideation was evaluated with the Paranoid Ideation Scale of the Symptom Checklist-90 Revised (SCL-90R; Derogatis 1986). It includes 6 items (e.g. "I think that other people would take advantage of me if I let them to do that") that are responded with a 5-point scale (1 = totally disagree; 5 = totally agree). The internal reliability of the scale was good (Cronbach's $\alpha = 0.74-0.80$ in 1997, 2001, 2007, and 2012). We calculated the mean score of the items for each measurement year if the participant had responded to at least 50% of the items. The scores for paranoid ideation were standardized with the mean and standard deviation of year 1997 scores, in order to stabilize the growth curve trajectories between different measurement years. The scale of paranoid ideation has been used also previously (e.g. Saarinen et al. 2018a, b). Previous studies have confirmed good reliability and discriminant validity for the SCL-90R and for the subscale of paranoid ideation (e.g. Olsen et al. 2004; Schmitz et al. 2000; Starcevic et al. 2000). Higher scores for paranoid ideation are found to discriminate between patients with paranoid conditions and controls and to predict less mature character traits (Bjørkly 2002; Saarinen et al. 2018b).

Covariates

Socioeconomic factors included participants' and their parents' level of income and educational level. Participants' and their parents' educational level was categorized into three categories (1 = comprehensive school; 2 = high school or occupational school; 3 = academic level, i.e. university or college). If mother's and father's educational levels differed from each other, we selected the higher level of education. Level of parents' income included 8 categories (1 = less than 15 000 Finnish mark per year; 8 = more than 100 000 Finnish mark per year). Participants' level of income was evaluated with a 13-point scale (1 = less than 5 000€ per year; 13 = more than 60 000€ per year).

Statistical Analyses

Statistical analyses were conducted with STATA SE (version 13.0). The association of self-reported cognitive functions with paranoid ideation was investigated using multilevel models for longitudinal design (growth curve models). Growth curve models estimate two types of effects: i) "fixed effects" that refer to classic regression coefficients, and ii) "random effects" that refer to the individual-level variance in the intercept, slopes, and residual variance (i.e. within-individual variance over the follow-up time). In all the analyses, we predicted the course of paranoid ideation over the 15-year follow-up time (in 1997−2012) by self-reported cognitive functions. Each indicator of cognitive functions (flexibility, task orientation, persistence, distractibility, and perseverance) was included separately in the analysis as time-invariant predictor. All the models were adjusted for follow-up time, follow-up time squared, age, sex, and participants' and their parents' socioeconomic factors. Further, we investigated whether the associations of self-reported cognitive functions with paranoid ideation change over the follow-up. For this purpose, we included the interactions of follow-up time with cognitive functions in the models.

Results

The descriptive statistics of the study variables are shown in Table 1. The correlation coefficients between the study variables are presented in Supplementary Table 1. Briefly, the inter-correlations between the cognitive functions were as follows: r(correlation of flexibility with other cognitive functions) = [− 0.283; 0.166]; r(correlation of perseverance with other cognitive functions) = [− 0.283; 0.166]; r(correlation of task orientation with flexibility or perseverance) = [− 0.163; 0.134]. The strongest correlation was

Table 1 The means, standard deviations (SD), frequencies, and ranges of the study variables

	Mean	SD	Measurement range	Frequency (%)
Age (1997)	27.479	4.983	20–35	
Sex (female)				737 (60.76)
Parents' educational level				
Comprehensive school				377 (31.08)
High school or occupational school				510 (42.04)
Academic level				326 (26.88)
Parents' level of income	4.986	1.889	1–8	
Participants' educational level				
Comprehensive school				22 (1.81)
High school or occupational school				632 (52.10)
Academic level				559 (46.08)
Participants' level of income	7.350	3.003	1–13	
Flexibility	3.925	0.608	1–5	
Task orientation	3.249	0.599	1–5	
Persistence	3.698	0.645	1–5	
Distractibility	2.980	0.732	1–5	
Perseverance	0.576	0.186	0–1	
Paranoid ideation				
1997	2.424	0.648	1–5	
2001	2.277	0.630	1–5	
2007	2.124	0.641	1–5	
2011	2.134	0.669	1–5	

found between task orientation and its subscale persistence (r = 0.719).

Attrition analyses showed that women were more likely to participate than men (40.2% vs. 27.0%, p < 0.001). There was no attrition bias in age, flexibility, task orientation, distractibility, persistence, or perseverance between included and excluded participants. Included participants had slightly lower level of paranoid ideation in 1997 (2.424 vs. 2.546, p < 0.001), in 2001 (2.277 vs. 2.385, p < 0.001), in 2007 (2.124 vs. 2.194, p < 0.05), and in 2012 (2.134 vs. 2.212, p < 0.05). There was no attrition bias in participants' level of income. Furthermore, included participants' parents had slightly higher level of income (4.986 vs. 4.691, p < 0.001) and were less likely to have low educational level (31.1% vs. 36.6%, p < 0.01) than excluded participants' parents. Previously, values of the psychosocial variables of the Young Finns data are found to be missing at random (Pulkki-Råback et al. 2015).

The results of the growth curve models are shown in Table 2. Regarding cognitive functions, the main effects showed that low flexibility (B = − 0.509, p < 0.001), task orientation (B = − 0.291, p < 0.001), and persistence (B = − 0.252, p < 0.001) predicted higher course of paranoid ideation. Additionally, high distractibility (B = 0.116, p < 0.001) and perseverance (B = 1.427, p < 0.001) predicted higher course of paranoid ideation. When predicting paranoid ideation, there were no significant interaction effects of follow-up time/follow-up time-squared with task orientation, persistence, or distractibility. That is, a difference in the cognitive functions at the baseline measurement (in 1997) predicted a stable difference in paranoid ideation over the 15-year follow-up (from 1997 to 2012). We obtained follow-up-interactions with flexibility (p < 0.05) and perseverance (p < 0.05), when predicting the course of paranoid ideation, but these interactions were not significant after Bonferroni correction for multiple testing. That is, between participants with high vs. low level of cognitive functions, there were no significant differences in the course of paranoid ideation over the follow-up. Taken together, the results showed that there was a decline in the level of paranoid ideation over the follow-up, independently of the level of cognitive functions at the baseline measurement point. Moreover, the results indicated that high flexibility, high task orientation, high persistence, low distractibility, and low perseverance predicted lower level of paranoid ideation over the 15-year prospective follow-up. The findings are illustrated in Fig. 1.

We further investigated whether participants' age might modify the associations of cognitive functions with paranoid ideation. That is, whether participants in different age periods and with different cognitive functions could have different developmental trajectories of paranoid ideation. There were no significant 2-way interactions between age (p > 0.05) and cognitive functions or 3-way interactions between age, cognitive functions, and follow-up time (p > 0.05). Consequently, the associations of cognitive functions with paranoid ideation seemed to be evident regardless of participants' age.

Discussion

To the best of our knowledge, this study was the first to longitudinally investigate the relationship of self-reported cognitive functions with paranoid ideation. The findings showed clear associations of all the single cognitive functions with paranoid ideation. That is, the results demonstrated that low flexibility, low task orientation, low persistence, high distractibility, and high perseverance predicted

Table 2 Results of the growth curve models. Estimates (B) with p-values (within brackets) of task orientation, distractibility, persistence, perseverance, flexibility and follow-up time, when predicting the growth curve of paranoid ideation in adulthood

	Fixed effects					Random effects		
	Predictor	Time	Time^2	Predictor* Time	Predictor* time^2	Variance of intercept	Variance of time	Residual variance
Task orientation	− 0.219 (< 0.001)	− 0.068 (0.027)	0.003 (0.157)	0.000 (0.970)	0.000 (0.925)	0.724 (< 0.05)	0.034 (< 0.05)	0.537 (< 0.05)
Distractibility	0.116 (0.001)	− 0.084 (< 0.001)	0.003 (0.048)	0.005 (0.534)	0.000 (0.804)	0.730 (< 0.05)	0.034 (< 0.05)	0.537 (< 0.05)
Persistence	− 0.252 (< 0.001)	− 0.104 (0.001)	0.004 (0.053)	0.009 (0.280)	0.000 (0.495)	0.718 (< 0.05)	0.034 (< 0.05)	0.537 (< 0.05)
Perseverance	1.427 (< 0.001)	− 0.026 (0.149)	0.000 (0.743)	− 0.075 (0.012)	0.004 (0.041)	0.696 (< 0.05)	0.034 (< 0.05)	0.537 (< 0.05)
Flexibility	− 0.509 (< 0.001)	− 0.149 (< .001)	0.007 (0.003)	0.020 (0.025)	− 0.001 (0.065)	0.675 (< 0.05)	0.034 (< 0.05)	0.537 (< 0.05)

N = 1210–1213 Adjusted for age, sex, and participants' and their parents' socioeconomic factors

STATA does not report the exact p-values for random effects

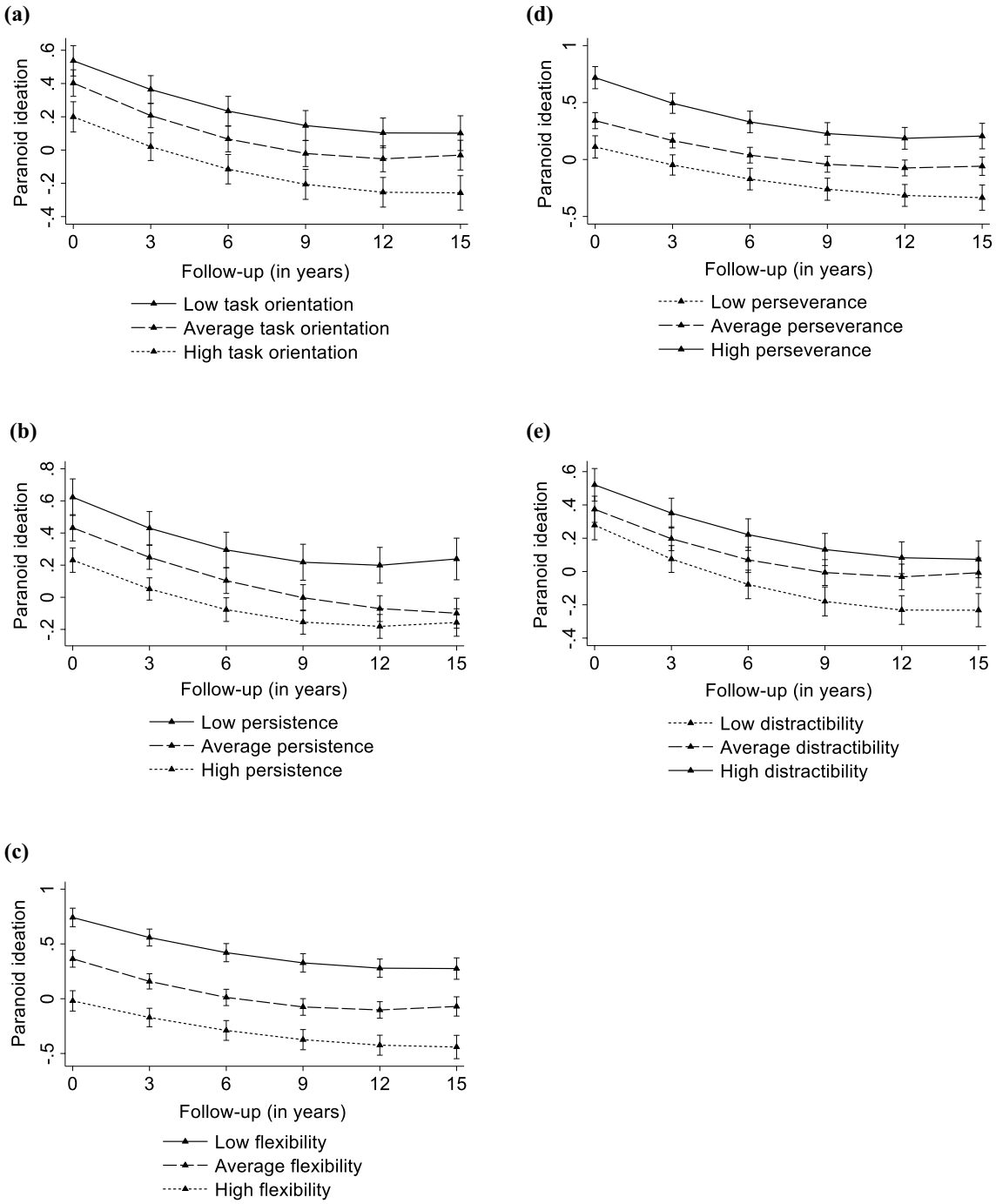

Fig. 1 The trajectories of paranoid ideation in adulthood separately for participants with low (lowest 25% in the sample), average, and high (highest 25% in the sample) scores of task orientation (**a**), persistence (**b**), flexibility (**c**), perseverance (**d**), and distractibility (**e**). Estimated means with 95% confidence intervals. *Note:* adjusted for age, sex, and participants' and their parents' socioeconomic factors

higher level of paranoid ideation. These associations were systematically evident over a 15-year prospective follow-up in adulthood. All the findings remained after controlling for age, sex, and participants' and their parents' socioeconomic factors. Overall, the results indicate that individuals with lower self-reported cognitive functioning are more prone to paranoid ideation.

The findings are highly in accordance with previous literature. Firstly, high perseverance is linked to higher levels of somatic anxiety, sensory sensitivity, and emotional reactivity

(Fruehstorfer et al. 2012; Jankowski and Zajenkowski 2012) and also more frequent beliefs about uncontrollability and danger of upcoming situations (Dragan and Dragan 2014) that, in turn, are reported to increase risk for higher paranoid ideation (Freeman et al. 2002; Freeman 2007). Secondly, low vigilance (high task distractibility, conversely) predicts lower level of social functioning (Meyer et al. 2014). Lowered social activity and staying away from interpersonal contacts, in turn, may result in fewer possibilities to receive contradictory evidence for one's paranoid beliefs (Morse and Lynch 2004). Finally, intervention studies suggest that lower level of inhibitory control is related to more frequent intrusive thoughts (Bomyea and Amir 2011). Intrusive mental imagery, in turn, is related to higher paranoid ideation (Schulze et al. 2013). Taken together, cognitive impairments may predict an array of alterations in socioemotional processes and every-day behavioral activities that, in turn, may increase risk for the emergence of paranoid ideation.

Previous evidence suggests that besides of the psychosocial associations between cognitive functions and paranoid ideation, there may also exist a neurophysiological pathway from cognitive functions to paranoid ideation. Specifically, neurophysiological alterations in the frontal cortex may likely explain a major part of the associations of cognitive functions with paranoid ideation. For example, studies among patients with neurosurgical lesions or delusions have shown that deficits in the prefrontal cortex are linked to biases in cognitive processing, such as "jumping to conclusions" and deficits in prediction-error processing (i.e. difficulties to expect rewards in different situations on the basis of one's previous experiences) (Corlett et al. 2007; Lunt et al. 2012). These cognitive biases, in turn, are strongly related to paranoia and other delusions (Corlett et al. 2007; Freeman et al. 2008). The neurophysiological deficits in the frontal lobe may partly derive from alterations in dopamine-related neurotransmission. That is, several studies have shown that cognitive impairments are related to dopamine-mediated dysfunctions in the frontal lobes (Abi-Dargham et al. 2002; Goldman-Rakic et al. 2004) that are suggested to predispose to the emergence of delusional ideation (Pankow et al. 2012).

Overall, it is necessary to consider that, besides of cognitive functions, there are a variety of other factors affecting the development of paranoid ideation: for example, early life experiences, sleep disturbances, reasoning biases, attributional styles, temperament traits related to anxiety-proneness, and depressive symptoms (Bentall et al. 2001; Freeman 2014; Saarinen et al. 2018a,b). Hence, training cognitive functions can be a part of treatment programs for paranoid ideation but also other types of interventions are needed.

This study had some limitations that are necessary to be taken into consideration. Firstly, despite the appropriate temporal design of this study, we could not investigate the interaction between cognitive functions and paranoid ideation. Previous evidence suggests that there may likely exist also indirect pathways from high paranoid ideation to cognitive functions. For example, severe paranoid ideation may increase stress, anxiety, and social isolation (APA 2013; Freeman 2007; Morse and Lynch 2004) that, in turn, may increase risk for deficits in cognitive functions (Cacioppo and Hawkley 2009; Derakshan and Eysenck 2009). Recent meta-analyses in clinical populations, however, have concluded that in most cases cognitive deficits are evident before the onset of symptomatology and that there appears to be no cognitive decline thereafter (Bora and Murray 2013; Rock et al. 2014). In this light, impairments in cognitive functions may be rather a predisposing factor than a consequency of paranoid ideation.

Secondly, as we used population-based data, our findings may not be generalized to clinical populations where paranoid ideation is clinically significant and reaches the level of paranoid personality disorder or psychosis. However, the current emphasis in interventions has been directed towards early preventive interventions for subclinical symptoms (McGorry 2010; Scott et al. 2013). This study responds to the need of early interventions, by providing new evidence for developing cognitive training interventions for individuals with subclinical paranoid ideation.

To the best of our knowledge, this is the longest follow-up study of the relationships of cognitive functions with paranoid ideation so far. Our findings provide several valuable implications for clinical practice. Previously, individuals with paranoid ideation have been treated with psychotherapeutically oriented interventions, such as psychodynamic therapy, cognitive analytic therapy, or self-dialogical methods (Bornstein 2005; Dimaggio et al. 2006; Kellett and Hardy 2014). However, even though those interventions commonly consist of a long-term set of meetings, their effectiveness has remained uncertain (e.g. Dixon-Gordon et al. 2011; Karterud et al. 2003; Schneider and Klauer 2001). Our findings suggest that promoting every-day cognitive functioning might have long-term protective effects against paranoid ideation in adulthood. Importantly, cognitive training is found to improve cognitive skills even within 2–3 months (Pisculic et al. 2015; Twamley et al. 2012), probably providing a cost-effective intervention for high-risk groups. Further, cognitive training may be particularly effective in subclinical populations (Rauchensteiner et al. 2011), so that it could be provided at the early stages of paranoid ideation. In addition to direct cognitive training, the interventions could be directed to providing beneficial preconditions for effective cognitive functioning e.g. through stress reduction and promoting healthy lifestyle like sufficient sleep.

To date, psychotherapeutic interventions for paranoid ideation have typically aimed to promote symptom

awareness and insight into one's deeper mental processes. Symptom awareness itself, however, may not necessarily improve treatment outcome. Instead, there is evidence that among paranoid patients, high insight may be linked to lower levels of self-acceptance, sense of autonomy, and personal growth (Valiente et al. 2011). With regard to treatment outcome, the crucial factor appears to be stigmatization. That is, when high symptom awareness occurs together with low stigmatization, the treatment outcomes seem to be substantially enhanced (Lysaker et al. 2006; Staring et al. 2009; Valiente et al. 2011). Our findings suggest that paranoid ideation is linked to self-experienced and self-recognized challenges in daily cognitive functioning. Moreover, challenges in every-day cognitive functioning do not fulfill any diagnosis that might increase stigmatization. Consequently, interventions focusing on self-experienced impairments in every-day cognitive functioning might provide a possible pathway to increase symptom awareness without resulting in stigmatization. This, in turn, might reduce treatment resistance and enhance the development of confidential relationships with health care professionals.

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Author Contributions A.S. designed the study, analyzed the data, and prepared the original draft of the manuscript. N.G. and T.L. contributed to interpretation of the results and collaborated with writing the manuscript.

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Compliance with Ethical Standards

Conflict of Interest Aino I. L. Saarinen, Niklas Granö, and Terho Lehtimäki declare that they have no conflict of interest.

Ethical Approval The study was carried out in accordance with the Declaration of Helsinki. Furthermore, the design of the Young Finns Study was approved by all the Finnish universities with medical schools.

Informed Consent Before participation, all the participants or their parents (for participants aged below 12 years) provided informed consent after the nature of the procedures had been fully explained.

Animal Rights No animal studies were carried out by the authors for this article.

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