REVIEW ARTICLE

Cognitive Prerequisites in Development of Childhood Anxiety: An Integrative Literature Review and Thematic Analysis

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Abstract

It has been suggested that cognitive development affects the emotional experience of children, including anxiety. However, an evidence review is needed to extract cognitive prerequisites that contribute to the development of anxiety in children. The purpose of the study is to explore evidence on cognitive prerequisites involved in experiencing anxiety in children. Four electronic databases of Scopus, OVID-PsycINFO, PubMed, and ScienceDirect were comprehensively searched for 1900 to 2018, yielding 4,618 articles. According to the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) and inclusion and exclusion criteria, 25 articles were found as eligible. The analysis of literature identified 3 themes, including threat perception, future thinking, and generalization. It is suggested that these cognitive abilities may underlie anxiety. These results have important implications for better understanding the effect of cognitive prerequisites in anxiety phenomena and also could shed light on the explanation of anxiety in some disorders characterized by deficits in cognitive development.

Keywords: Children; Cognitive ability; Anxiety; Cognitive development; Cognitive prerequisites.

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Introduction

Anxiety disorders are among the most prevalent psychological disorders, affecting nearly 6.5% of children and adolescents worldwide (1). Theories of emotional development argue that cognitive development plays an important role in emotions, including anxiety (e.g., 2,3). Some researchers examined the relationship between cognitive development and anxiety in children. They indicated that normal children reported more anxiety than children with below-average intellectual abilities,

and there was a positive relationship between cognitive development and the level of anxiety (4–6). Karpinski et al. (7) argued that cognitive ability makes individuals respond to environmental stressors by worry, and worry is a positive risk factor for psychological disorders, particularly anxiety. In the same vein, Penney et al. (8) found that worry is associated with higher cognitive ability. Worry is considered a transdiagnostic construct (9) and is a common feature in many anxiety disorders (10). Studies on children with autism spectrum disorder (ASD) also found a positive relationship between cognitive ability and the level of anxiety (11,12). Some researchers examined the relationship between cognitive ability and anxiety; however, they considered cognitive ability in the context of cognitive development, and most of them utilized intelligent measures to assess cognitive abilities (e.g., 4–6). Just a few researchers indirectly mentioned some specific cognitive abilities that can influence the development of anxiety phenomena. Vasey (13) believed that to worry, a child must be able to anticipate future events. Also, some research findings indicated that highly anxious children, in comparison to their non-anxious counterparts, showed increased anticipation of negative emotions (e.g., 14,15). Making a prediction is a cognitive skill that undergoes significant development during the first 5 years of life (16). Additionally, Broeren and Muris (5) emphasized the fact that anxiety is rooted in threat, and the threat must be conceptualized, which conceptualization relays on cognitive abilities (17).

Taken together, along with cognitive development, cognitive abilities, such as conceptualization, prediction, and anticipation of future are needed for the expression of anxiety. A few studies have investigated these preconditions cognitive variables

(5). This perspective has important implications for better understanding the cognitive factors by which anxiety initiates and also could shed light on the conceptualization of anxiety in some neurodevelopmental disorders, including autism, characterized by deficits in cognitive ability and cognitive development. In this integrative literature review, using thematic analysis, we aimed to extract some cognitive abilities involved in anxiety development from the research that addressed the cognitive processes, cognitive models, and cognitive mechanisms in experiencing anxiety.

Materials & Methods

The integrative literature review was used to synthesize the literature. This method is considered as the best method for exploring the literature with diverse methodologies and approaches (18). Whittemore and Knafl's (18) methodology for conducting integrative reviews contains five steps: formulation of the problem, literature search, evaluation of data, data analysis, and presentation of the results. Formulation of the problem is presented in the introduction section. The other steps are described below.

Literature search

A systematic search strategy was used to find the literature relevant to the subject of the study. Four databases (Scopus, OVID-PsycINFO, PubMed, ScienceDirect) were searched using search terms from 1900 to 2018, and a systematic search strategy was used to identify the literature related to the subject (See Table 1).

Selection and evaluation of data

Initially, 4,618 articles were retrieved, and 2,255 duplicates among them were removed. We also hand-searched the reference list of the

10

Iran J Child Neurol. Summer 2022 Vol. 16 No. 3

selected articles. In addition, an online search was conducted using Google to identify relevant grey literature (n=7). Titles and abstracts were screened, which resulted in the removal of 2,319 non-relevant articles; i.e., 51 studies remained for full-text review. Finally, 25 articles were found as eligible, based on the inclusion and exclusion criteria (see figure 1). The inclusion and exclusion criteria are presented in Table 2. Just the original and peer-reviewed papers were included in this study because the good-quality sources for a literature review are those that are peer-reviewed and original research (19). Two researchers screened titles and abstracts of papers in duplicate for inclusion, and disagreements were resolved through discussion. Full publications were then reviewed in duplicate for inclusion. Disagreements were resolved by a discussion between two reviewers.

Analysis of data

Data were analyzed using thematic analysis at both semantic or explicit and latent or interpretative levels (20); however, our approach to extracting themes from papers was more interpretative. Twenty-five articles were reviewed, and various themes and concepts were identified from the findings of these articles. Afterward, the main themes were extracted. For all stages of the study, all articles were analyzed by two reviewers independently; then, each reviewer presented her understanding and interpretations to the other one. Two reviewers collaborated closely until achieving an agreement about the main themes, which are presented in the next section.

Results

The results of the review are presented as themes, drawn from the findings of each article to address the overall literature. Aveyard (21) suggests a

simplified method for thematic analysis of the literature. This method advises researchers to summarize the content of each paper. Then, the researcher should focus on the results section, re-read and describe the findings of each paper, and identify themes from the findings (21). First, we conducted a descriptive analysis of studies to extract general characteristics and relevant results (see Table 3). As mentioned earlier, our approach to identifying themes is inclined towards interpretative approaches. Although none of the articles directly mentioned cognitive abilities important to the development of anxiety, we extracted some cognitive abilities, including (1) Threat perception; (2) Future thinking; and (3) Generalization that explained below. Some of the studies contained more than one theme as well as a recurring theme.

3.1 Content Validity

To validate themes, fifteen experts were asked to rate the themes on two grounds: The first rating, called CVR (content validity rate), is defined as "essential, useful but not necessary, and not necessary", and the second rating is content validity index (CVI) and is defined as "irrelevant, need serious review, relevant but need review, and fully relevant." CVI is computed as the number of experts rating each theme as "strongly relevant" divided by the total number of experts. Values ranged from zero to 1, where CVI > 0.79 indicates the relevance of the item. The formula for computing the CVR is $CVR = (Ne – N/2)/ (N/2)$, where Ne is the number of experts rating an item as "essential" and N is the total number of experts (22)have made it an essential step in the instrument development. This article attempts to give an overview of the content validity process and to explain the complexity of this process by introducing an example. METHODS

We carried out a methodological study conducted to examine the content validity of the patient-centered communication instrument through a two-step process (development and judgment. Content validity will be approved if the value is greater than the value mentioned in the table (Table 4) (23). Based on the table, for each theme, CVR ≥0.49 indicates that the theme is essential.

The scores obtained from CVR (necessity) and CVI (resolution) for each theme in this research are shown in table 5. As you see in table 5, all three themes gained the required quota in both CVR and CVI.

3.2. Inter-rater reliability

Initially, inter-rater reliability was tested by comparing the absence or presence of themes (See Table 6). Inter-rater reliability was calculated using the formula suggested by Miles & Huberman (24):

Reliability = number of agreements/number of agreements + disagreements

As a rule, the minimum percentage to indicate adequate levels of agreement is 75% (25). Values lower than this percentage demonstrate an inadequate level of agreement. According to this formula, the inter-rater reliability in this research is:

Reliability = 22/22 + 1 = 0/95 High agreement

Hence, in this study, the thematic analysis presented adequate inter-rater reliability.

Themes

Threat perception

Research on cognition and cognitive process in childhood anxiety revealed some cognitive biases toward threats. Some papers mentioned specific types of cognitive biases involved in developing and maintaining childhood anxiety, including attentional bias to threat (26–31), threat interpretation bias (32–37), judgment bias of ability to deal with threatening/negative events (14,31,32), probability bias about occurring threatening events in future (38–41), threat perception and detection bias (15,42–44), memory bias to threat (27), and emotional reasoning (45). It can be concluded that if children can pay attention to threats, interpret threats from ambiguous stimuli and situations, perceive and detect a threat from stimuli, view physical symptoms as a sign of impending danger and threat (i.e., emotional reasoning), judge threatening events as more likely to occur (i.e., probability bias), recall more memories about the threat (i.e., memory bias), and underestimate their ability to cope with a threatening situation (i.e., judgment bias), they must be able to perceive the threat. Hence, we consider threat perception as an ability that is a prerequisite for experiencing anxiety.

Future thinking

Some articles revealed a bias relevant to future-directed thinking, called probability bias. As reported by a number of studies (38–40), anxious children estimated negative events as more likely to happen in the future. Using a future-thinking task, Miles et al. (41) reported that anxious children predicted more negative events in the future. As anxious children anticipate more negative events in the future, it can be argued that future thinking ability contributes to the development of anxiety, and perhaps some children that have deficits in future thinking are less likely to experience anxiety.

Generalization

Among 25 articles analyzed in this review, 4 mentioned the role of overgeneralization in the development of anxiety (32,46–48). Weems et al. (2001) and Cannon and Weems (32) reported overgeneralization as an important cognitive distortion in the pathology of anxiety. El-Bar

et al. (47) and Schiele et al. (46) addressed the role of fear generalization in childhood anxiety. Anxious children exhibited lower perceptual discrimination thresholds and wider generalization after conditioning. Thus, over-generalization is a feature of anxiety disorder, and it can be concluded that presumably, a person should have the ability of generalization to experience anxiety.

Table 1. Search terms

Database searched	Search terms and strategies used
Scopus	TITLE-ABS-KEY (cognition OR cognitive OR "Developmental factor" OR "Developmental marker") AND TITLE (anxiety OR anxious) AND TITLE-ABS-KEY(youth OR "young people" OR "young person" OR adolescent OR teen OR juvenile OR children OR child)
PubMed	(cognition[tiab] OR cognitive[tiab] OR " Developmental factor"[tiab] OR " Developmental marker"[tiab]) AND "anxiety"[ti] AND (youth[tiab] OR young people[tiab] OR "young person"[tiab] OR adolescent [tiab] young people[tiab] OR teen[tiab] OR juvenile[tiab] OR children[tiab] OR child[tiab])
OVID-PsycINFO	(cognition or cognitive or "Developmental factor" or Developmental marker).ab. and (youth or "young people" or "young person" or adolescent or teen or juvenile or children or child).ab. and anxiety.ti.
Sciencedirect	Title: (anxiety) Title, abstract or keywords: (youth OR "young people" OR "young person" OR adolescent OR teen OR juvenile OR children OR child) AND (cognition OR cognitive OR "Developmental factor" OR "Developmental marker")

Table 2. Inclusion and exclusion criteria.

Inclusion	Rationale
1. Literature mentioned the cognition, cognitive process, cognitive models, cognitive prerequisites and abilities, and cognitive developmental markers that play a role in experiencing anxiety.	to address the purpose of the study
2. The study population included children, adolescents or both	to address the purpose of the study
3. Research published between 1900 and 2018	To attain a wider range of research
4. Peer-reviewed research	To increases the vigor and credibility of the study.
5. Primary or original research	To include good-quality research only.
6. Articles with full text available	To be able to analyze the whole of the article
Exclusion	**Rationale**
Non-English literature that has not been translated	It would take time and expense to translate papers written in a different language.
Literature addressed just the specific type of anxiety	The purpose of the study is to examine cognitive abilities involved in all kinds of anxiety disorders and overall anxiety.

Table 3. Summary of the reviewed studies

	Author/s and years	country	Participants	Anxiety measure	Study Design	Findings
1	Richards et al., 2007 (26)	United Kingdom	50 children aged 10 to 11 years	State-Trait Anxiety Inventory for Children	correlational	High-anxious children sowed more selective attention to theat.
2	Muris, Kindt, et al., 2000 (42)	The Netherlands	105 children aged 8–13 years	State-Trait Anxiety Inventory for Children	correlational	High levels of anxiety were associated with higher threat perception and detection.
3	Muris and van der Heiden, 2006 (38)	The Netherlands	70 primary school children aged 10–13 years	Revised Child Anxiety and Depression Scale	comparative correlational	High-anxious children estimated future negative events as more likely to happen in future (higher ratings of probability bias) After controlling for comorbid depression symptoms, higher level anxiety were significantly accompanies by higher probability bias for future negative events.
4	Muris, Merckelbach, et al., 2003 (15)	The Netherlands	156 children aged 8–13 years	The Spence Children's Anxiety Scale	comparative correlational	High levels of anxiety were associated with higher threat perception and detection
5	Watts and Weems, 2006 (27)	United States	81 participants aged 9-17 years	The Revised Child Anxiety and Depression scales	correlational	Attention bias and memory bias toward threat positively predict the high level of anxiety.
6	Waters et al., 2014 (28)	Australia	435 children aged 5-13 years (233 children with anxiety disorder 202 with no psychiatric disorder)	Spence Children's Anxiety Scale	comparative	Children with principal distress anxiety disorder (GAD) indicated a significant attention bias toward threat and children with principal fear disorder (social phobia, specific phobia, separation anxiety disorder) indicated a significant attention bias away from threat compared to healthy controls.

14

Iran J Child Neurol. Summer 2022 Vol. 16 No. 3

Table 3. Summary of the reviewed studies

	Author/s and years	country	Participants	Anxiety measure	Study Design	Findings
7	Cannon and Weems, 2010 (32)	United States	72 children and adolescents aged 7-17 years (24 clinically anxious participants 48 healthy healthy matched controls	The Revised Child Anxiety and Depression scale	comparative correlational	Anxious children showed lowered estimates of the ability to control external and/or internal threating stimulus (judgment biases) and more tendency to interpret neutral stimuli in a threating way (interpretive biases) compered to healthy controls. Also overgeneralization and judgement bias were significantly predictors of anxiety.
8	Muris, Luermans, et al., 2000these stories contained information that could be interpreted as threatening (43)	The Netherlands	76 children aged 3-6 years	State–Trait Anxiety Inventory for Children	correlational	High levels of anxiety were associated with higher threat perception and detection.
9	Bögels and Zigterman, 2000 (14)	the Netherlands	45 children and adolescent aged 9-17 (15 anxious children and adolescents., 15 children and adolescents with externalizing disorder as The clinical control group., 15 healthy controls matched the anxious children)	Diagnostic Interview Schedule for Children	comparative	Anxious children judged given stories as more dangerous and had lowered estimates of their ability to cope with threats than control groups.
10	Morren et al., 2008 (45)	The Netherlands	122 children aged 7-13 years	Revised Children's Anxiety and Depression Scale	correlational	The emotional reasoning (tend to employ specific interceptive information as a parameter for determining the dangerousness of a situation) positively predicted the level of anxiety.

Table 3. Summary of the reviewed studies

	Author/s and years	country	Participants	Anxiety measure	Study Design	Findings
11	Creswell et al., 2011 (33)	United Kingdom	110 children aged 5-9 years	Child Behavior Checklist Scale	longitudinal correlational	Interpretation of ambiguity as threating were stable over time and significantly predicted anxiety in children.
12	Creswell and O'Connor, 2011 (34)	United Kingdom	65 children aged 10-11 years	Spence Children's Anxiety Scale	- longitudinal - correlational	Individual differences in threat interpretation of ambiguity were stable over time and were significantly associated with anxiety symptoms.
13	Waters, Craske, et al., 2008 (35)	Australia	45 children aged 7-12 years (15 anxious children 14 non-anxious control children 16 at-risk children)	The Anxiety Disorders Interview Schedule for Children	- comparative	anxious children showed more interpretation biases and reported less ability to cope with threating situations compared with control and at-risk groups.
14	Miles et al., 2004 (41)	United Kingdom	123 school-aged adolescents	Revised Children's Manifest Anxiety Scale	comparative - correlational	In future thinking task, anxious children predicted more negative events in future and in memory task, they reported more negative events in the past.
15	Muris, Rapee, et al. 2003 (80)	The Netherlands	299 children aged 8-13 years	The Spence Children's Anxiety Scale	- correlational	High level of general anxiety and state anxiety were significantly relates to lower threat thresholds and increased threat perception.
16	Schiele et al., 2016 (46)	Germany	267 Children aged 8-10 and 285 adults aged 18-50	Skin conductance responses (SCR) and ratings of valence and arousal	experimental	Children indicated higher fear generalization relative to adults. Also results showed that overgeneralization of conditioned fear is a developmental correlate of fear learning that is the pathogenesis of anxiety disorder.

16

Iran J Child Neurol. Summer 2022 Vol. 16 No. 3

Table 3. Summary of the reviewed studies

	Author/s and years	country	Participants	Anxiety measure	Study Design	Findings
17	El-Bar et al., 2017 (47)	Israel	40 children and adolescents 9-18 years (17 anxious children and adolescents., 23 age-matched control)	Diagnostic Interview Schedule for Children	experimental	Anxious children showed overgeneralization and lowered perceptual discrimination thresholds compared to healthy control.
18	Roy et al., 2008 (29)	United States	101 children and adolescents aged 7- 18 years (51 Non-anxious youths aged 9 - 18 years)	Anxiety Disorder Interview Schedule for Children	comparative	Anxious children showed a greater attention bias toward threat compared to control group.
19	Creswell et al., 2005 (37)	Australia	60 children aged 7-15 years (27 children with anxiety disorders, 33 nonclinical Children)	Revised Children's Manifest Anxiety Scale	comparative	Compared to healthy control, anxious children interpret ambiguous situation as more threating.
20	Vasey et al., 1995 (30)	United States	24 children aged 9- 14 years (12 anxious children., 12 normal controls)	Child Behavior Checklist	comparative	The anxious children showed attentional bias toward threat words compared to non-anxious children.
21	Weems et al., 2001 (48)	United States	251 anxious children and adolescents aged 6–17 years	Revised Children's Manifest Anxiety Scale	correlational	After controlling depression score, overgeneralization significantly related to anxiety trait, anxiety sensitivity and manifest anxiety. overgeneralization was the strongest predictor of trait anxiety.

Table 3. Summary of the reviewed studies

	Author/s and years	country	Participants	Anxiety measure	Study Design	Findings
22	Waters, Wharton et al., 2008 (31)	Australia	38 children aged 8-12 years (19 anxious children., 19 non-anxious control children)	Spence Children's Anxiety Scale	comparative correlational	Anxious children showed significantly higher interpretation and attention biases towards threat at pre-treatment in compared with healthy children. After successful treatment with CBT, interpretation biases toward threat but not attentional biases toward threat reduced in anxious children. For anxious group at pre and post- treatment the levels of anxiety were significantly associated with higher danger judgments and negative emotions.
23	Dalgleish et al., 1997 (39)	United Kingdom	80 children and adolescents 9-18 years (15 depressed children and adolescents., 22 anxious children and adolescents., 43 healthy control)	Revised Children's Manifest Anxiety Scale	comparative correlational	The anxious children and controls estimated that negative events were more likely to happen in the future to others than to themselves and this effect was stronger in the anxious group.
24	Canterbury et al., 2004 (40)	United Kingdom	66 participants aged 9–18 years	The Revised Children's Manifest Anxiety Scale	comparative correlational	The high anxious participants estimated negative events as more likely to happen in the future than the low anxious group. Probability estimates for negative events in the future increased with the levels of anxiety in all participants.
25	Taghavi et al., 2000 (36)	United Kingdom	57 children and adolescents aged 8-17 years (17 anxious patients., 40 healthy controls)	The Revised Children's Manifest Anxiety Scale	comparative	Clinically anxious children and adolescents reported the threatening meaning of ambiguous threat/ neutral homograph words more relative to healthy control group in a sentence generation task.

18

Iran J Child Neurol. Summer 2022 Vol. 16 No. 3

Table 4. CVR validity

Number of people in expert panel	Minimum validity
5	0.99
6	0.99
7	0.99
8	0.85
9	0.78
10	0.62
15	0.49
20	0.42
25	0.37
30	0.33
40	0.29

Table 5. CVR and CVI scores

themes	CVR	CVI
Threat perception	1	1
Future thinking	0.73	0.86
generalization	0.6	0.8

Table 6. absence/presence themes

Themes	In paper:	Reter 1 Present/Absent	Rater 2 Present/Absent
Threat perception	Vasey et al., 1995	Present	Present
	Dalgleish et al., 1997	Present	Present
	Bögels and Zigterman, 2000	Present	Present
	Muris, Kindt, et al., 2000	Present	Present
	Muris, Luermans, et al., 2000these stories contained information that could be interpreted as threatening	Present	Present
	Taghavi et al., 2000	Present	Present
	Muris, Rapee, et al. 2003	Present	Present
	Muris, Merckelbach, et al., 2003	Present	Present
	Creswell et al., 2005	Present	Present
	Muris and van der Heiden, 2006	Present	Present
	Watts and Weems, 2006	Present	Present

Themes	In paper:	Reter 1 Present/Absent	Rater 2 Present/Absent
Threat perception	Richards et al., 2007	Present	Present
	Morren et al., 2008	Present	absent
	Roy et al., 2008	Present	Present
	Waters, Craske, et al., 2008	Present	Present
	Waters,Wharton et al., 2008	Present	Present
	Cannon and Weems, 2010	Present	Present
	Creswell et al., 2011	Present	Present
	Creswell and O'Connor, 2011	Present	Present
	Waters et al., 2014	Present	Present
Future thinking	Dalgleish et al., 1997	Present	Present
	Miles et al., 2004	Present	Present
	Canterbury et al., 2004	Present	Present
	Muris and van der Heiden, 2006	Present	Present
generalization	Weems et al., 2001	Present	Present
	Cannon and Weems, 2010	Present	Present
	Schiele et al., 2016	Present	Present
	El-Bar et al., 2017	Present	Present

Discussion

In this review, we explored some cognitive abilities that are likely important to experience anxiety by analyzing written documents about the cognitive processes in childhood anxiety. The findings indicated three cognitive abilities (i.e., threat perception, future thinking, and generalization). The ability of threat perception is one of the identified abilities. Perception of threat is major component of various definitions and theories of anxiety. According to the American Psychiatric Association (49), anxiety is anticipation of future threats that more often are associated with muscle tension and vigilance in preparation for future danger and cautious or avoidant behavior. Threat perception is considered an adaptive process that helps the individuals adjust to the environment (50); However, threat perception is not always an adaptive process.

According to Beck's theory of anxiety, anxious individuals tend to overestimate the threat and perceive more threats in different situations (51). In general, the tendency to process situations as threatening is a central feature of cognitive models of anxiety (e.g., 51–53). The earliest signs of threat detection emerge in infancy around the age of 3–4 months and are present throughout childhood (54). As threat detection and perception is a central

20

Iran J Child Neurol. Summer 2022 Vol. 16 No. 3

feature of anxiety, it seems that anxious children should have the ability of threat perception to experience anxiety. Anxiety is a future-oriented emotional state, and all humans experience it to varying degrees. Anticipating or pre-viewing the future evokes anxiety, and this emotion is relevant to anticipatory representations of future events (55). According to Beck's cognitive theory, anxiety includes a large future-directed component as it is viewed primarily as involving the anticipation of potential future threats (see, e.g., 51). Developmental studies showed that children begin to develop the ability to think and anticipate the future around the age of three (56), and by five or six years of age, this ability is still improving (57,58). One facet of future thinking is episodic future thinking which allows individuals to pre-experience the future (56,59). Episodic future thinking is defined as the ability to project oneself into the future and pre-experience an event in the future (59). Anxious individuals exhibit a pessimistic bias toward the future, pre-experience threatening in the near and far future (60), and anticipate the occurrence of threatening events in the future (61,62). As anxiety contains a future-directed component, it is likely necessary for children to have future thinking abilities in order to experience anxiety. Accordingly, children who have deficits in future thinking are less likely to experience anxiety.

Based on the results of this review, another cognitive ability involved in anxiety is generalization. Some articles analyzed in this review mentioned overgeneralization as a mechanism that occurs in anxious individuals (e.g., (47,63–65). Also, In cognitive and learning theories, overgeneralization of dangerous stimuli is considered an etiological account of anxiety (66). According to learning theory, stimulus generalization is a learning mechanism by which a response previously trained for a specific stimulus can also be elicited by another similar, but not identical, stimuli (67); Accordingly, when the stimulus predicts negative or dangerous outcomes, other similar stimuli can elicit the danger and threat as well (68). Although generalization of fear learning is an adaptive mechanism for survival, wide generalization can cause some problems in life (69–71), including anxiety (Laufer et al., 2016). Overgeneralization can happen in the form of broad generalization for threatening or dangerous stimulus that have an imprecise similarity or association with a learned threat and causes clinical anxiety (72–74); Indeed, fear generalization is a characteristic of anxiety disorders such that the focus of fear becomes excessive and broad, extending to many objects, persons, and situations (49,74). Yet, even in a safe context, patients still have wide generalization (66). Additionally, cognitive models of psychopathology emphasize the role of faulty or negative ways of thinking in anxiety (75,76). Beck's cognitive model introduced some cognitive distortions or errors and assigned an important role in clinical anxiety to them (75). One of these cognitive distortions is overgeneralization. It happens when one supposes that the negative outcome of an event applies to the same or similar event or situation in the future (77). Research indicated that this cognitive error was a strong predictor of anxiety in children (48,78). As a result, it is assumed that the ability of generalization can play an important role in experiencing anxiety. This review suggests that children with poor performance in generalization ability are less likely to experience anxiety.

While we tried to use a rigorous and systematic method to conduct this review, some limitations

should be acknowledged. Owning to resource constraints, our search was limited to published literature that were written in English and indexed in investigated databases.

Conclusions and Future directions

The role of cognitive development and cognitive abilities in childhood anxiety is asserted by several researchers (e.g., 13,79). The current study was a further attempt to investigate the cognitive abilities prerequisite to experience anxiety in children. We explored the literature surrounding the cognitive process in anxiety, and three cognitive abilities that may underlie anxiety were extracted (i.e., threat perception, generalization, and future thinking).

This integrative literature review makes an important contribution to current understandings of the anxiety phenomena in children. This study also could have implications for understanding anxiety in children who suffer from some neurodevelopmental disorders, including autism, which can cause impairment in mentioned cognitive abilities. Hence, diagnosing anxiety in these children requires special considerations and careful monitoring. Nevertheless, further studies (e.g., experimental studies) are required to extend our knowledge regarding this topic. Also, other cognitive abilities involved in the development of childhood anxiety can be an interesting topic. Some comparative studies in which anxiety of children with cognitive deficits is compared to that of their typically developing counterparts would provide more detailed information about the role of cognitive development and cognitive abilities on the development of anxiety.

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Author's Contribution

Conflict of interest

None

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23

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24

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26

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Iran J Child Neurol. Summer 2022 Vol. 16 No. 3

27