Anxiety sensitivity dimensions in young individuals with at-risk-mental states

Andrea Pozza,[1] Anna Meneghelli,[2] Maria Meliante,[2] Luisa Amato,[2] Davide Dèttore[3]

[1]Department of Medical Sciences, Surgery and Neurosciences, University of Siena, Siena; [2]Programma 2000 Center for Early Detection and Intervention in Psychosis, Department of Mental Health, Niguarda Ca' Granda Hospital, Milan; [3]Department of Health Sciences, University of Florence, Florence, Italy

ABSTRACT

Anxiety Sensitivity (AS) is a transdiagnostic risk factor involved in the development and maintenance of different psychopathological conditions including anxiety disorders and psychosis. It consists of Physical Concerns (*e.g.*, the belief that palpitations lead to a cardiac arrest), Social Concerns (the belief that observable anxiety reactions will elicit social rejection), and Cognitive Concerns (the belief that cognitive difficulties lead to mental incapacitation). No study investigated whether specific AS dimensions are related to At-Risk Mental States (ARMS). This study compared AS dimensions between young individuals with ARMS, patients after a recently occurred First-Episode Psychosis (FEP) and matched community controls. Based on models of ARMS and previous evidence, it was hypothesized that ARMS individuals have higher physical, social and cognitive concerns than FEP patients and controls. Thirty individuals with ARMS and 30 with FEP and 30 controls recruited from the general population completed the Anxiety Sensitivity Index-3 (ASI-3) and Penn State Worry Questionnaire. ARMS and FEP individuals had higher scores than controls on ASI-3 Cognitive Concerns [$F_{(2,87)}$= 11.48, p<.001]. Individuals with ARMS had higher ASI-3 Physical Concerns scores than FEP patients [$F_{(2,87)}$= 5.10, p<.01] and at a marginal significance level than controls. No between-group difference was found on Social Concerns. Higher ASI-3 Physical Concerns scores [B = -.324, Wald's $\chi2_{(1)}$ = 8.29, p < .01] and psychiatric comorbidities [B = -2.726, Wald's $\chi2_{(1)}$ = 9.33, p < .01] were significantly related to ARMS than FEP. Higher ASI-3 Social Concerns scores were related to FEP, despite at a marginal significance level [B =.213, Wald's $\chi2_{(1)}$ = 3.79, p = .052]. Interventions for AS Cognitive/Physical Concerns could be incorporated in the treatment of ARMS. A replication of the findings is required. Future longitudinal studies should examine whether Cognitive Concerns predict development of FEP in ARMS to improve early detection and prevention strategies.

Key words: At-risk mental states; psychosis; anxiety sensitivity; cognitive bias; ultra-high risk of psychosis.

Introduction

The at-risk-mental state concept: a paradigm shift

In the last twenty years, increasing efforts have been put into developing early detection strategies for mental disorders, particularly psychosis. Growing interest has been dedicated to the so-called At-Risk-Mental States (ARMS) concept which encompasses two early detection approaches: the ultra-high-risk criteria that focus on an imminent risk of psychosis (Yung & McGorry, 1996) and the basic symptom criteria that focus on the earliest possible specific symptoms (Schultze-Lutter, 2009).

Ultra-high-risk criteria identify three subgroups of ARMS individuals: i) those reporting attenuated psychotic symptoms; ii) those having brief limited intermittent psychotic episodes below duration criteria for a brief psychotic episode; iii) those who have genetic vulnerability (*i.e.*, familial risk or a schizotypal personality disorder combined with decline in functioning during the last year) (Fusar-Poli et al., 2013; Pozza & Dèttore, 2019; Yung et al., 2005). An age range of 15–35 years was also included in this approach (Yung et al., 2005). Attenuated psychotic symptoms include at least ideas of reference, odd beliefs or magical thinking (*e.g.*, ideas of grandiosity, paranoid ideation and unusual perceptual

OPEN ACCESS

experiences) (Yung et al., 2005). Brief limited intermittent psychotic symptoms include at least hallucinations, delusions, and formal thought disorders (Yung et al., 2005). Genetic risk consists of family history of psychosis in first-degree relatives, schizotypal personality disorder in combination with a recent significant decline in psychosocial functioning.

An early detection strategy complementary to the ultra-high-risk approach is represented by the basic symptoms criteria (Klosterkotter et al., 2001; Schultze-Lutter, Ruhrmann, Berning, Maier, & Klosterkötter, 2008). They were conceptualized as subjectively experienced subclinical disturbances in drive, affect, thinking, speech, body perception, motor action, central vegetative functions, and stress tolerance (Gross, 1989). They are rarely observable to others, although the patient's self-initiated coping strategies (including avoidance behaviours and social withdrawal) in response to these symptoms may be recognizable to others. Basic symptoms are also distinct from frank psychotic symptoms that are experienced by the patient as real, normal thinking, and feeling.

Anxiety sensitivity: a transdiagnostic construct

Anxiety Sensitivity (AS) is a long-studied individual difference consisting of fear of arousal-related sensations (Naragon-Gainey, 2010). It is believed to develop from the combination of genetic vulnerability factors and learning experiences that result in the acquisition of interpretations of potential harmful effects of autonomic arousal (Reiss & McNally, 1985).

AS is conceptualized as a multidimensional construct including Physical Concerns, Social Concerns, and Cognitive Concerns (Taylor, 1999). Physical Concerns reflect worry about the physical health consequences of arousal sensations (*e.g.*, palpitations leading to a heart attack). Social Concerns consist of beliefs that publicly observable anxiety signals might lead to social rejection or disapproval. Cognitive Concerns are associated with worries that psychological symptoms, such as concentration difficulties, might lead to cognitive consequences, *i.e.* mental incapacitation (Taylor et al., 2007).

Cognitive models of psychopathology conceptualize AS dimensions as vulnerability and maintenance factors of anxiety symptoms (Reiss & McNally, 1985). AS dimensions may have impacts on the development and maintenance of anxiety disorders or symptoms, as each one might be associated with thematically related psychopathology (Taylor et al., 2007). Evidence from clinical samples showed that Physical Concerns discriminated patients with a primary panic disorder with/without agoraphobia from those with other anxiety disorders (Taylor et al., 2007; Wheaton, Deacon, McGrath, Berman, & Abramowitz, 2012). Social Concerns seemed to be specific to patients with primary social anxiety disorder, whereas patients with primary gener-

alized anxiety disorder and obsessive-compulsive disorder had the highest levels of Cognitive Concerns (Escocard, Fioravanti-Bastos, & Landeira-Fernandez, 2009; Naragon-Gainey, 2010; Olthuis, Watt, & Stewart, 2014; Pozza & Dèttore, 2015). However, such a specificity was not unequivocally demonstrated in all the studies: for example, elevated Physical Concerns were found among patients with illness anxiety disorder (Wheaton et al., 2012), high Social Concerns were observed in patients with generalized anxiety disorder (Pozza & Dèttore, 2015), and Cognitive Concerns were shown by clinical groups with major depressive disorder (Kemper, Lutz, Bähr, Rüddel, & Hock, 2012).

All the dimensions of AS have been found to be higher in patients with chronic psychosis than in healthy controls in a previous research (Luzón, Harrop, & Nolan, 2009). These mixed findings suggested that AS may be a transdiagnostic construct which may have a role as vulnerability and maintenance factor in other conditions than exclusively in anxiety disorders.

At-risk-mental state and anxiety sensitivity

Several theoretical and clinical hypotheses and empirical findings may support the need of assessing the role of AS dimensions in ARMS individuals and patients after a recent First-Episode Psychosis (FEP). Young individuals with ARMS report higher symptoms than healthy controls and 85% of them experience moderate to severe anxiety symptoms (Hui et al., 2013). According to a meta-analysis (Fusar-Poli, Nelson, Valmaggia, Yung, & McGuire, 2014), prevalence of comorbid anxiety disorders in young individuals with ARMS is estimated around 15%. Among the anxiety symptoms, social anxiety symptoms were found to be the most common ones affecting about 42% of ARMS individuals (Rietdijk et al., 2013).

As suggested by a systematic review (Mian, Lattanzi, & Tognin, 2018), as compared with healthy controls and even FEP patients, young people with ARMS have been found to engage in more maladaptive coping strategies such as social withdrawal, attributional biases of social cues and avoidance of arousal-related sensations. ARMS people showed higher levels of interpersonal sensitivity, a construct related to Social Concerns, which is defined as undue and excessive awareness of and sensitivity to the behaviour/feelings of others (*e.g.*, Masillo et al., 2012; Masillo et al., 2016). According to the cognitive model of ARMS (van der Gaag et al., 2013), the intensity/recurrence of psychotic-like experiences is caused and reinforced by catastrophic interpretations of such experiences which activate mental signals of arousal amplifying fear of losing control and "going crazy" in a self-perpetuating vicious cycle. Young individuals with ARMS or after a FEP often fear "going crazy" and losing control over their minds because of psychotic-like experiences or recently occurred FEP. In a recent meta-analysis (Cotter, Yung, Carney, & Drake, 2017), ARMS groups showed stronger beliefs about the uncon-

trollability of their thoughts than healthy controls and as high beliefs as patients with psychosis.

Worry about thinking, defined as a process involving a chain of thoughts/mental images negatively affect-laden and uncontrollable (Barcaccia et al., 2019; Borkovec & Inz, 1990), may be another coping strategy engaged by the young individual to manage the distress associated with ARMS (Hartley et al., 2014; Startup, Freeman, & Garety, 2007). Young individuals with ARMS had higher levels of anticipatory worry than healthy controls and to a similar extent as patients with psychosis (Fresán et al., 2015). Worry was a strong predictor of sub-clinical psychotic symptoms in community samples (Freeman et al., 2012; Pozza & Dèttore, 2017).

Rationale and hypotheses

The role of AS during the first phases of psychosis is an under-explored area. No study investigated AS dimensions in young individuals with ARMS or in remitted patients after FEP. Therefore, the present study aimed to compare the levels of AS dimensions between a group of young individuals with ARMS, a group of remitted patients after a FEP and a matched control group recruited from the community. In addition, the association between all the AS dimensions and mental state (ARMS versus FEP condition) was explored controlling for the effects of socio-demographic variables (age and gender), presence of other psychiatric comorbidities and intensity of worry.

It may be hypothesized that young individuals experiencing ARMS or the phase after a FEP have higher levels in all anxiety sensitivity dimensions and a higher general tendency to worry than individuals from the general population. According to previous evidence (Fresán et al., 2015; Masillo et al., 2012; Mian et al., 2018; Pozza & Dèttore, 2015), ARMS and FEP individuals are expected to have high physical concerns because they have catastrophic interpretations of psychotic-like experiences (*e.g.*, recurrent bodily sensations), have high cognitive concerns because they worry that mental signals of arousal lead to catastrophic consequences such as mental incapacitation, and have high social concerns because they have interpersonal sensitivity and other social anxiety-related features such as social avoidance and fear of social devaluation. According to the cognitive model of ARMS (van der Gaag Nieman, & van den Berg, 2013), physical, social and cognitive concerns and worry play as maintenance factors of the intensity/recurrence of psychotic-like experiences. Therefore, since the control group recruited from the general population was not screened on psychiatric disorders, ARMS individuals were compared with FEP patients on these cognitive maintenance factors which were hypothesized to be specific to ARMS controlling for socio-demographic variables and psychiatric comorbidities. Comparing ARMS individuals with FEP patients on these cognitive factors may suggest personalized treatment approaches.

Methods

Participants and procedure

The clinical groups (ARMS and FEP individuals) were recruited at the PROGRAMMA 2000 service of Niguarda Ca' Granda Hospital, Milan, Italy. To be included in the ARMS or FEP groups, individuals had to respectively meet the criteria for ARMS (Schultze-Lutter et al., 2008; Yung et al., 2005) or to be on remission after a recent FEP occurring within the last year. Individuals were excluded if they met the criteria for any i) psychotic disorders; ii) intellectual disability; iii) neurological diseases; iv) active suicidal intent. A recent FEP occurred within the last year was ascertained by checking the medical records of the patients. The control group consisted of young community individuals recruited from a variety of settings such as libraries, universities, and other public contexts. They were matched on age and gender with the ARMS group.

All the participants completed the questionnaires individually. Participation was voluntary and uncompensated. In accordance with the Ethical Principles of Psychologists and Code of Conduct (American Psychological Association, 2002), all the participants recruited for the study provided written informed consent to participate after having received a detailed description of the aims. The written informed consent was signed by parents if the participant's age was lower than 18 years. Materials containing personal information about participants were kept on electronic supports protected by passwords. In accordance with the Helsinki Declaration, the study was approved by the Institutional Ethics Committee of Niguarda Ca' Granda Hospital, Milan, Italy.

Measures

At-Risk-Mental State

ARMS was evaluated through the Early-Recognition Inventory Interview for the Retrospective Assessment of the Onset and Course of Schizophrenia and Other Psychoses (Häfner et al., 1990). It is a comprehensive early-recognition inventory for the early recognition of schizophrenia risk. It was developed on a purely empirical basis. As stated, it permits persons suspected of being at risk of developing psychosis to be selected in three successive steps: Step 1 relies on a persons' self-perception with maximum sensitivity, Step 2 comprises screening by means of a short interview or questionnaire at a general practice or other primary health service and Step 3 of a detailed interview at a specialist mental-health service. This scale consists of 50 symptoms, including basic symptoms, attenuated psychotic symptoms and brief limited intermittent psychotic episodes. For each of the 50 symptoms respondents are asked to refer i) if this specific symptom was present in the past four weeks; ii) if it already occurred within the last 12 months; iii) if there was

a deterioration during the last 12 months; and iv) if there is a current emotional distress regarding this symptom (score range 0–200, cut-off = 30). ARMS is defined by a score higher than the cut-off or the presence of at least two basic symptoms, or the presence of at least one attenuated psychotic symptoms or brief limited intermittent psychotic episode, independent of the score achieved. This instrument demonstrated superior sensitivity in detecting ARMS individuals than other instruments such as the Comprehensive Assessment of At-Risk Mental State (CAARMS; Yung et al., 2005) which focuses on brief limited intermittent psychotic symptoms and attenuated psychotic symptoms (Maurer et al., 2018; Rausch et al., 2013). The Italian version (Meneghelli et al., 2014) showed good internal consistency and discriminated effectively between young individuals with ARMS and patients with FEP. In the present study, the ERiraos was administered by clinical psychologists with several years of experience in ARMS who had been trained through specific workshops and internships to use this instrument.

Concurrent psychiatric diagnoses

Psychiatric diagnoses other than ARMS or FEP were made through the Structured Clinical Interview for DSM-IV-TR Axis I Disorders (SCID-I; First, Spitzer, Gibbon, M., & Williams, 1997a; SCID-I Italian; Mazzi, Morosini, De Girolamo, Lussetti, & Guaraldi, 2000).

Personality disorders were assessed through the Structured Clinical Interview for DSM-IV-TR Personality Disorders (SCID-II; First, Gibbon, Spitzer, Williams, & Benjamin, 1997b; SCID-II Italian; Maffei et al., 1997). Both these instruments were administered by clinical psychologists who had received a formal training on their administration. Despite the fact that no formal evaluation of between-assessor concordance on diagnosis was conducted, clinical case meetings were planned to establish consensus and monitor temporal stability of primary and secondary diagnoses.

Anxiety Sensitivity dimensions

AS was measured by the Anxiety Sensitivity Index-3 (ASI-3; Taylor et al., 2007), an 18-item self-report tool aimed at assessing Physical Concerns (*e.g.*, belief that palpitations would lead to cardiac arrest), Social Concerns (*e.g.*, belief that publicly observable anxiety reactions would elicit social rejection), Cognitive Concerns (*e.g.*, belief that concentration difficulties would lead to insanity). It contains three scales corresponding to each one of the dimensions (Physical Concerns, example item: *When I notice my heart skipping a beat, I worry that there is something seriously wrong with me*"; Physical Concerns, example item: "*I worry that other people will notice my anxiety*; Cognitive Concerns, example item: *When my thoughts seem to speed up, I worry that I might be going crazy*). Scale scores can be derived for the three dimensions, where higher scores are as-

sociated with greater AS. Respondents are asked to indicate the strength of their endorsement for each item on a 5-point Likert scale (0= "very little"; 4= "very much"). The ASI-3 and its scales have shown good to particularly good internal consistency in non-clinical and clinical samples from five countries (alphas range= .73-.91) (Taylor et al., 2007). The Italian version (Pozza & Dèttore, 2015) showed good to excellent internal consistency across the scales, and moderate correlations with depression and trait anxiety measures. In the present study, internal consistency was good for all the scales (Cronbach's alpha = .83-.87).

Intensity of general worry

The intensity of general worry was assessed through the Penn State Worry Questionnaire (PSWQ; Meyer, Miller, Metzger & Borkovec, 1990). It consists of 16 items (example item: *Once I start worrying, I cannot stop*) rated on a 5-point Likert scale, with values ranging from 1 (*Not at all typical of me*) to 5 (*Very typical of me*). Meyer and colleagues (Meyer et al., 1990) showed good or excellent internal consistency (alpha = .88-.95), good test-retest reliability (r = .74-.92), and good convergent and divergent validity in clinical and non-clinical samples. High scores indicate more intense clinical worry. The Italian version (Morani, Pricci & Sanavio, 1999) had good internal consistency. In the present study, internal consistency was good (Cronbach's alpha = .82).

Statistical analyses

To investigate differences on AS dimensions and worry between control participants, individuals with ARMS and remitted patients after a recent FEP, a one-way ANOVA was conducted with Scheffé post-hoc comparisons. Effect sizes were calculated as Partial Eta Squared (η^2) coefficients (Olejnik & Algina, 2003). Values of 0.01, 0.06, 0.14 suggest low, moderate, and large effect sizes, respectively (Cohen, 1998). To explore the effects of AS dimensions on ARMS of FEP, a generalized linear model was conducted on the ARMS and FEP groups using the maximum likelihood estimation method in the ARMS and FEP groups by entering the scores on the ASI-3 scales and PSWQ and sociodemographic/clinical variables (age, gender and presence of comorbidities) as predictors and the mental state groups (ARMS versus FEP group) as the binary response variable. The ARMS vs. FEP condition was chosen as binary response variable because control participants were not screened for mental disorders. For all the analyses the level of statistical significance was set at *p*< .05. The analyses were conducted using the SPSS software, version 21.00.

Results

Descriptive characteristics of the groups

Thirty young individuals with ARMS, 30 remitted pa-

tients after FEP and 30 control participants were included (see Table 1 for a detailed overview of the clinical characteristics). All the individuals who were recruited accepted to participate, except one in the FEP group. In the ARMS and FEP groups, 50% and 10% respectively had concurrent Axis I psychiatric disorders (other disorders than recent FEP or ARMS status). Anxiety disorders were present in 3 and in none of the individuals in the ARMS and FEP groups, respectively. In the ARMS group 10% presented a concurrent personality disorder whereas none in the FEP group reported this type of comorbidity. In the ARMS and FEP groups, 56.7% and 93.3% respectively were on concurrent psychiatric medication. No statistically significant difference was found between the groups on age ($F = .73$, $p = .40$) and clinical variables. A significant difference on gender between the ARMS and FEP groups emerged, with the former group having a higher number of females than the second one ($\chi^2 = 4.44$, $p = .04$) and on concurrent psychiatric medication, with a higher number of FEP patients being on concurrent psychiatric

medication than ARMS individuals ($\chi^2 = 12.42$, $p = .001$).

Comparisons on anxiety sensitivity dimensions and worry across groups

Between-group comparisons on AS dimensions are presented in Table 2. Individuals with ARMS and patients with FEP had significantly higher scores than control participants on ASI-3 Cognitive Concerns scale with a large effect size [$F_{(2,87)} = 11.48$, $p<.001$]. Individuals with ARMS had significantly higher scores on ASI-3 Physical Concerns scale than patients with FEP with a large effect size [$F_{(2,87)} = 5.10$, $p<.01$]. No between-group difference emerged on the scores on ASI-3 Social Concerns and PSWQ.

Effects of anxiety sensitivity dimensions across mental state groups

A generalized linear model was conducted in the ARMS and FEP groups to explore the effects of AS dimensions on mental state controlling for general worry,

Table 1. Socio-demographic and clinical characteristics.

	ARMS group (n = 30) M (SD; range) / n (%)	FEP group (n = 30) M (SD; range) / n (%)	F/χ^2	p-value
Any concurrent Axis I psychiatric disorders (other conditions than FEP/ARMS)	15 (50)	3 (10)	15.42	.05
Major Depressive Disorder	*5 (16.7)*	*1 (3.3)*		
Obsessive-Compulsive Disorder	*1 (3.3)*	*2 (6.7)*		
Generalised Anxiety Disorder	*2 (6.7)*	*0*		
Social Anxiety Disorder	*1 (3.3)*	*0*		
Hypochondriasis	*1 (3.3)*	*0*		
Adjustment Disorder	*1 (3.3)*	*0*		
Depressive Disorder Not Otherwise Specified	*1 (3.3)*	*0*		
Anxiety Disorder Not Otherwise Specified	*3 (10)*	*0*		
Any concurrent personality disorders	3 (10)	0	3.15	.08
Borderline personality disorder	*2 (6.7)*	*0*		
Schizotypal personality disorder	*1 (3.3)*	*0*		
On concurrent psychiatric medication	17 (56.7)	28 (93.3)	11.42	.001

ARMS: At-Risk Mental State; FEP: First Episode of Psychosis.

Table 2. Between-group comparisons on anxiety sensitivity dimensions.

	ARMS group (n = 30) Mean (SD)	FEP group (n = 30) Mean (SD)	Control group (n = 30) Mean (SD)	$F_{(2, 87)}$	p-value	Partial $\eta2$	Post-hoc comparison (Scheffé test)
ASI-3 Physical Concerns	4.47 (4.12)	8.80 (6.17)	6.87 (5.30)	5.10	.008	.10	ARMS > FEP, ARMS = Controls, Controls = FEP
ASI-3 Social Concerns	6.63 (5.52)	8.37 (6.21)	6.73 (4.44)	.95	.387	.02	ARMS = FEP = Controls
ASI-3 Cognitive Concerns	9.27 (5.99)	10.60 (5.06)	4.50 (4.36)	11.48	<.001	.21	ARMS = FEP > Controls
PSWQ	51.63 (13.91)	46.93 (12.60)	54.10 (12.10)	2.39	.097	.05	ARMS = FEP = Controls

ASI-3: Anxiety Sensitivity Index-3; ARMS: At-Risk Mental State; FEP: First Episode of Psychosis; PSWQ: Penn State Worry Questionnaire.

psychiatric comorbidities and sociodemographic variables (gender and age) (Table 3).

Higher scores on the ASI-3 Physical Concerns scale [B = -.324, Wald's $\chi^2_{(1)}$ = 8.29, p < .01] and presence of comorbid psychiatric disorders other than ARMS/FEP [B = -2.726, Wald's $\chi^2_{(1)}$ = 9.33, p < .01] were significantly associated with a higher probability of having ARMS. An effect emerged also for the scores on the ASI-3 Social Concerns scale: higher scores on this scale were associated with a higher probability of having had a recent FEP, despite the fact that such an effect was found only at a marginal significance level [B =.213, Wald's $\chi^2_{(1)}$ = 3.79, p = .052].

Discussion

The present study is the first one aimed to compare the levels of AS dimensions between a group of young individuals with ARMS, a group of remitted patients after a recent FEP and a matched control group recruited from the community. In addition, the association between all the AS dimensions and mental state (ARMS versus FEP condition) was explored controlling for the effects of socio-demographic variables (age and gender), psychiatric comorbidities and intensity of general worry.

In line with our hypothesis, individuals with ARMS and patients with a recent FEP showed higher Cognitive Concerns than control participants suggesting that these groups may worry that mental signals of arousal can lead to catastrophic psychological consequences such as mental incapacitation. This result may be in line with the hypothesis that young individuals experiencing ARMS or the phase after a FEP are more likely to fear losing control over their minds and "going crazy". It may be hypothesized that this

maladaptive belief is reinforced by a selective attentional bias towards cognitive performance such as a difficulty concentrating or thoughts speed. This result suggests the importance of a thorough assessment of Cognitive Concerns in both the groups. In addition, the psychological intervention may focus on this vulnerability/maintenance factor.

Consistent with our hypothesis, individuals with ARMS showed higher levels of Physical Concerns than remitted patients after FEP. This result may be consistent with the cognitive model of ARMS (van der Gaag et al., 2013) which assumes that the high level of arousal and distress in young ARMS individuals is reinforced by catastrophic interpretations of psychotic-like experiences, including bodily sensations. The catastrophic interpretations of such sensations can activate high levels of emotional arousal which in turn make such sensations evolve into somatic misperceptions through a negative vicious cycle based on selective attention on the body signals (Modai & Cygielman, 1986).

No difference emerged between the three groups on Social Concerns. This result was in contrast with our hypothesis and with previous data showing that interpersonal sensitivity and other social anxiety-related features such as social avoidance and fear of social devaluation may be vulnerability/maintenance factors of ARMS and psychotic symptoms (Masillo et al., 2012; Mian et al., 2018). However, the absence of a significant effect may be attributed to the relatively small sample size and a larger sample size in future research should clarify this. Another interpretation may be related to the fact that the participants were help-seeking individuals. Due to this recruitment strategy, other subtypes of ARMS individuals with severe Social Concerns may have been under-represented (*e.g.*, Pozza, Coluccia, Kato, Gaetani, & Ferretti, 2019).

Surprisingly, we did not detect any difference between

Table 3. Generalised linear model: effects of anxiety sensitivity dimensions (ASI-3 scores) on mental state (FEP *versus* ARMS group) (n = 60).

Outcome: Group (FEP versus ARMS group)	B	95% CI Lower	95% CI Upper	Wald's $\chi^2_{(1)}$	*p*-value
Intercept	-2.063	-8.219	4.093	.431	.511
Female gender	-1.347	-2.859	.166	3.045	.081
Male gender	0[a]	0[a]	0[a]	0[a]	0[a]
Age (years)	.201	-.013	.416	3.373	.066
ASI-3 Physical Concerns	-.324	-.545	-.104	8.296	.004
ASI-3 Social Concerns	.213	-.001	.428	3.790	.052
ASI-3 Cognitive Concerns	.022	-.135	.180	.078	.780
With concurrent psychiatric disorders (other disorders than ARMS or FEP)	-2.726	-4.475	-.978	9.338	.002
Without concurrent psychiatric disorders (other disorders than ARMS or FEP)	0[a]	0[a]	0[a]	0[a]	0[a]
PSWQ	-.026	-.107	.055	.392	.531

[a]Parameter set at 0 because redundant in the statistical model; ARMS: At-Risk Mental State; ASI-3: Anxiety Sensitivity Index-3; CI: Confidence Interval; FEP: First Episode of Psychosis; PSWQ: Penn State Worry Questionnaire.

the groups on a general tendency to worry. This result seems to be in contrast with our hypothesis and previous research (Fresán et al., 2015) showing that ARMS individuals have higher levels of worry than healthy controls. Some explanations may be proposed for this. Our findings might be explained by the fact that the control group included community participants who were not screened for mental disorders. In addition, it should be considered that the FEP group was composed by remitted individuals and the ARMS group was assessed by the ERIraos which mostly detects distal symptoms of ARMS. A relevant point for clinical practice may be that on one hand a general worry tendency is not sufficient to discriminate young individuals experiencing ARMS or FEP from community controls; on the other hand, the clinical assessment should focus on some specific contents of the worry process (*i.e.*, physical/cognitive signs of arousal) instead of evaluating a general propensity to worry. In addition, it may be considered that a general tendency to worry is a coping strategy engaged by the ARMS/FEP young individuals to manage emotional distress which works effectively in some life domains and does not work in other domains (Pozza, Domenichetti, & Dèttore, 2019). Thus, clinicians should be aware of this point and the psychotherapeutic intervention aimed to reduce worry may carefully take into account these aspects.

The results of the generalized linear model showed that young ARMS individuals had higher Physical Concerns and a higher probability of a concurrent psychiatric disorder other than ARMS or FEP. This result is in line with our hypothesis and appears in line with the cognitive model of ARMS (van der Gaag et al., 2013) and points out the importance of assessing Physical Concerns as a dimension of AS specific to ARMS.

The lack of a significant effect of Cognitive Concerns is in contrast with our hypothesis and suggests that these two subgroups do not differ with regard to this AS dimension. It may be hypothesized that these two subgroups endorse equally high Cognitive Concerns for different reasons: for example, young individuals experiencing ARMS may fear losing control over their cognitive processes due to the recurrent and persistent psychotic-like symptoms and may fear that such symptoms can get worse. Remitted patients after a recent FEP might be traumatized by this event and might be worried about the cognitive signals of arousal because they can interpret them catastrophically as a warning sign of an imminent relapse. The lack of differences regarding Social Concerns between the two clinical groups and controls and between ARMS and FEP patients may appear inconsistent with our hypothesis and with the literature showing interpersonal sensitivity as a specific marker in ARMS and FEP populations. The relatively small sample size may account for the marginal difference between ARMS and FEP patients where the latter group endorsed higher Social Concerns. It may be that the awareness of a mental disorder and the

traumatic effect of a recent FEP explain this difference. However, a larger sample size and the measurement of additional covariates such as the awareness of having a mental disorder and traumatic symptoms should clarify this point in future research.

Overall, these findings suggest that cognitive behavioural interventions including interoceptive exposure and cognitive restructuring of misinterpretations of arousal signals, mental functioning and social cues, may be used to improve the treatment options for ARMS individuals (Smits, Berry, Tart, & Powers, 2008).

The association between psychiatric comorbidities and ARMS appears to be in line with the view that the ARMS clinical picture may be a prodromal state of a wider spectrum of mental conditions, not only psychosis (*e.g.*, Beck et al., 2019). This result appears consistent with literature data showing that other disorders than ARMS-related conditions are frequent in this clinical population (Hui et al., 2013; Rietdijk et al., 2013). Some explanations may be proposed with respect to this result including the fact that the FEP group consisted of individuals on remission state while ARMS individuals experienced an acute state of distress which can reinforce other disorders than ARMS-related conditions.

The lack of a significant association between general worry and ARMS or FEP is not consistent with our hypothesis and suggests that worry may not be a specific factor discriminating ARMS individuals from those after a FEP. This result supports previous evidence that worry is associated with a variety of mental conditions and is present among patients experiencing different stages of psychosis (Freeman et al., 2012; Fresán et al., 2015; Pozza & Dèttore, 2017).

Limitations and conclusions

The cross-sectional design of the present study does not allow us to draw reliable conclusions about the causal link between AS dimensions and ARMS. Future research should assess the prognostic value of AS dimensions in the first stages of psychosis by monitoring their levels over time. An interesting point may be investigating which AS dimensions predict conversion to a FEP in ARMS individuals or a relapse in remitted patients after a FEP. If such a role of AS dimensions in ARMS and FEP populations is supported by further research, a clinical implication may be the importance of normalizing the experience of arousal-related symptoms and the use of some evidence-based cognitive behavioral techniques, such as interoceptive exposure and cognitive restructuring, targeting specific AS dimensions as a strategy to prevent conversion or relapse in a transdiagnostic fashion (*e.g.*, Pozza, Coradeschi, & Dèttore, 2013; Schmidt et al., 2007).

The relatively small sample size may be another shortcoming which may have increased the probability of a type-II error and have limited the statistical power of the

effect of Social Concerns on FEP status, emerged at a borderline significance level. The relatively small percentage of comorbid anxiety or depressive disorders prevented an investigation of the effect of these specific types of comorbidity.

The small sample size also did not allow the exploration of the interaction effects between AS dimensions and other relevant variables such as demographic factors (*e.g.*, gender), concurrent anxiety/depressive disorders (Coluccia, Ferretti, Fagiolini, & Pozza, 2015; Norr, Albanese, Allan, & Schmidt, 2015; Rietschel et al., 2017) or other cognitive factors (Pozza et al., 2019), which may affect mental state. As shown by a recent meta-analysis (Boldrini et al., 2019), personality disorders are quite common in the ARMS population and affect about 40% of the individuals. It may be interesting to explore whether the levels of certain AS dimensions are different between ARMS individuals with comorbid personality disorders and those without, such as schizotypal and borderline personality disorders which are the most common diagnoses.

Another limitation regards the fact that in the FEP group the number of females was smaller than that of males. This data, however, appears to be in line with other studies where young individuals with a FEP are more frequently males (*e.g.*, Abel, Drake, & Goldstein, 2010). Finally, it may be interesting to evaluate the effects of specific ARMS features such as basic symptoms and ultra-high-risk symptoms instead of considering ARMS as a unitary condition. For example, it may be clinically useful to explore whether psychotic-like experiences and basic symptoms specifically related to bodily signals (*e.g.*, abnormal bodily phenomena) are associated with Physical Concerns.

In conclusion, the present study was the first empirical investigation of the AS dimensions in ARMS and FEP young individuals. Cognitive Concerns seem to be higher in these clinical groups than in community controls and Physical Concerns might be specific to the ARMS group, irrespective of demographic variables, psychiatric comorbidities and a general tendency to worry. Psychotherapeutic practice with these groups should focus on these vulnerability and maintenance factors to improve treatment and prognosis of these young individuals.

References

Abel, K. M., Drake, R., & Goldstein, J. M. (2010). Sex differences in schizophrenia. *Intern Rev Psychiatry 22*, 417-428.

American Psychological Association (2002). Ethical principles of psychologists and code of conduct. *Am Psychologist 57*, 1060-1073.

Barcaccia, B., Baiocco, R., Pozza, A., Pallini, S., Mancini, F., & Salvati, M. (2019). The more you judge the worse you feel. A judgemental attitude towards one's inner experience predicts depression and anxiety. *Personality and Individual Differences 138*, 33-39.

Beck, K., Andreou, C., Studerus, E., Heitz, U., Ittig, S., Leanza, L., & Riecher-Rössler, A. (2019). Clinical and functional long-term outcome of patients at clinical high risk (CHR) for psychosis without transition to psychosis: A systematic review. *Schizophr Res 210*, 39-47.

Boldrini, T., Tanzilli A., Pontillo M., Chirumbolo A., Vicari S., & Lingiardi V. (2019). Comorbid personality disorders in individuals with an at-risk mental state for psychosis: A meta-analytic review. *Frontiers in Psychiatry 10*, 429.

Borkovec, T. D., & Inz, J. (1990). The nature of worry in generalized anxiety disorder: a predominance of thought activity. *Behav Res Ther 28*, 153–158.

Cohen, J. (1998). *Statistical power analysis for the behavioral sciences.* New York, NY: Routledge.

Coluccia, A., Ferretti, F., Fagiolini, A., & Pozza, A. (2015). Incidenza e fattori di rischio per disturbi psicotici nelle popolazioni migranti in Europa: una metanalisi di studi trasversali. *Italian J Criminol 9*, 29–39.

Cotter, J., Yung, A. R., Carney, R., & Drake, R. J. (2017). Metacognitive beliefs in the at-risk mental state: a systematic review and meta-analysis. *Behav Res Ther 90*, 25-31.

Escocard, M. R. P. G., Fioravanti-Bastos, A. C. M., & Landeira-Fernandez, J. (2009). Anxiety sensitivity factor structure among Brazilian patients with anxiety disorders. *J Psychopathol Behav Assessment 31*, 246-255.

First, M., Spitzer, R., Gibbon, M., & Williams, J. (1997a). *Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I)*. Firenze: Giunti OS.

First, M. B., Gibbon, M., Spitzer, R. L., Williams, J. B. W., & Benjamin, L. S. (1997b). *Structured Clinical Interview for DSM-IV Axis II Personality Disorders (SCID-II)*. Washington, DC, USA: American Psychiatric Press.

Freeman, D., Stahl, D., McManus, S., Meltzer, H., Brugha, T., Wiles, N., & Bebbington, P. (2012). Insomnia, worry, anxiety and depression as predictors of the occurrence and persistence of paranoid thinking. *Soc Psychiatry Psychiatric Epidemiol 47*, 1195–1203.

Fresán, A., Leon-Ortiz, P., Robles-García, R., Azcárraga, M., Guizar, D., Reyes-Madrigal, F., & de la Fuente-Sandoval, C. (2015). Personality features in ultra-high risk for psychosis: a comparative study with schizophrenia and control subjects using the Temperament and Character Inventory-Revised (TCI-R). *J Psychiatric Res 61*, 168–173.

Fusar-Poli, P., Borgwardt, S., Bechdolf, A., Addington, J., Riecher-Rössler, A., Schultze-Lutter, F., (...) & Valmaggia, L. (2013). The psychosis high-risk state: a comprehensive state-of-the-art review. *JAMA Psychiatry, 70*, 107-120.

Fusar-Poli, P., Nelson, B., Valmaggia, L., Yung, A. R., & McGuire, P. K. (2014). Comorbid depressive and anxiety disorders in 509 individuals with an at-risk mental state: impact on psychopathology and transition to psychosis. *Schizophr Bull 40*, 120-131.

Gross, G. (1989). The 'basic' symptoms of schizophrenia. *British J Psychiatry, 155*, 21-25.

Häfner, H., Riecher, A., Maurer, K., Meissner, S., Schmidtke, A., Fätkenheuer, B., & Löffler, W. an der Heiden W. (1990). Ein Instrument zur retrospektiven Einschätzung des Erkrankungsbeginns bei Schizophrenie (Instrument for the Retrospective Assessment of the Onset of Schizophrenia–"IRAOS") Entwicklung und Ergebnisse. *Zeitschrift für klinische Psychologie, Psychiatrie und Psychotherapie, 19*, 230-255.

Hartley, S., Haddock, G., Vasconcelos, E., Sa, D., Emsley, R., & Barrowclough, C. (2014). An experience sampling study of worry and rumination in psychosis. *Psychological Med 44*, 1605–1614.

Hui, C., Morcillo, C., Russo, D. A., Stochl, J., Shelley, G. F., Painter, M., … Perez, J. (2013). Psychiatric morbidity, functioning and quality of life in young people at clinical high risk for psychosis. *Schizophr Res 148*, 175–180.

Kemper, C. J., Lutz, J., Bähr, T., Rüddel, H., & Hock, M. (2012). Construct validity of the anxiety sensitivity index–3 in clinical samples. *Assessment 19*, 89-100.

Luzón, O., Harrop, C., & Nolan, F. (2009). Cognitive Processes during Acute Psychosis: The Role of Heightened Responsibility and Catastrophic Misinterpretations. *Behav Cognitive Psychotherapy 37*, 357-377.

Maffei, C., Fossati, A., Agostoni, I., Barraco, A., Bagnato, M., Donati, D., Namia, C., Novella, L., & Petrachi, M. (1997). Interrater reliability and internal consistency of the Structured Clinical Interview for DSM-IV Axis II Personality Disorders (SCID-II), version 2.0. *J Personality Disord, 11*, 279–284.

Masillo, A., Day, F., Laing, J., Howes, O., Fusar-Poli, P., Byrne, M., (...) & Valmaggia, L. R. (2012). Interpersonal sensitivity in the at-risk mental state for psychosis. *Psychological Med 42*, 1835-1845.

Masillo, A., Valmaggia, L. R., Saba, R., Brandizzi, M., Lindau, J. F., Solfanelli, A., (...) & Di Pietro, D. (2016). Interpersonal sensitivity and functioning impairment in youth at ultra-high risk for psychosis. *European Child & Adolescent Psychiatry 25*, 7-16.

Mazzi, F., Morosini, P., De Girolamo, G., Lussetti, M., & Guaraldi, G. P. (2000). *SCID-I– Structured Clinical Interview for DSM-IV Axis I Disorders (Italian edition).* Firenze: Giunti OS.

Meneghelli, A., Alpi, A., Cascio, M. T., Häfner, H., Maurer, K., Preti, A., Raballo, A., & Cocchi, A. (2014). Italian validation of the "Early Recognition Inventory for the retrospective assessment of the Onset of Schizophrenia Checklist": reliability, validity and instructions for use. *J Psychopathol 20*, 186-198.

Meyer, T. J., Miller, M. L., Metzger, R. L., & Borkovec, T. D. (1990). Development and validation of the Penn State Worry Questionnaire. *Behav Res Ther 28*, 487–495.

Mian, L., Lattanzi, G. M., & Tognin, S. (2018). Coping strategies in individuals at ultra-high risk of psychosis: A systematic review. *Early Interv Psychiatry 12*, 525-534.

Modai, I., & Cygielman, G. (1986). Conversion Hallucinations– A Possible Mental Mechanism. *Psychopathol 19*, 324-326.

Morani, S., Pricci, D., & Sanavio, E. (1999). Penn State Worry Questionnaire e Worry Domains Questionnaire. Presentazione delle versioni italiane ed analisi della fedeltà. *Psicoterapia Cognitiva e Comportamentale 5*, 13–34.

Naragon-Gainey, K. (2010). Meta-analysis of the relations of anxiety sensitivity to the depressive and anxiety disorders. *Psychological Bull 136*, 128-150.

Norr, A. M., Albanese, B. J., Allan, N. P., & Schmidt, N. B. (2015). Anxiety sensitivity as a mechanism for gender discrepancies in anxiety and mood symptoms. *J Psychiatric Res 62*, 101-107.

Olejnik S, Algina J. (2003). Generalized eta and omega squared statistics: measures of effect size for some common research designs. *Psychological Methods 8*, 434-447.

Olthuis, J. V., Watt, M. C., & Stewart, S. H. (2014). Anxiety Sensitivity Index (ASI-3) subscales predict unique variance in anxiety and depressive symptoms. *J Anxiety Disord 28*, 115-124.

Pozza, A., Coluccia, A., Kato, T., Gaetani, M., & Ferretti, F. (2019). The 'Hikikomori' syndrome: worldwide prevalence and co-occurring major psychiatric disorders: a systematic review and meta-analysis protocol. *BMJ Open 9*, e025213.

Pozza, A., Coradeschi, D., & Dèttore, D. (2013). Do dysfunctional beliefs moderate the negative influence of comorbid severe depression on outcome of residential treatment for refractory OCD? A pilot study. *Clinical Neuropsychiatry 10*, 72-83.

Pozza, A., & Dèttore, D. (2015). Psychometric Evidence of the Italian Anxiety Sensitivity Index-3 (ASI-3) in Patients with Anxiety Disorders and Psychosis. *Res Psychol Behav Sci 3*, 7-17.

Pozza, A., & Dèttore, D. (2017). The CBQ-p: a confirmatory study on factor structure and convergent validity with psychotic like experiences and cognitions in adolescents and young adults. *BPA-Applied Psychol Bull 65*, 58–69.

Pozza, A., & Dèttore, D. (2019). Modular cognitive-behavioral therapy for affective symptoms in young individuals at ultra-high risk of first episode of psychosis: Randomized controlled trial. *J Clinical Psychol 76*, 392-405. Doi:10.1002/jclp.22901

Pozza, A., Domenichetti, S., & Dèttore, D. (2019). Cognitive behavioural therapy for worry in young individuals with at-risk mental states: a preliminary investigation. *Cognitiv Behav Ther 12*, e36.

Rausch, F., Eifler, S., Esser, A., Esslinger, C., Schirmbeck, F., Meyer-Lindenberg, A., & Zink, M. (2013). The Early Recognition Inventory ERIraos detects at risk mental states of psychosis with high sensitivity. *Comprehensive Psychiatry 54*, 1068-1076.

Reiss, S., McNally, R. J. (1985). Expectancy model of fear. In S. Reiss & R.R. Botzin (Eds.), Theoretical issues in behavior therapy (pp. 107-121). San Diego, CA: Academic Press, 1985.

Rietdijk, J., Ising, H. K., Dragt, S., Klaassen, R., Nieman, D., Wunderink, L., (...) & van der Gaag, M. (2013). Depression and social anxiety in help-seeking patients with an ultra-high risk for developing psychosis. *Psychiatry Res 209*, 309-313.

Rietschel, L., Lambert, M., Karow, A., Zink, M., Müller, H., Heinz, A., (...) & Naber, D. (2017). Clinical high risk for psychosis: gender differences in symptoms and social functioning. *Early Interv Psychiatry, 11*, 306-313.

Schmidt, N. B., Eggleston, A. M., Woolaway-Bickel, K., Fitzpatrick, K. K., Vasey, M. W., & Richey, J. A. (2007). Anxiety Sensitivity Amelioration Training (ASAT): A longitudinal primary prevention program targeting cognitive vulnerability. *J Anxiety Disord 21*, 302-319.

Schultze-Lutter, F. (2009). Subjective symptoms of schizophrenia in research and the clinic: the basic symptom concept. *Schizophr Bull 35*, 5-8.

Schultze-Lutter, F., Ruhrmann, S., Berning, J., Maier, W., & Klosterkötter, J. (2008). Basic symptoms and ultrahigh risk criteria: symptom development in the initial prodromal state. *Schizophr Bull 36*, 182-191.

Smits, J. A., Berry, A. C., Tart, C. D., & Powers, M. B. (2008). The efficacy of cognitive-behavioral interventions for reducing anxiety sensitivity: A meta-analytic review. *Behav Res Ther 46*, 1047-1054.

Startup, H., Freeman, D., & Garety, P. A. (2007). Persecutory delusions and catastrophic worry in psychosis: developing the understanding of delusion distress and persistence. *Behav Res Ther 45*, 523-537.

Taylor, S. E. (1999). *Anxiety sensitivity: Theory, research, and treatment of the fear of anxiety.* Lawrence Erlbaum Associates Publishers: Mahwah, NJ.

Taylor, S., Zvolensky, M. J., Cox, B. J., Deacon, B., Heimberg, R. G., Ledley, D. R., (...) & Coles, M. (2007). Robust dimensions of anxiety sensitivity: development and initial validation of the Anxiety Sensitivity Index-3. *Psychological Assessment 19*, 176-188.

van der Gaag, M., Nieman, D., & van den Berg, D. (2013). *CBT for Those at Risk of a First Episode Psychosis: Evidence-based Psychotherapy for People with an "at Risk Mental State".* New York, NY: Routledge.

Yung, A. R., & McGorry, P. D. (1996). The initial prodrome in psychosis: descriptive and qualitative aspects. *Australian New Zealand J Psychiatry 30*, 587-599.

Yung, A. R., Yuen, H. P., McGorry, P. D., Phillips, L. J., Kelly, D., Dell'Olio, M., (...) & Godfrey, K. (2005). Mapping the onset of psychosis: the comprehensive assessment of at-risk mental states. *Australian New Zealand J Psychiatry, 39*, 964-971.

Wheaton, M. G., Deacon, B. J., McGrath, P. B., Berman, N. C., & Abramowitz, J. S. (2012). Dimensions of anxiety sensitivity in the anxiety disorders: Evaluation of the ASI-3. *J Anxiety Disord 26*, 401-408.