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Emerging Metacognitive Processes During Childhood: Implications for Intervention Development with Children

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Abstract This paper reviews the literature of how three aspects of metacognition, relevant to working with children in clinical settings, develop across childhood. In cognitive therapy children use their metacognition to monitor the recall of thoughts from memory and to control thoughts as they are actively worked on and restructured. This paper will show that over childhood children use metacognitive monitoring and control abilities in increasingly complex ways and it will provide the ages at which children may be consistently using the cognitive abilities necessary to fully benefit from cognitive therapies.

Keywords Cognitive development · Children · Metacognitive processes

Introduction

Cognitive behavioral treatments have been widely used to alleviate a range of adult problems (Dobson et al. 2008; Gosselin et al. 2006; Mendes et al. 2008). Because of its popularity with adult populations, there has been much interest in adapting CBT for children and adolescents (Southam-Gerow and Kendall 2000). Despite the increasing interest there has not yet been a detailed examination of the cognitive capacities that are required for children to successfully engage in CBT. Without a careful review of what children are capable of certain CBT treatment components may not fit the developmental capability of young children. At the same time, we have begun to see more and more attention being focused on uncovering the underlying mechanisms responsible for effective treatments (Prins and Ollendick 2003; Sauter et al. 2009; Tryon 2009). Adapting CBT for younger children requires

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a careful examination of children's cognitive development and the skills that are rapidly changing during this time including how children's emerging metacognitive abilities influence their capacity to fully engage in CBT (Sauter et al. 2009; Southam-Gerow and Kendall 2000).

Cognitive-Behavioral Therapy Applied to Children

The cornerstone of CBT is that maladaptive ways of thinking about the world are a cause of distress and correcting inaccurate thoughts is the hallmark of this approach. Under the umbrella of CBT several techniques can be used to change one's thinking including cognitive restructuring (Southam-Gerow and Kendall 2000).

The participants in meta-analyses and individual CBT effectiveness studies that have shown the benefits in symptom reduction include young children. Although meta-analyses are powerful tools to synthesize information, they do have certain limitations. Some of the limitations include problems in the design of the original studies that can be carried forward to the meta-analysis and influence the results (Thompson and Pocock 1991). These problems might include flawed treatment randomization procedures and poor compliance to treatment protocol in one of the conditions (Flather et al. 1997). In addition, it is more likely that study trials with favorable results, as opposed to trials with uncertain results, were published in the literature that the meta-analysis pools from, thus leading to an overestimation of treatment effects. Despite the above limitations the results of the following meta-analyses help to establish some guidelines regarding the ages at which CBT is successful for children and can prompt future researchers to purposefully design new studies to examine the issue of the development of cognitive abilities in CBT outcomes.

A meta-analysis by Harrington and colleagues included 8-year-old children (Harrington et al. 1998) and the participants in another meta-analysis conducted by Reinecke et al. (1998) were 11-years-old and older. Other meta-analyses, however, include children as young as 5- (Durlak et al. 1991; In-Albon and Schneider 2007) and 6-years-old (James et al. 2005; Shortt et al. 2001), but only one study has examined the effect of age on therapeutic outcome. Let's take a look at the details of this meta-analysis a bit closer. In 1991, Durlak et al. conducted a meta-analysis of studies published between 1970 and 1987 comparing the outcome of cognitive-behavior therapy in comparison to a control group. Their results included an examination of treatment effect sizes by participant age group. The effect size for 11- to 13-year-old children was large (0.92) while the youngest two age groups (8- to 11-year-olds and 5- to 7-year-olds) exhibited medium effect sizes (0.55 and 0.57, respectively) (Durlak et al. 1991). These results begin to indicate that there may be something about a child's age that moderates or reduces the effectiveness of treatment. Considering that not many studies, including multi-center, meta-analytic and individual studies, have not yet adequately examined how a child's age influences whether they benefit from receiving cognitive therapy, with the exception of Durlak and colleagues, the question of how children's cognitive development influences the outcome of therapy is still open.

Cognitive Therapy and Emerging Metacognitive Abilities During Childhood

Cognitive therapies that use cognitive restructuring consist of teaching children and adolescents to use cognitive techniques to modify their behavior. An important component of cognitive restructuring techniques requires that children be attentive to the content of their thoughts. Developmental research suggests that the ability to attend to one's thinking, an essential capacity when attempting to engage in cognitive restructuring, develops gradually between the ages of 5 and 7 (Flavell et al. 2000). Young children are much less aware of their thinking than are older children and adolescents, but they nevertheless have some abilities to introspect. The full, adult-like capacity to be aware of one's thinking may not be in place until adolescence and the ability to attend to one's thinking may be highly compromised in young people between the ages of 5 and 8 (Grave and Blissett 2004).

Children's Metacognition

Attending to one's thinking has been termed metacognition. This ability to self-reflect on ongoing cognitive processes is unique to human beings and plays a special role in human consciousness (Metcalfe 2008). Metacognition is defined as thinking about thinking (Flavell 1979, 1992; Flavell et al. 1995) and others have defined it as knowing about knowing (Van Overschelde 2008). In a common model of metacognition, Nelson and Narens (1990) distinguished between cognitions that occur about objects (the object-level) such as thinking about "a dog" and cognitions that occur about those objects (the meta-level) such as thinking "I keep thinking about a grey dog". Figure 1 helps to illustrate for the reader what is meant by metacognition. In Fig. 1, the object-level can refer to thoughts such as "a dog" and the meta-level consists of cognitions about the object-level "I keep thinking about that grey dog". In therapy, the therapist and client might be working to help a child change a distorted thought that she has about being afraid that a stranger will break into her house and hurt her family. The object-level is the thought about a stranger who might break into her family's home and the meta-level is the cognition about the object-level such as "I keep thinking about a stranger breaking into my house".

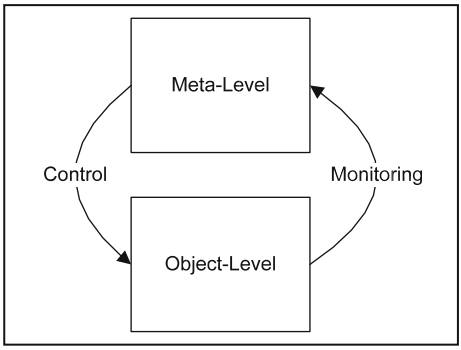

Fig. 1 Model of metacognition adapted from Nelson and Narens (1990)

Metacognition occurs as a result of *monitoring* object-level thoughts. A large part of clinical work focuses on helping the child become aware of the recurring thought that they have. In addition, metacognition can influence object-level thoughts by exerting *control* and changing the object-level (see Fig. 1).

In the area of developmental cognitive psychology, much theoretical and empirical work on metacognition was advanced by Flavell and his colleagues (Flavell 1979). The study of metacognitive development began with studies focused on knowledge about memory, which they termed metamemory but the concept was later expanded and coined metacognition. Metacognition was defined as knowledge or cognitive activity that regulates cognition (Schneider and Lockl 2008). The concept broadly encompasses "people's knowledge about the nature of people as cognisers, about the nature of different cognitive tasks, and about possible strategies for coping with different tasks" (Flavell 2000). The notion behind this research is that people think about objects and behaviors, and also about cognition itself (Wellman 1985).

Although numerous studies have explored how the metacognitive processes of monitoring and control influence object-level thoughts, only three such processes have been widely researched in the developmental literature. These are ease-of-learning judgments, feeling-of-knowing judgments, and comprehension monitoring (Nelson et al. 1992). Each of the metacognitive processes below describe different ways that monitoring and control develop throughout childhood, and as a result of examining them in detail it will be possible to hone in on the age at which children begin to exhibit metacognitive processes in their thinking.

Ease-of-Learning Judgments

Ease-of-learning judgments are predictions of one's own memory span. Ease-of-learning judgments occur in advance of learning something new and are made in reference to items that have not yet been learned (Schneider and Lockl 2008). In the context of Fig. 1, ease of learning judgments are made using information in the meta-level as a result of monitoring object-level cognitive activity when trying to commit items to memory. In other words, ease-of-learning judgments refer to being aware that some things are easier to remember than others. In experiments designed to study ease-of-learning (EOL) judgments participants are asked to estimate how easy it will be to remember lists of facts. Accurate ease-of-learning judgments are made when a participant is able to adequately estimate the length of the list that they will recall from memory. To do this type of estimation requires having had some past successes from which to base accurate judgments, and having *monitored* the result of the recall.

In one of the early ease-of-learning studies, kindergarteners, second-graders, fourth-graders, and sixth-graders were presented with 18 pictures that served as the items they were to recall. The first task involved asking children to name each of the 18 pictures, which they all did correctly. Then, the children were asked how many pictures they thought they could remember if the pictures were covered and they were instructed to point to those. Results indicated that, on average, kindergartens estimated that they would be able to recall 11.17 of the 18 pictures presented, but they actually recalled 7.25 (Worden and Sladewski-Awig 1982). On average, second-graders

predicted that they would recall 8.62 words, but actually recalled 9.5 words (Worden and Sladewski-Awig 1982). Fourth- and sixth-graders exhibited the same pattern of underestimation as second-graders. The overall results suggest that kindergartners overestimate their memory performance, but that older children underestimate their memory. It is possible that during childhood children are differentially accessing and using information extracted by monitoring object-level activity.

The results from the ease-of-learning research suggests that cognitive restructuring techniques requiring clients to pay attention to their thoughts would be best suited for second-grade children because before this time children are not very accurately or consistently monitoring their ongoing thoughts.

Feeling-of-Knowing Judgments

Cognitive therapy, however, requires more than attending to, and monitoring, one's thoughts. An additional cognitive monitoring ability involved in therapy is the ability to accurately examine the content of one's memory. This ability is relevant in helping to determine the accuracy of distorted thoughts, and if we consider distorted thoughts as residing at the object-level, then evaluating their accuracy occurs as a meta-level activity.

The feeling-of-knowing judgment refers to a feeling that is experienced when items are not recalled from memory. Feeling-of-knowing (FOK) judgments tap into one's ability to determine whether items that were not recalled from memory (as in the feeling experienced when trying but failing to remember the name of an old friend) are actually stored in memory. The feeling of not recalling the name of that friend but knowing that the name is in one's memory occurs as a result of meta-level monitoring of the recall activity. When we persist at recalling the name, the meta-level is involved again by suggesting that we indeed have recalled the name or it will provide us with a continuing feeling-of-knowing. In other words, at the same time that one is attempting to recall the name of an old friend (object-level cognition), there is a feeling that occurs in parallel that lets us know that it was difficult to remember the person's name (meta-level cognition).

Experiments examining the developmental trends of the feeling-of-knowing judgment have asked children to define vocabulary words (which increase in difficulty) until they incorrectly define words or no longer provide an answer. In these experiments accurate feeling-of-knowing judgments occur when a word is presented whose definition is *not* known, and as a result of searching one's memory concluding that one does not know the definition. In one experiment, a group of German children in first through fourth grades were tested on the accuracy of their feeling-of-knowing judgments (Lockl and Schneider 2002). Following the first task, the children were presented with a word, asked to point to the picture that corresponded to the definition of the word, and asked to indicate (on a 4-point scale) their confidence in their choice. Results indicated that errors of commission (providing wrong definitions) were consistent across all ages. Recall that accurate feeling-of-knowing judgments require knowing the content of one's memory. Thus, at all ages children were found to be inaccurate in monitoring their memory because they gave definitions for words that they in fact did not know. In regards to the

confidence ratings, only the older children (fourth-graders) were significantly less confident (than all three younger age groups) at having chosen the correct definition. Although all age groups gave wrong definitions at similar rates (36% of the words were incorrectly defined across all ages) only fourth- graders (9- to 10-year-olds) showed an *awareness* of having given an incorrect answer evident in their decreased confidence judgments.

Comprehension Monitoring

Consider Fig. 1 again, the meta-level feeds information back to the object-level through processes labeled as *control*. This suggests that the meta-level is able to influence the object-level thoughts by allowing one to ignore or change the thought. Flavell et al. (1981) provide evidence that children are cognitively able to engage in monitoring but suggest that children might have difficulties in communicating the result of what they are thinking about (Flavell et al. 1981).

In a study examining the development of comprehension monitoring, Flavell et al. asked 6- and 8-year-old participants to listen to instructions played on a cassette tape for how to build a structure with blocks. The goal of the study was to examine children's behavior following difficult instructions. The children's task was to use building blocks to create the structure specified by the instructions. Some of the instructions played on the cassette tape were easy to comprehend, but others were not. Some words in the incomprehensible instructions were not audible, and other instructions included an unknown word, contained ambiguous references, or contradictory directions. It was expected that as a result of the incomprehensible instructions children would have difficulty carrying out the task. If children were monitoring their metacognitive processes while listening to the incomprehensible instructions, then they should be expected to engage in behaviors to articulate their lack of comprehension such as replaying the cassette tape or asking the experimenter for clarification.

The study found age differences in children's behavior as they carried out the incomprehensible instructions. Both 6- and 8-year-old children appeared to engage in different degrees of monitoring. When listening to the incomprehensible instructions, the 8-year-old children were significantly more likely than the 6-year-olds to spontaneously verbalize a problem in their understanding of the instructions, to pause while block building and to display facial expressions of puzzlement. The 6-year-old children did not appear to notice the faulty instructions as they attempted to carry them out to build the block structure. Compared to the 8-year-olds, the 6-year-olds seemed unaware of the incomprehensible instructions. The youngest group either was not paying careful attention to the difficulty experienced as they attempted to build the blocks, or they simply did not know how to verbalize their difficulty.

The Fit Between Cognitive Behavior Therapy and Children's Abilities

Cognitive therapy requires that individuals be able to think about thinking and recognize that thoughts, processes and behaviors are separate concepts. In addition,

cognitive therapies require that children be able to hold information in mind and to manipulate that information in order to make decisions about that information. For example, consider a therapist who is working with a child who believes that she is not a friendly type of person and that she prefers to be alone when she is at school. To work on the thought that she is not a friendly person, the therapist asks the child to remember times that she was friendly with peers at school. To challenge the thought that she is not a friendly person, the therapist may ask for several instances in which she was friendly. In this example, the child is required to (1) know that she has examples of friendly behavior in her memory, (2) to recall these instances, and (3) and use these as object-level thoughts as the therapist helps to restructure them. To successfully engage in each of these steps, the child should be able to monitor and control object-level thoughts, an ability that they are beginning to exhibit between the ages of 8 and 10.

Together, the results from feeling-of-knowing and ease-of-learning judgments indicate that during childhood the ability to attend to one's thoughts emerges by first being able to monitor that some things are easier to remember (an ability present among 8-year-olds) and then by monitoring that one provided a definition for a word they did not know (an ability present among 9- to 10-year-olds). Considering Fig. 1 again, the cognitive *monitoring* that 8-year-olds are doing is quite different from the type of *monitoring* that 9- to 10-year-old children are doing. Both age groups, however, are actually taking object-level thoughts and thinking about them. The implication for cognitive therapy is that beginning around age 8 children are able to look inward to their thoughts.

As outlined by Nelson and Narens, and illustrated in Fig. 1, the second component of metacognition, control, may be present among the 9- to 10-year-olds, but most likely not earlier. The available evidence on metacognitive control suggests that these skills (verbalizing difficulty in comprehending instructions) are thought to develop slightly later in development than metacognitive monitoring (Roebers et al. 2007; Son 2005). Whether metacognitive monitoring is a precursor to metacognitive control or whether both abilities develop simultaneously are questions that remain to be answered.

Taken together, the previous studies on children's metacognitive processes suggest that by age 8 children are able to accurately predict their memory performance as a result of relying on monitoring their thinking, but at this age they are still incorrectly confident after providing a wrong answer. In addition, by age 8 children are able to monitor their thinking so that instructions that do not make sense to them are flagged for clarification. The ability to predict what one is able to remember can be considered a basic ability that demonstrates that one is able to consider their own thoughts as referents. In other words, this means that children have some ability to consider themselves as cognitive beings and to consider their mental strengths and weaknesses (Lockl and Schneider 2007). The literature on feeling-of-knowing judgments indicates that a developing ability in children's monitoring their own thinking appears between ages 9 and 10, and in the study cited was illustrated by decreases in children's confidence in their wrong answers. Lastly, the comprehension monitoring study provides even more support to the idea that by ages 8 and 9 children can pick up on obstacles to their understanding as they

listened to verbal instructions. Picking up on the faulty instructions requires that as they were listening to the instructions they also were processing and evaluating them for accuracy and completeness. Thus, considering the above studies metacognitive processes are being used on a consistent and mature basis between ages 8 and 10.

Given the above review of the development of metacognitive processes during childhood, it is possible to expect that children between the ages of 8 and 10 would do relatively well in cognitive-behavioral therapies. To help move the field of cognitive-based interventions towards being more developmentally appropriate future research should empirically test the ages at which children receive the greatest benefit from CBT.

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