



Self-reported fears and mental health in elementary school children across Europe

Mathilde M. Husky¹ · Adina Bitfoi² · Christine Chan-Chee³ · Mauro Giovanni Carta⁴ · Dietmar Goelitz⁵ · Ceren Koç⁶ · Sigita Lesinskiene⁷ · Zlatka Mihova⁸ · Roy Otten⁹ · Taraneh Shojaei¹⁰ · Viviane Kovess-Masfety¹¹

Received: 8 October 2020 / Accepted: 8 June 2021
© Springer-Verlag GmbH Germany, part of Springer Nature 2021

Abstract

Fears are common in the general population and particularly among children. The number of fear subtypes (animals, natural environment, situational, blood–injection–injury or other type) has been shown to be associated with psychopathology. Furthermore, there is evidence suggesting that some subtypes may be more often associated with mental disorders than others. The present study uses data from a large cross sectional survey, the School Children Mental Health in Europe (SCMHE) study, conducted in eight European countries on children ages 6 through 13-years-old attending elementary school ($n=9613$). Fear subtypes and self-reported mental health were assessed using the Dominic Interactive (DI), a self-administered computerized image-based questionnaire. The findings show that the number of fear subtypes is strongly associated with self-reported internalizing and externalizing problems. In addition, adjusting for the number of subtypes, fear of animals was less likely than other fears to be associated with psychopathology. The findings support the notion that children who report excessive and generalized fear should be targeted for prevention, consistent with research identifying childhood onset generalized specific phobia as a probable precursor to subsequent psychopathology.

Keywords Fears · Specific phobia · Mental health · Children

✉ Mathilde M. Husky
mathilde.husky@u-bordeaux.fr

¹ Laboratoire de Psychologie, EA4139, Université de Bordeaux, 3 ter, place de la Victoire, 33076 Bordeaux, France

² The Romanian League for Mental Health, Bucharest, Romania

³ Santé Publique France, Paris, France

⁴ Centro Di Psichiatria Di Consulenza E Psicosomatica Azienda Ospedaliero, Universitaria Di Cagliari, Cagliari, Italy

⁵ Department of Humanities, Social Sciences and Theology, Friedrich-Alexander-University, Erlangen-Nuernberg, Germany

⁶ Yeniden Health and Education Society, Istanbul, Turkey

⁷ Clinic of Psychiatry, Institute of Clinical Medicine, Faculty of Medicine, Vilnius University, Vilnius, Lithuania

⁸ New Bulgarian University, Sofia, Bulgaria

⁹ Behavioural Science Institute, Radboud University Nijmegen, Nijmegen, The Netherlands

¹⁰ French Embassy in Thailand, Bangkok, Bangkok, Thailand

¹¹ Université de Paris, Institut de Psychologie, Paris, France

Introduction

Fear is a basic emotion considered an adaptive response to a perceived threat [1]. Excessive fears-associated certain objects, creatures or situations have been described as specific fears and have been found to be very common among children [2–4]. In fact, specific fears are so common that they are considered to be an integral part of typical child development [2–4]. The content of fears has been shown to evolve as the child matures for instance with fears of fictional creatures dissipating and fear of social criticism or bodily injury appearing over time [4, 5]. The frequency of fears has also been shown to decrease with age, with fewer adolescents endorsing fears as compared to elementary school children, to be more frequent among girls as compared to boys [5–7], and to be more frequent in lower socioeconomic environments [8]. While fears have been described as developmentally normal, age-dependent, transient experiences, there has been significant interest in the association of fears with psychopathology.

Specific fears that interfere with functioning are the central component of specific phobia, a common anxiety

disorder with an estimated lifetime prevalence of 8.1% of the general population of high income countries [9]. Furthermore, specific phobias have an early onset with an estimated median age of onset around 8 years old and are typically more frequent among females as compared to males [9, 10]. The DSM [11] recognizes five subtypes of fears in specific phobia: animal type (e.g., spiders, insects, dogs), natural environment type (e.g., heights, storms, water), situational type (e.g., elevators, enclosed places), blood-injection-injury type (e.g., needles, seeing blood) and other type (e.g., vomiting, contracting an illness; costumed characters) [11]. Epidemiologic data suggests that fear of heights and animals are the most prevalent subtypes [12]. For instance, a population-based survey of adults in the Netherlands reported that fear of heights was the most prevalent lifetime fear (19.1%), followed by fear of animals (12.6%) with 41.2% of the sample reporting at least one unreasonable fear [13]. Research further suggests that it is common for adults with specific phobia to have multiple subtypes of fears, with one [12] to two thirds [14] reporting a single subtype.

While the majority (60.5%) of adults with lifetime specific phobia display comorbidity with other psychiatric disorders, including other internalizing disorders such as anxiety (41.2%) or mood (34.3%) disorders [9], there is evidence suggesting that specific phobia may be an early indicator of subsequent psychopathology and in particular internalizing disorders, as in the majority of cases (72.6%) the onset of specific phobia preceded the onset of the comorbid disorder. A prospective study of adolescents (age 14) followed-up 10 years later provided further evidence of specific phobia predicting a range of subsequent first onset internalizing disorders [15]. Specifically, the strongest prediction was observed with regard to anxiety disorders such as panic disorder (risk ratio (RR)=4.38), generalized anxiety disorder (RR=4.10), obsessive-compulsive disorder (RR=3.79), post-traumatic stress disorder (RR=2.15) and mood disorders including dysthymia (RR=2.75) and major depression (RR=1.54) [15]. Considering these findings, it has been suggested that targeting early treatment of phobias may be beneficial in the prevention of subsequent psychopathology [14, 16].

There has been some research on specific subtypes of fears as well as on the concurrent presence of multiple subtypes with regard to their differential associations with psychopathology. Regardless of the specific nature of the fear, an increasing number of fear subtypes in specific phobia has consistently been shown to be associated with greater probability of comorbid disorders, greater impairment and disability [9, 12, 14, 15, 17]. When specific subtypes of fears are considered, additional research is needed considering the contrasting findings. In a population-based survey of adults, variations were observed between fear subtypes and the level of impairment and comorbidity patterns whereby

fear of animals tended to be associated with less impairment as compared to fear of being alone or fear of enclosed places [13]. Another study confirmed the differential association of fear subtypes with psychopathology although the findings differed considerably. Specifically, in a longitudinal study conducted in Germany among adolescents followed-up for 10 years, the subtype with the least elevated risk of subsequent mental disorders was the environmental subtype, whereas the animal subtype, situational, and blood-injection-injury subtypes were associated with a broad range of subsequent disorders [15]. In contrast, data from the National Comorbidity Survey-Adolescent supplement, the blood-injection-injury and situational subtypes were associated with greater impairment and comorbidity [17]. Among Korean youth, fear of animals was found to be the least associated with psychopathology [18]. Taken together, prior research has provided clear evidence that the number of fears is associated with psychopathology, and that fear subtypes are differentially associated with psychopathology. However, which subtypes pose a greater risk remains unclear. Additional research is needed to identify fear-specific associations and to understand the mechanisms involved in these associations.

Studies that have established associations between childhood fears and phobias and psychopathology have typically been conducted in adolescents or adults using retrospective estimations of fears and disorder age of onset, which may be subject recall bias [19, 20]. The present study aims to examine specific self-reported fears at the age at which phobias typically have their onset in a large international sample of elementary school children stemming from eight European countries. The study seeks to determine the distribution of specific fears and to examine their differential association with self-reported internalizing and externalizing problems. The study further aims to examine the extent to which the type of fear is an important factor when the number of fears is taken into account. We hypothesize that the number of fear subtypes will be associated with psychopathology and that there would be differential associations of fear subtypes with psychopathology.

Methods

Sampling and procedure

Data were drawn from the School Children Mental Health in Europe (SCMHE) study, a cross sectional survey conducted in the Netherlands, Italy, Germany, Lithuania, Bulgaria, Romania, and Turkey in 2010 and from a related cross-sectional study conducted two large regions of France in 2004 using similar methodology to collect data from children, parents, and teachers. In each country, a three-stage probability

sampling method (school-level, class-level and child-level) was used [21]. Parents received a packet containing socio-demographic questions to complete and to return to the school. Passive consent was used: parents of selected children received a written informed consent form to be signed and returned to the school should they oppose their child's participation. Children who were present on the day of the study were asked to complete a computerized questionnaire to evaluate their self-reported mental health. All countries received approval from appropriate local ethical review boards. Overall, SCMHE gathered data on 10,245 children between 6 and 13-years old from at least one informant. In the present study, only children who completed the Dominic Interactive were included ($n=9613$).

Measures

Child self-reported mental health

Self-reported mental health was measured using the Dominic Interactive (DI) [22, 23]. The DI is a self-administered computerized questionnaire relevant for children aged between 6 and 13-years old. The child is invited to follow a cartoon-like character, Dominic, and is asked whether he or she feels the same as Dominic (who can be adapted to match the child's gender and ethnicity). The emotional and behavioral symptoms of seven DSM-IV childhood mental disorders are assessed through 91 items [24] and assesses the probable presence of internalizing disorders (including separation anxiety disorder, generalized anxiety disorder, major depressive disorder, and phobias) and externalizing disorders (including attention deficit/hyperactivity disorder (ADHD), conduct disorder (CD) and oppositional defiant disorder (ODD)). The child is asked to indicate whether he/

she relates with Dominic in each scenario. Probable cases of each disorder are determined based on established cut-points. The DI is available in all languages used in each participating country [25]. The presence or absence of nine fears categorized into four types of fears was assessed: animal type (insects, dogs, cat, and spiders), environmental type (storms, heights), situational type (elevators, hallways), or other type (persons in costumes). For analysis, two variables were examined: the number of types of fears ranging from 1 to 4, and the type of fear reported.

Data analysis

First, the prevalence of any fear and of specific types of fears was examined by age and by sex pooling children from all countries included in the study using cross-tabulations (Fig. 1). Second, cross-tabulations were used to present the number of types of fears among those with at least one fear (Table 1). In addition, the mean number of fear subtypes and 95% confidence interval was computed. Third, using cross-tabulations, the presence of any fear, as well as the number of fear subtypes were presented by child sex, age, and country of residence (Table 2). Chi-squares were performed to identify between-group differences in the number of types of fears by sociodemographic characteristic. Fourth, univariate associations between the number of fear subtypes as well as the specific types of fear were determined using logistic regressions to compute unadjusted odds of presenting each internalizing disorder (dichotomous variable) (Table 3). Then, six multivariate logistic regressions adjusting for child age and sex as well as country of residence were performed using each internalizing disorder as the outcome (Table 4). In model 1, each type of fear was simultaneously entered in the model. Model 2 included the number of types of fears. This was

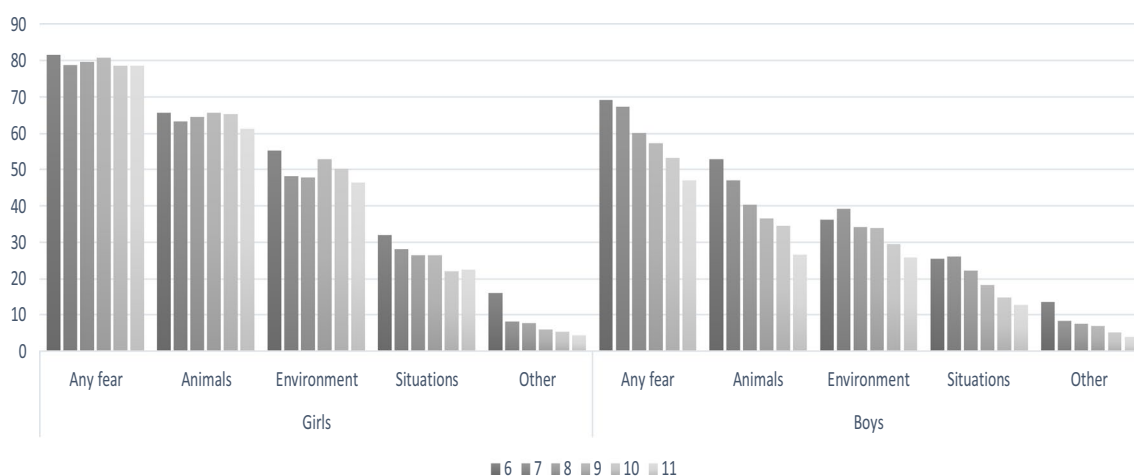


Fig. 1 Prevalence of self-reported fears in children across Europe by age and sex

Table 1 Distribution of self-reported fears in children across Europe

	Prevalence of fears subtypes <i>n</i> = 9613			Number of types of fears among those with at least one fear <i>n</i> = 6611								Mean number of fears subtypes	
				1		2		3		4			
	<i>n</i>	%	SE	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	M	95%CI
Specific fears													
Animals	4945	51.44	.005	1603	32.42	2108	42.63	1027	20.77	207	4.19	1.97	1.94–1.99
Situations	2183	22.71	.004	361	16.54	724	33.17	891	40.82	207	9.48	2.43	2.40–2.47
Environment	3978	41.38	.005	868	21.82	1891	47.54	1012	25.44	207	5.20	2.14	2.11–2.17
Other	691	7.19	.003	67	9.70	167	24.17	250	36.18	207	29.96	2.86	2.79–2.94
Any fear	6611	68.77	.005	2899	43.85	2445	36.98	1060	16.03	207	3.13	1.78	1.76–1.80

Table 2 Distribution of self-reported number of subtypes of fears in children across Europe by sociodemographic characteristic

	Any fear		Number of subtypes of fears among those with at least one								Chi ²	<i>p</i> value
			1		2		3		4			
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%		
Child's sex	***										91.076	<.0001
Boy	2882	58.61	1451	50.35	954	33.10	388	13.46	89	3.09		
Girl	3729	79.41	1448	38.83	1,491	39.98	672	18.02	118	3.16		
Child's age	***										78.225	<.0001
6	496	75.15	178	35.89	182	36.69	109	21.98	27	5.44		
7	1300	72.83	540	41.54	478	36.77	234	18.00	48	3.69		
8	1458	69.56	643	44.10	528	36.21	229	15.71	58	3.98	117.510	<.0001
9	1434	68.65	615	42.89	542	37.80	248	17.29	29	2.02		
10	1377	65.82	634	46.04	527	38.27	181	13.14	35	2.54		
11 +	546	61.28	289	52.93	188	34.43	59	10.81	10	1.83		
Country	***										117.510	<.0001
Bulgaria	878	63.53	399	45.44	289	32.92	145	16.51	45	5.13		
France	1293	73.55	512	39.60	480	37.12	252	19.49	49	3.79		
Germany	572	64.13	294	51.40	201	35.14	63	11.01	14	2.45		
Italy	511	67.50	226	44.23	192	37.57	81	15.85	12	2.35		
Lithuania	821	72.02	331	40.32	337	41.05	130	15.83	23	2.80		
Netherlands	876	58.99	469	53.54	308	35.16	88	10.05	11	1.26		
Romania	1064	76.27	428	40.23	406	38.16	194	18.23	36	3.38		
Turkey	596	74.13	240	40.27	232	38.93	107	17.95	17	2.85		

****p* < .0001

performed to test the individual association of the type of fear and the number of fears with each outcome. Models 3 through 6 entered each of the four types of fear sequentially and adjusted for the number of fears to identify potential effects of each fear subtype beyond the presence of multiple types. Finally, a similar procedure of univariate (Table 5) and multivariate analyses (Table 6) were used to examine the association of fears with individual externalizing disorders. Significance was set at a *p* < 0.01 due to the number of models tested. Analyses were conducted using Stata 15.

Results

Distribution of self-reported fears in children across Europe

The great majority of children reported at least one fear (68.77%), fear of animals (51.44%) was the most common, followed by environmental fears (41.38%) fear of specific situations (22.71%), and lastly other types of fears (7.19%) (Table 1). Figure 1 also illustrates the steady decrease in

Table 3 Univariate association between number of fear subtypes and self-reported internalizing problems among children with at least one fear ($n = 6611$)

	Any internalizing problem			Depression			Separation anxiety			Generalized anxiety disorder		
	%	OR	95%CI	%	OR	95%CI	%	OR	95%CI	%	OR	95%CI
Number of fear subtypes												
2	20.50	Ref		5.03	Ref		15.42	ref		6.34	ref	
3	27.57	1.99***	1.71–2.31	10.00	2.02***	1.51–2.71	25.28	1.90***	1.60–2.25	13.40	2.14***	1.64–2.79
4	35.00	2.96***	2.42–3.63	27.54	5.64***	4.25–7.48	50.24	4.33***	3.63–5.16	37.20	6.60***	5.11–8.53
Type of fear												
Animals	17.15	1.06	.91–1.23	5.95	1.53**	1.17–2.01	16.04	1.32**	1.12–1.56	7.68	1.59***	1.24–2.03
Situations	20.94	1.45***	1.26–1.68	8.93	2.53***	2.05–3.14	21.53	2.00***	1.75–2.30	11.54	2.61***	2.16–3.16
Environment	20.71	1.89***	1.64–2.19	6.84	2.12***	1.66–2.71	19.26	2.41***	2.06–2.82	9.28	2.76***	2.19–3.48
Other	24.60	1.67***	1.33–2.10	15.20	3.98***	3.12–5.07	28.80	2.57***	2.15–3.08	19.10	3.99***	3.20–4.97

Bold signifies odds that are significant at $p < .01$

* $p < .05$

** $p < .01$

*** $p < .001$

the prevalence of fears by age among children, although the decrease was more important among boys as compared to girls. Girls were significantly more likely to report any fear (79.41%) as compared to boys (58.61%), and fears decreased with age from 75.15% at age 6 to 61.28% at age 11 or above (Table 2). Country of residence was also associated with reporting any fear ranging from 58.99% in the Netherlands to 76.27% in Romania.

Association between number of fear subtypes and self-reported internalizing problems

The number of types of fears was strongly associated with odds of any internalizing problem, depression, separation anxiety and generalized anxiety (Table 3). Taken individually, each type of fear was associated with increased odds of internalizing problems although fear of animals was not significantly associated with odds of any internalizing disorder and is less associated with odds of specific disorders as compared with other types of fear. For instance, fear of situations had a significantly stronger association with depression (OR = 2.53; 95%CI = 2.05–3.14), separation anxiety (OR = 2.00; 95%CI = 1.75–2.30), generalized anxiety disorder (OR = 2.61; 95%CI = 2.16–3.16) as compared to fear of animals (OR = 1.53, 1.32, and 1.59, respectively). The same was true for environmental fears and other types of fears, although the confidence interval of environmental fears for depression overlapped with that of animal fears.

In multivariate analyses, the presence of each type of fear was significantly associated with increased odds of internalizing problems (Model 1), so was the number of fear subtypes (Model 2). Fear of animals (Model

3) was associated with decreased odds of any internalizing problem (AOR = 0.70, 95%CI = 0.59–0.84), depression (AOR = 0.73, 95%CI = 0.53–1.00), separation anxiety (AOR = 0.71, 95%CI = 0.59–0.86), and generalized anxiety (AOR = 0.67, 95%CI = 0.50–0.90) adjusting for the number of fears. Environmental fears (Model 4) were associated with increased odds of separation anxiety (AOR = 1.43, 95%CI = 1.18–1.74) and any internalizing problem (AOR = 1.35, 95%CI = 1.14–1.60), though they were not significantly associated with depression or generalized anxiety. Situational fears (Model 5) were not significantly associated with odds of internalizing problems considered together or individually. Finally, other types of fears (Model 6) was only associated with increased odds of depression (AOR = 1.61, 95%CI = 1.14–2.29). In all models examining individual fears, an increasing number of fears was consistently and strongly associated with odds of internalizing problems.

Association between number of fear subtypes and self-reported externalizing problems

As was observed with regard to internalizing disorders, the number of fears was strongly associated with odds of any externalizing problem, ADHD, conduct and ODD (Table 5). Similarly, each type of fear was associated with increased odds of externalizing disorders although the strength of the association of fear of animals was significantly weaker than the association of situational fears.

In multivariate analyses adjusting for child age and sex as well as for country of residence, each type of fear was associated with increased odds of externalizing problems with AORs ranging from 1.71 (95%CI = 1.39–2.12) for

Table 4 Multivariate association between number of fear subtypes and self-reported internalizing problems

	Any internalizing problem		Depression		Separation anxiety		Generalized anxiety disorder	
	AOR	95%CI	AOR	95%CI	AOR	95%CI	AOR	95%CI
Model 1								
Type of fear								
Animals	1.37***	1.16–1.61	1.68***	1.27–2.23	1.50***	1.26–1.78	1.71***	1.32–2.20
Environment	2.14***	1.84–2.49	1.94***	1.51–2.51	2.43***	2.06–2.84	2.65***	2.09–3.37
Situations	1.67***	1.43–1.94	2.33***	1.87–2.92	1.89***	1.64–2.19	2.37***	1.94–2.89
Other fears	1.80***	1.42–2.28	3.41***	2.63–4.42	2.12***	1.75–2.57	3.23***	2.55–4.09
Model 2								
Number of fear subtypes								
2	2.00***	1.71–2.33	2.09***	1.55–2.81	1.90***	1.60–2.26	2.15***	1.64–2.81
3	2.93***	2.37–3.61	4.46***	3.26–6.09	3.42***	2.82–4.16	4.93***	3.72–6.53
4	4.29***	1.68–10.98	14.60***	9.84–21.65	9.84***	7.22–13.39	18.23***	12.69–26.20
Model 3								
Animals	.70***	.59–.84	.73	.53–1.00	.71**	.59–.86	.67**	.50–.90
Number of fears								
2	2.23***	1.89–2.63	2.31***	1.69–3.18	2.12***	1.76–2.55	2.44***	1.83–3.26
3	3.38***	2.70–4.23	5.13***	3.63–7.28	3.97***	3.20–4.91	5.88***	4.29–8.05
4	5.03**	1.96–12.93	17.07***	11.12–26.21	11.55***	88.36–15.97	22.15***	14.93–32.84
Model 4								
Environment	1.35**	1.14–1.60	.87	.63–1.19	1.43***	1.18–1.74	1.25	.93–1.67
Number of fears								
2	1.74***	1.46–2.07	2.23***	1.60–3.11	1.61***	1.33–1.95	1.94***	1.43–2.62
3	2.42***	1.92–3.07	4.90***	3.35–7.15	2.73***	2.17–3.42	4.27***	3.06–5.97
4	3.48*	1.35–8.96	16.16***	10.24–25.50	7.70***	5.53–10.74	15.66***	10.39–23.60
Model 5								
Situations	.99	.83–1.18	1.08	.80–1.45	.98	.81–1.17	.98	.75–1.27
Number of fears								
2	2.00***	1.71–2.34	2.06***	1.52–2.78	1.91***	1.60–2.28	2.16***	1.64–2.83
3	2.95***	2.31–3.75	4.22***	2.89–6.15	3.48***	2.75–4.40	5.00***	3.57–7.02
4	4.32**	1.67–11.20	13.65***	8.54–21.82	10.04***	7.09–14.21	18.58***	12.09–28.55
Model 6								
Other fears	1.10	.85–1.43	1.61**	1.14–2.29	.97	.75–1.25	1.27	.92–1.76
Number of fears								
2	1.98***	1.70–2.32	2.02***	1.50–2.73	1.91***	1.60–2.27	2.12***	1.62–2.78
3	2.85***	2.28–3.56	3.97***	2.86–5.50	3.45***	2.82–4.22	4.66***	3.48–6.25
4	3.89**	1.47–10.28	9.19***	5.47–15.43	10.14***	6.82–15.09	14.46***	8.94–23.40

All models are adjusted for age, sex, and country of residence. Bold signifies odds that are significant at $p < .01$

* $p < .05$

** $p < .01$

*** $p < .001$

animal fears to 2.70 (95%CI=2.19–3.34) for other types of fears (Model 1). As was observed with internalizing disorders having two, three or four fears, regardless of the type (Model 2) was incrementally strongly associated with odds of each externalizing problem examined. Differential associations were observed for each specific type of fear when adjusting for the number of fears (Models 3 through

6). Specifically, fear of animals was not significantly associated with any externalizing disorder (Model 3), nor was situational fear (Model 5) or other types of fears (Model 6). However environmental fears were significantly associated with decreased odds of conduct disorder (AOR=0.61, 95%CI=0.44–0.86) (Model 4).

Table 5 Univariate association between number of fear subtypes and self-reported externalizing problems among children with at least one fear ($n = 6611$)

	Any internalizing or externalizing problem			Any externalizing			ADHD			Conduct			ODD		
	%	OR	95%CI	%	OR	95%CI	%	OR	95%CI	%	OR	95%CI	%	OR	95%CI
Number of fear subtypes															
2	25.02	<i>ref</i>		8.67			4.42			3.39			4.09		
3	39.35	1.84***	1.60–2.11	15.00	1.51***	1.23–1.87	7.74	1.81***	1.34–2.46	7.08	1.40*	1.01–1.93	7.37	1.32	98–1.76
4	88.68	4.61***	3.90–5.46	43.48	3.90***	3.17–4.80	21.26	4.34***	3.22–5.84	28.50	4.71***	3.50–6.33	28.50	3.74***	2.84–4.92
Type of fear															
Animals	24.18	1.21**	1.06–1.39	10.13	1.32**	1.08–1.61	4.93	1.34*	1.01–1.78	4.79	1.59**	1.17–2.17	5.30	1.36*	1.03–1.79
Situations	32.70	2.02***	1.79–2.29	15.12	2.43***	2.06–2.87	7.47	2.42***	1.92–3.05	7.83	3.13***	2.46–3.99	8.20	2.57***	2.05–3.21
Environment	27.99	1.90***	1.68–2.16	11.11	1.61***	1.35–1.92	5.56	1.76***	1.37–2.28	4.90	1.41**	1.09–1.81	5.96	1.77***	1.38–2.27
Other	43.67	2.87***	2.39–3.44	23.01	3.44***	2.82–4.21	11.87	3.42***	2.62–4.47	13.75	4.73***	3.65–6.13	12.01	3.16***	2.43–4.11

Bold signifies odds that are significant at $p < .01$ * $p < .05$ ** $p < .01$ *** $p < .001$

Discussion

The core strength of the study is to assess the association of fears with psychopathology among children as opposed to doing so retrospectively among adults, thereby limiting retrospective recall biases. In addition, the study is based on a large cross-national sample of children. The study underscores the high prevalence of fears among children. The study further provides evidence that the number of fear subtypes is significantly associated with self-reported psychopathology. Finally the present findings highlight the differential associations between specific fears and psychopathology.

As was reported in a large sample of adolescents in Mexico [26], and consistent with prior reports [3] the majority of children in the present sample (68.77%) reported at least one fear. Consistent with adolescent data [26], the most frequent type of fear was fear of animals and insects (51.44%), followed by environmental fears (41.38%) fear of specific situations (22.71%), and finally other types of fears (7.19%). In the Dutch general population, however, the lifetime prevalence of fears concerned 41.2% of adults, with fear of heights (an environmental fear) being the most frequent (19.1%) followed by fear of animals (12.6%) [13]. In accordance with existing knowledge regarding specific phobia [10, 12, 16, 27, 28], girls were significantly more likely to report any fears as compared to boys. Finally, reporting fears decreased with age in the present sample, with younger children more likely to endorse fears as compared to older children, in accordance with prior research [5, 29]. That being said the decline tended to be more pronounced for boys than for girls. These findings are noteworthy in that fears were assessed at the age of their first onset rather than retrospectively among adolescents or adults, which is known to be associated with recall bias [20].

The second main contribution of the present study is the replication of the finding regarding the cumulative effect of fear subtypes. This cumulative effect was indeed described in World Mental Health surveys data covering 25 countries, whereby the prevalence of internalizing disorders increased with the number of subtypes in persons with childhood onset specific phobia [14]. An increasing number of fear subtypes was significantly associated with self-reported psychopathology when controlling for age, sex, and country of residence. These findings held true for each specific internalizing and externalizing disorder, which is in line with findings identifying consistent time lagged associations within internalizing and externalizing domains, but also to a lesser degree between-domain associations [30]. The deleterious effect of cumulative subtypes was also described in a longitudinal study where

Table 6 Multivariate association between number of fear subtypes and self-reported externalizing problems

	Any internalizing or externalizing problem			Any externalizing			ADHD			Conduct			ODD		
	AOR	95%CI		AOR	95%CI		AOR	95%CI		AOR	95%CI		AOR	95%CI	
Model 1															
Type of fear															
Animals	1.67***	1.44–1.93		1.71***	1.39–2.12		1.78***	1.32–2.39		2.10***	1.52–2.89		1.67***	1.26–2.22	
Environment	2.23***	1.95–2.55		1.76***	1.46–2.12		1.88***	1.45–2.45		1.52**	1.16–1.98		1.85***	1.43–2.38	
Situations	2.18***	1.91–2.48		2.30***	1.94–2.73		2.27***	1.79–2.88		2.85***	2.21–3.66		2.36***	1.87–2.97	
Other fears	2.63***	2.17–3.19		2.70***	2.19–3.34		2.80***	2.12–3.71		3.48***	2.64–4.60		2.40***	1.83–3.17	
Model 2															
Number of fear subtypes															
1															
2	1.92***	1.67–2.20		1.69***	1.36–2.09		2.05***	1.51–2.79		1.61**	1.16–2.24		1.42*	1.06–1.91	
3	3.61***	3.01–4.34		3.20***	2.53–4.06		3.94***	2.82–5.51		3.50***	2.52–5.03		2.65***	1.93–3.64	
4	42.40***	22.96–78.30		13.71***	9.86–19.07		12.51***	8.19–19.08		18.17***	12.06–27.36		12.77***	8.74–18.65	
Model 3															
Animals	.76**	65–0.89		.86	68–1.09		.82	59–1.14		1.00	70–1.44		.88	64–1.21	
Number of fears															
2	2.08***	1.80–2.42		1.77***	1.41–2.23		2.19***	1.58–3.04		1.61**	1.14–2.29		1.48*	1.09–2.02	
3	4.04***	3.32–4.92		3.42***	2.64–4.44		4.31***	2.98–6.24		3.56***	2.43–5.21		2.80***	1.98–3.98	
4	48.10***	25.92–89.24		14.73***	10.39–20.90		13.80***	8.74–21.78		18.17***	11.64–28.35		13.58***	9.01–20.49	
Model 4															
Environment	1.17*	1.00–1.36		.89	71–1.11		.88	64–1.21		.61**	44–86		1.03	75–1.40	
Number of fears															
2	1.78***	1.52–2.08		1.78***	1.41–2.25		2.17***	1.55–3.05		1.98***	1.39–2.83		1.41*	1.02–1.94	
3	3.27***	2.66–4.02		3.46***	2.61–4.57		4.28***	2.89–6.35		4.92***	3.24–7.46		2.60***	1.79–3.79	
4	38.06***	20.43–70.91		14.89***	10.32–21.48		13.68***	8.47–22.11		25.99***	16.01–42.17		12.52***	8.10–19.36	
Model 5															
Situations	1.07	0.92–1.25		1.21	97–1.50		1.13	84–1.54		1.38	1.00–1.90		1.28	95–1.74	
Number of fears															
2	1.89***	1.64–2.18		1.63***	1.31–2.02		2.00***	1.47–2.74		1.52*	1.09–2.11		1.36*	1.01–1.83	
3	3.44***	2.78–4.26		2.80***	2.12–3.72		3.61***	2.42–5.37		2.86***	1.90–4.31		2.22***	1.52–3.26	
4	39.91***	21.30–74.77		11.65***	7.98–17.01		11.22***	6.83–18.43		13.90***	8.53–22.63		10.31***	6.54–16.26	
Model 6															
Other fears	1.06	.85–1.34		1.10	.82–1.47		1.30	.88–1.90		1.26	.84–1.87		.72	.46–1.13	
Number of fears															
2	1.91***	1.66–2.20		1.68***	1.36–2.08		2.02***	1.48–2.75		1.59**	1.15–2.21		1.45*	1.08–1.94	

Table 6 (continued)

	Any internalizing or externalizing problem		Any externalizing		ADHD		Conduct		ODD	
	AOR	95%CI	AOR	95%CI	AOR	95%CI	AOR	95%CI	AOR	95%CI
3	3.55***	2.93–4.31	3.13***	2.45–4.01	3.70***	2.61–5.25	3.36***	2.34–4.82	2.84***	2.04–3.95
4	39.89***	20.77–76.62	12.50***	8.08–19.35	9.72***	5.55–17.04	14.56***	8.29–25.58	17.57***	9.80–31.49

All models are adjusted for age, sex, and country of residence. Bold signifies odds that are significant at $p < .01$

* $p < .05$

** $p < .01$

*** $p < .001$

specific phobia with two or more subtypes was associated with significantly elevated risk of anxiety disorders later in life [15]. These findings support the clinical value of number of fear subtypes, and the notion of generalized subtype of specific phobia [12].

Considering the variability in the prevalence of fear subtypes, investigations of the differential association of any specific subtype and psychopathology provided additional support for the existence of this association. In the Netherlands Mental Health Survey and Incidence Study, while the number of fears did not greatly vary as a function of type of fear, the likelihood of specific fears being associated with lifetime specific phobia did (e.g., 26.5% for animals, 36.6% for fear of flying) [13]. Consistent with the latter study and with prior studies [17, 18], the present findings suggested that fear of animals was less likely than other fears to be associated with psychopathology.

Several limitations inherent to the study should be acknowledged. First, the DI is not a clinical evaluation and as a consequence, the study was not able to identify children who met diagnostic criteria for internalizing and externalizing disorders. The assessment of probable specific phobia based on the DI is not equivalent to a DSM diagnosis of specific phobia, as it fails to assess avoidance, nor does it assess symptom duration and related impairment. Thus, the present analyses examined fears and not specific phobia. Second, while three of the fear subtypes were assessed, the blood–injection–injury type was not, despite evidence suggesting that this subtype is particularly important in that it has been shown to be associated with psychopathology [17]. Third, the reliance on a single informant may have biased the findings in a manner that likely overestimated the observed associations. Fourth, the study was cross sectional and not suited to examine the predictive role of fear subtypes or number of subtypes on subsequent psychopathology. Longitudinal studies of children are needed to complement existing knowledge on the trajectory of fears and their role in the development of later onset psychopathology. Finally, as most research in this area the present study relied on dichotomous indicators reflecting the presence or absence of fears and psychopathology. A finer-grained dimensional assessment of these constructs reflecting severity and related impairment and taking into account complex patterns of comorbidity is likely to yield more nuanced findings [31]. Future studies on this topic may benefit from considering such fine-grained assessments.

The association observed between the number of fear subtypes and internalizing and externalizing problems among children suggests that those who report excessive and generalized fear may be in need of further assessment. Therefore, screening for the type and number of fears in children may prove useful in identifying youth in need, whether the diagnostic criteria for specific phobia are met or not. There is a

wealth of evidence supporting the efficacy of interventions for anxiety disorders in children [32]. Cognitive behavior therapy (CBT) programs such as the Coping Cat have been shown to reduce symptoms in children and adolescents and maintain symptom reduction gains [33–36]. However, a significant challenge remains and lies in the fact that although CBT is efficacious in the treatment of common childhood disorders, it is not available to everyone. A high level of unmet need for mental health services among children is reported in a number of regions of the world including Europe [37–40]. Ameliorating access to mental health care among children is crucial, as if left untreated childhood disorders are likely to contribute to substantial long-term psychopathology.

Conclusions

The present study extends beyond existing retrospective surveys among adults as it relied on a large sample of children from eight countries to investigate fears and their association with self-reported psychopathology at the age at which specific phobias typically have their initial onset. The strong association between the number of fear subtypes and internalizing and externalizing problems among children confirm that children who report excessive and generalized fear should be targeted for prevention, consistent with findings from adult population based studies identifying childhood onset generalized specific phobia as a probable precursor to subsequent internalizing psychopathology [14]. Further research is required to understand gender differences in the acquisition of fears and the mechanisms through which they contribute to subsequent gender differences in the prevalence of adult psychiatric disorders.

Author contributions MH and VKM designed the study. Data collection was organized by AB, MCG, CCC, DG, CK, SL, ZM, RO, TS. Analyses were performed by VKM. The first draft of the manuscript was written by MH and VKM and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

Funding This study was funded by the European Union, Grant Number 2006336 (Pr. Kovess-Masfety).

Availability of data and material The data will not be available as it is currently being analyzed.

Declarations

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval The study was conducted in accordance with the ethical standards of the 1964 Helsinki Declaration and its later amendments. Participating countries obtained approval of their relevant

ethical committees which reviewed the study. Parents received an information letter and a consent form to be signed and returned to the school if they opposed their child's participation in the study.

References

1. Cosmides L, Tooby J (2000) Evolutionary psychology and the emotions. In: Lewis M, Haviland-Jones J (eds) *Handbook of emotions*, 2nd edn. Guilford, New York, NY, pp 91–115
2. Gullone E (2000) The development of normal fear: a century of research. *Clin Psychol Rev* 20(4):429–451. [https://doi.org/10.1016/S0272-7358\(99\)00034-3](https://doi.org/10.1016/S0272-7358(99)00034-3)
3. Ollendick TH, King NJ, Muris P (2002) Fears and phobias in children: phenomenology, epidemiology, and aetiology. *Child Adolesc Ment Health* 7(3):98–106. <https://doi.org/10.1111/1475-3588.00019>
4. Gullone E (1996) Developmental psychopathology and normal fear. *Behav Chang* 13(3):143–155. <https://doi.org/10.1017/S0813483900004927>
5. Poulton R, Trainor P, Stanton W, McGee R, Davies S, Silva P (1997) The (in)stability of adolescent fears. *Behav Res Ther* 35(2):159–163. [https://doi.org/10.1016/S0005-7967\(96\)00083-6](https://doi.org/10.1016/S0005-7967(96)00083-6)
6. Ollendick TH, Yang B, King NJ, Dong Q, Akande A (1996) Fears in American, Australian, Chinese, and Nigerian children and adolescents: a Cross-Cultural Study. *J Child Psychol Psychiatry* 37(2):213–220. <https://doi.org/10.1111/j.1469-7610.1996.tb01393.x>
7. Salcuni S, di Riso D, Mazzeschi C, Lis A (2009) Children's fears: a survey of Italian children ages 6 to 10 years. *Psychol Rep* 104(3):971–988. <https://doi.org/10.2466/PRO.104.3.971-988>
8. Croake JW (1969) Fears of children. *Hum Dev* 12(4):239–247
9. Wardenaar KJ, Lim CCW, Al-Hamzawi AO, Alonso J, Andrade LH, Benjet C, Bunting B, de Girolamo G, Demyttenaere K, Florescu SE, Gureje O, Hisateru T, Hu C, Huang Y, Karam E, Kiejna A, Lepine JP, Navarro-Mateu F, Oakley Browne M, Piazza M, Posada-Villa J, Ten Have ML, Torres Y, Xavier M, Zarkov Z, Kessler RC, Scott KM, de Jonge P (2017) The cross-national epidemiology of specific phobia in the World Mental Health Surveys. *Psychol Med* 47(10):1744–1760. <https://doi.org/10.1017/S0033291717000174>
10. Fredrikson M, Annas P, Fischer H, Wik G (1996) Gender and age differences in the prevalence of specific fears and phobias. *Behav Res Ther* 34(1):33–39
11. American Psychiatric Association (2013) *Diagnostic and statistical manual of mental disorders (DSM-5®)*. American Psychiatric Association
12. Stinson FS, Dawson DA, Chou SP, Smith S, Goldstein RB, Ruan WJ, Grant BF (2007) The epidemiology of DSM-IV specific phobia in the USA: results from the National Epidemiologic survey on Alcohol and Related Conditions. *Psychol Med* 37(7):1047
13. Depla MF, ten Have ML, van Balkom AJ, de Graaf R (2008) Specific fears and phobias in the general population: results from the Netherlands Mental Health Survey and Incidence Study (NEMESIS). *Soc Psychiatry Psychiatr Epidemiol* 43(3):200–208. <https://doi.org/10.1007/s00127-007-0291-z>
14. De Vries YA, Al-Hamzawi A, Alonso J, Borges G, Bruffaerts R, Bunting B, Caldas-de-Almeida JM, Cia AH, De Girolamo G, Dinolova RV (2019) Childhood generalized specific phobia as an early marker of internalizing psychopathology across the lifespan: results from the World Mental Health Surveys. *BMC Med* 17(1):101
15. Lieb R, Miché M, Gloster AT, Beesdo-Baum K, Meyer AH, Wittchen HU (2016) Impact of specific phobia on the risk of onset

- of mental disorders: A 10-year prospective-longitudinal community study of adolescents and young adults. *Depress Anxiety* 33(7):667–675
16. Eaton WW, Bienvenu OJ, Miloyan B (2018) Specific phobias. *The Lancet. Psychiatry* 5(8):678–686. [https://doi.org/10.1016/S2215-0366\(18\)30169-X](https://doi.org/10.1016/S2215-0366(18)30169-X)
 17. Burstein M, Georgiades K, He JP, Schmitz A, Feig E, Khazanov GK, Merikangas K (2012) Specific phobia among US adolescents: phenomenology and typology. *Depress Anxiety* 29(12):1072–1082
 18. Kim SJ, Kim BN, Cho SC, Kim JW, Shin MS, Yoo HJ, Kim HW (2010) The prevalence of specific phobia and associated comorbid features in children and adolescents. *J Anxiety Disord* 24(6):629–634. <https://doi.org/10.1016/j.janxdis.2010.04.004>
 19. Simon GE, VonKorff M (1995) Recall of psychiatric history in cross-sectional surveys: implications for epidemiologic research. *Epidemiol Rev* 17(1):221–227. <https://doi.org/10.1093/oxfordjournals.epirev.a036180>
 20. Kendler KS, Karkowski LM, Prescott CA (1999) Fears and phobias: reliability and heritability. *Psychol Med* 29(3):539–553. <https://doi.org/10.1017/s0033291799008429>
 21. Kovess V, Carta MG, Pez O, Bitfoi A, Koç C, Goelitz D, Kuijpers R, Lesinskiene S, Mihova Z, Otten R (2015) The school children mental health in Europe (SCMHE) project: design and first results. *CPEMH* 11(1):113–123. <https://doi.org/10.2174/1745017901511010113>
 22. Valla JP, Bergeron L, Berube H, Gaudet N, St-Georges M (1994) A structured pictorial questionnaire to assess DSM-III-R-based diagnoses in children (6–11 years): development, validity, and reliability. *J Abnorm Child Psychol* 22(4):403–423
 23. Valla JP, Bergeron L, Bidaut-Russell M, St-Georges M, Gaudet N (1997) Reliability of the Dominic-R: a young child mental health questionnaire combining visual and auditory stimuli. *J Child Psychol Psychiatry* 38(6):717–724
 24. American Psychiatric Association (1994) Diagnostic and statistical manual of mental disorders, 4th edn. American Psychiatric Association, Washington, DC
 25. Kuijpers R, Otten R, Vermulst A, Pez O, Bitfoi A, Carta M, Goelitz D, Keyes K, Koç C, Lesinskiene S (2014) Cross-country construct validity of the ‘Dominic Interactive.’ *Eur J Public Health*. <https://doi.org/10.1093/eurpub/cku165.046>
 26. Benjet C, Borges G, Stein DJ, Méndez E, Medina-Mora ME (2012) Epidemiology of fears and specific phobia in adolescence: results from the Mexican Adolescent Mental Health Survey. *J Clin Psychiatry* 73(2):152–158. <https://doi.org/10.4088/jcp.11m07442>
 27. Ollendick TH, Matson JL, Helsel WJ (1985) Fears in children and adolescents: normative data. *Behav Res Ther* 23(4):465–467. [https://doi.org/10.1016/0005-7967\(85\)90174-3](https://doi.org/10.1016/0005-7967(85)90174-3)
 28. Essau CA, Conradt J, Petermann F (2000) Frequency, comorbidity, and psychosocial impairment of specific phobia in adolescents. *J Clin Child Psychol* 29(2):221–231. https://doi.org/10.1207/S15374424jccp2902_8
 29. Muris P, Merckelbach H, Gadet B, Moulart V (2000) Fears, worries, and scary dreams in 4- to 12-year-old children: their content, developmental pattern, and origins. *J Clin Child Psychol* 29(1):43–52
 30. Kessler RC, Ormel J, Petukhova M, McLaughlin KA, Green JG, Russo LJ, Stein DJ, Zaslavsky AM, Aguilar-Gaxiola S, Alonso J, Andrade L, Benjet C, de Girolamo G, de Graaf R, Demyttenaere K, Fayyad J, Haro JM, Cy Hu, Karam A, Lee S, Lepine J-P, Matchsinger H, Mihaescu-Pintia C, Posada-Villa J, Sagar R, Üstün TB (2011) Development of lifetime comorbidity in the World Health Organization World Mental Health Surveys. *Arch Gen Psychiatry* 68(1):90–100. <https://doi.org/10.1001/archgenpsychiatry.2010.180>
 31. Kotov R, Krueger RF, Watson D, Achenbach TM, Althoff RR, Bagby RM, Brown TA, Carpenter WT, Caspi A, Clark LA, Eaton NR, Forbes MK, Forbush KT, Goldberg D, Hasin D, Hyman SE, Ivanova MY, Lynam DR, Markon K, Miller JD, Moffitt TE, Morey LC, Mullins-Sweatt SN, Ormel J, Patrick CJ, Regier DA, Rescorla L, Ruggero CJ, Samuel DB, Sellbom M, Simms LJ, Skodol AE, Slade T, South SC, Tackett JL, Waldman ID, Waszczuk MA, Widiger TA, Wright AGC, Zimmerman M (2017) The hierarchical taxonomy of psychopathology (HiTOP): a dimensional alternative to traditional nosologies. *J Abnorm Psychol* 126(4):454–477. <https://doi.org/10.1037/abn0000258>
 32. Creswell C, Waite P, Cooper PJ (2014) Assessment and management of anxiety disorders in children and adolescents. *Arch Dis Child* 99(7):674–678. <https://doi.org/10.1136/archdischild-2013-303768>
 33. James AC, James G, Cowdrey FA, Soler A, Choke A (2015) Cognitive behavioural therapy for anxiety disorders in children and adolescents. *Cochrane Database System Rev* 2:CD00690–CD004690. <https://doi.org/10.1002/14651858.CD004690.pub4>
 34. Albano AM, Kendall PC (2002) Cognitive behavioural therapy for children and adolescents with anxiety disorders: clinical research advances. *Int Rev Psychiatry* 14(2):129–134. <https://doi.org/10.1080/09540260220132644>
 35. Kendall PC, Flannery-Schroeder E, Panichelli-Mindel SM, Southam-Gerow M, Henin A, Warman M (1997) Therapy for youths with anxiety disorders: a second randomized clinical trial. *J Consult Clin Psychol* 65(3):366–380. <https://doi.org/10.1037/0022-006X.65.3.366>
 36. Walkup JT, Albano AM, Piacentini J, Birmaher B, Compton SN, Sherrill JT, Ginsburg GS, Rynn MA, McCracken J, Waslick B, Iyengar S, March JS, Kendall PC (2008) Cognitive behavioral therapy, sertraline, or a combination in childhood anxiety. *N Engl J Med* 359(26):2753–2766. <https://doi.org/10.1056/NEJMoa0804633>
 37. Jensen PS, Goldman E, Offord D, Costello EJ, Friedman R, Huff B, Crowe M, Amsel L, Bennett K, Bird H, Conger R, Fisher P, Hoagwood K, Kessler RC, Roberts R (2011) Overlooked and underserved: “Action Signs” for identifying children with unmet mental health needs. *Pediatrics* 128(5):970. <https://doi.org/10.1542/peds.2009-0367>
 38. Merikangas KR, He J-P, Brody D, Fisher PW, Bourdon K, Koretz DS (2010) Prevalence and treatment of mental disorders among US children in the 2001–2004 NHANES. *Pediatrics* 125(1):75–81
 39. Kataoka SH, Zhang L, Wells KB (2002) Unmet need for mental health care among U.S. children: variation by ethnicity and insurance status. *AJP* 159(9):1548–1555. <https://doi.org/10.1176/appi.ajp.159.9.1548>
 40. Kovess-Masfety V, Van Engelen J, Stone L, Otten R, Carta MG, Bitfoi A, Koc C, Goelitz D, Lesinskiene S, Mihova Z, Fermanian C, Pez O, Husky MM (2017) Unmet need for specialty mental health services among children across Europe. *Psychiatr Serv* 68(8):789–795. <https://doi.org/10.1176/appi.ps.201600409>