HHS Public Access

Author manuscript

Annu Rev Clin Psychol. Author manuscript; available in PMC 2017 May 23.

Published in final edited form as:

Annu Rev Clin Psychol. 2016 ; 12: 181–216. doi:10.1146/annurev-clinpsy-032814-112836.

Developmental Demands of Cognitive Behavioral Therapy for Depression in Children and Adolescents: Cognitive, Social, and Emotional Processes

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Abstract

Although some treatments for depression in children and adolescents have been found to be efficacious, the effects sizes have tended to be modest. Thus, there is considerable room to improve upon existing depression treatments. Some children may respond poorly because they do not yet have the cognitive, social, or emotional maturity needed to understand and apply the skills being taught in therapy. Therefore, treatments for depression may need to be tailored to match children's ability to both comprehend and implement the therapeutic techniques. This paper outlines the steps needed for such developmental tailoring: (1) specify the skills being taught in depression treatments; (2) identify what cognitive, social, and emotional developmental abilities are needed to attain these skills; (3) describe the normative developmental course of these skills, and how to determine a child's developmental level; and (4) use this information to design an individualized treatment plan. Possible approaches to intervening include: alter the therapy to meet the child's level of development, train the child on the skills needed to engage in the therapy, or apply a dynamic assessment approach that integrates evaluation into treatment and measures children's potential as well as their current abilities.

Keywords

Cognitive Behavioral Therapy; Development; Depression; Children and Adolescents

INTRODUCTION

Depression is a recurrent, persistent, and disabling disorder associated with impairment in multiple domains of functioning. Mood disorders are linked with higher rates of anxiety, risky behaviors, poor physical health, obesity, substance use disorders, and suicide, and are the third leading cause of death for adolescents and young adults (Barbe, Bridge, Birmaher, Kolko, & Brent 2004; Kessler, Foster, Saunders, & Stang 1995; Rice, Lifford, Thomas, & Thapar 2007). Prevalence rates are about 4% in children and 10% to 20% in adolescents (Avenevoli, Knight, Kessler, & Merikangas 2008). Particularly concerning is the fact that early onset depression is a potent predictor of the recurrence of depressive disorders across

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the lifespan. Among individuals who had a depressive episode during adolescence, 25% have been found to have a recurrence within 1 year, 40% within 2 years, and 70% within 5 years (Mash & Wolfe 2012).

Therefore, finding efficacious treatments for depression in youth is of critical importance. Medications have been reported to significantly reduce depression in adolescents, but they also have been linked with undesirable side effects and suicidality (Vitiello & Swedo 2004). Psychotherapies also have been shown to successfully reduce depression in children and adolescents, although the overall effect size has been modest (ES=.34; Weisz, McCarty, & Valeri 2006). Moreover, the long-term effectiveness of therapy for depression in children remains to be demonstrated, with some children continuing to report clinical symptoms even after treatment (e.g., Emslie et al. 2010).

Thus, there is still considerable room to improve upon the outcomes of existing treatments for depression in youth. This can be done through creating new interventions or modifying existing approaches. One advantage of starting with extant treatments is that an empirical base is already available for several known interventions, particularly regarding moderators that may contribute to the variability in the effects (Weersing, Jeffreys, Do, Schwartz, & Bolano in press). One potentially important moderator of treatment effects is age. Meta-analyses have found larger mean effect sizes for older children and adolescents compared to children under age 11 (Durlak, Furhman, & Lampman 1991; Weisz, Weiss, Han, Granger, & Morton 1995). One treatment study of depressed adolescents found a greater benefit of adjunctive CBT as compared to medication alone for older versus younger adolescents (Asarnow et al. 2009). Other studies of adolescents, however, have not found age to moderate response to CBT (e.g., Curry et al. 2006; Stice, Rohde, Seeley, & Gau 2008), although the more restricted age range in these adolescent-only samples may have made it harder to find an age effect.

Another reason that age may not be a consistent moderator of the effects of treatment on depression is that age is just a rough indicator of a more important factor – developmental level. Although many studies have examined age as a moderator of treatment response, few studies have explicitly assessed children's developmental level separately from age, or have tested whether variability in developmental level moderates treatment effects (Grave & Blissett 2004; Holmbeck, O'Mahar, Abad, Colder, & Updegrove 2006). Of particular importance to the present discussion is the fact that relatively limited attention has been paid to the developmental demands of treatments for depression. Developmental psychopathologists have highlighted the importance of using a developmental framework to examine continuity and change in disorders (e.g., Toth & Cicchetti 1999), but such a developmental framework generally has not been extended to clinical research on interventions (Holmbeck & Kendall 1991; Shirk 1999). The idea of incorporating development into treatment planning is not new (Eyberg, Schuhmann, & Rey 1998; Ollendick, Grills, & King 2001; Shirk 1988), but such tailoring of interventions for children has been done informally and often at a superficial level (e.g., linguistic changes), rather than being systematic and empirically-driven (Masten & Braswell 1991; Ollendick et al. 2001).

Thus, one reason psychotherapies are not uniformly effective may be that some children are not yet cognitively, socially, or emotionally able to engage in various aspects of the treatment. Therefore, determining a child's readiness for a particular treatment strategy and matching his or her level of development to a specific technique likely will lead to better outcomes (Holmbeck et al. 2006; Weisz & Hawley 2002). The current paper provides a roadmap for taking such a developmentally-informed approach to treatments for depression.

Developmentally Tailoring Treatments

Why tailor treatments developmentally?

There are several reasons for using a developmentally sensitive approach when treating children for depression. First, development is heterogeneous within chronological age. Despite often being used interchangeably, the terms "age" and "development" are not synonymous (Durlak & McGlinchey 1999; Holmbeck & Kendall 1991). Development is more complex and comprehensive than the linear progression of chronological age. Therefore, we should not assume that cognitive therapy always works better in older than in younger children (Sauter, Heyne, & Westenberg 2009). Moreover, given the heterogeneity of development, not all adolescents (or even adults) possess the developmental competencies necessary to grasp some of the abstract and hypothetical constructs involved in therapy. Use of a person's developmental level to guide treatment decisions may decrease the chances of erroneous developmental assumptions based on age alone (Durlak et al. 1991; Holmbeck & Kendall 1991).

Second, children's levels of cognitive, social, and emotional development constrains what they can learn in therapy. Implementing therapy strategies without having a developmental framework is likely to be ineffective (Kinney 1991). Interventions may be either too elementary or too advanced if designed without considering a child's developmental level at a given point in time. Simply put, "we need to make sure our patients understand what we ask and are able to do what we recommend" (Steiner 2004, p. 24).

As children develop, they may use skills differently depending on the context. That is, a child may demonstrate mastery of a developmental ability in one context, but may not be able to utilize this skill in a different situation (Sauter et al. 2009). In addition, a child's *zone of proximal development* (i.e., the difference between what the child can learn with or without support; Vygotsky 1978) will impact his/her ability to implement new skills when help from others (e.g. therapist, parents) is not present.

Third, clinical symptoms can impact the progression of development and disrupt pathways of "typical" development. One goal of treatment should be to return children to a more normative trajectory (Shirk 1999). Moreover, level of functioning in one developmental domain may be associated with difficulties in another. For example, delayed metacognitive ability may interfere with the growth of mature social perspective taking.

Given the unquestionable importance of incorporating development into treatment design and planning, why is this not already an empirically-validated and universally implemented standard of care? The translation of developmental principles into practice is neither simple

nor direct, and as such the integration of clinical and developmental psychology continues to be a challenge (Holmbeck et al. 2006; Ollendick et al. 2001). We next describe existing attempts to tailor interventions developmentally, note limitations of these approaches, and suggest ways to improve upon this earlier work.

Existing Attempts to Developmentally Tailor Treatments for Depression

Many interventions for youth depression have been downward extensions of adult treatment approaches (Stallard 2002), and some adolescent treatment manuals have been extended further to even younger age groups (Eyberg et al. 1998). Although unintentional, the downward extension approach to designing treatments for children and adolescents tends to ignore individual differences and perpetuate the developmental uniformity myth, which is that persons with the same psychiatric diagnosis are homogenous across age with regard to etiology and phenomenology, and therefore, presumably will respond similarly to treatment regardless of developmental level (Holmbeck et al. 2006; Shirk 1999). Rather, there is considerable variability in children's levels of development in the skills required to engage in treatment. In general, most clinical scientists and practitioners do not believe this myth, but remain challenged as to how to translate an empirically-based developmental perspective into clinical practice.

The most common adaptation of therapy for children has been to alter the methods used to convey therapy techniques by using age-appropriate activities, "child-friendly" materials, simplified language, and cartoons. For example, "thought bubbles" have been used to help children identify what they are thinking (e.g., *Adolescent Coping with Depression Course*; Clarke, Lewinsohn, & Hops 1990). With younger children, therapists may use more concrete pictorial or narrative formats, behavioral strategies, or activities that stimulate imagination (Grave & Blissett 2004). For example, some programs represent cognitive distortions as coming from a "Bad Thought Monster" (Leahy 1988) or "Muck Monster" (Stark, Goldman, & Jensen 2007). Children are then instructed to either fight the monster (e.g., with the help of a "Zen Warrior") or to "talk back" to the monster (e.g., with the help of the therapist).

Using "less complex" behavioral techniques with younger children and "more complex" cognitive techniques with older children also has been recommended, although empirical evidence supporting this approach is lacking (Doherr, Reynolds, Wetherly, & Evans 2005; Eyberg et al. 1998). CBT techniques, such as identifying thinking errors, examining underlying beliefs, and using Socratic questioning have been recommended only for older children who are assumed to be more cognitively advanced (Siqueland, Rynn, & Diamond 2005; Stallard 2009). Some CBT programs for children have simplified the cognitive restructuring process by just replacing negative thoughts with more positive thoughts. Although this "replacement" strategy allows less cognitively advanced children to engage in a form of cognitive restructuring, its efficacy as compared to teaching children the actual process of examining their beliefs and generating more accurate and realistic counter-thoughts has not been demonstrated.

Providing more support, structure, and feedback also has been recommended for working with younger clients (Merrell 2001). In response to this need, treatments have been developed for depressed children that utilize parents as "co-therapists" or coaches to help

children better grasp emotion regulation strategies (CERT: Contextual Emotion Regulation Therapy; Kovacs, Rottenberg, & George 2009). However, the extent of parental involvement in treatment, the child's openness to such involvement, and its efficacy remain open questions likely to be related to children's developmental level.

The importance of developmental factors in therapy has been increasingly recognized over the last few decades. As far back as 1980, Furman acknowledged that the same treatments should not be cavalierly applied to children and adults, but he cautioned that developmental modifications of treatment programs should be based on empirical evidence rather than on subjective clinical judgments. Interestingly, the number of empirical articles mentioning developmental issues in treatment rose from 26% between 1990 and 1998 to 70% between 1999 and 2004 (Holmbeck et al. 2006). Nevertheless, the process of making treatments developmentally sensitive has been a mostly informal rather than empirically driven endeavor.

To individualize treatments according to a child's specific developmental capacities and adapt treatments for depression to the developmental level of the child, we (Frankel, Gallerani, & Garber 2012) have recommended several steps: (1) create a catalogue of the therapeutic techniques used to treat depression in children and adolescents; (2) determine what developmental abilities are required to enact these skills; (3) delineate the normative trajectories of these skills and identify appropriate tools for assessing a child's developmental level on these skills; and (4) use the knowledge of a child's level on the relevant developmental tasks to guide the therapist's formulation of an individualized treatment plan for that child.

Cataloguing Therapy Techniques for Treating Depression in Children

The first step involves the careful and systematic identification of the full range of techniques currently used in the treatment of depression in youth. In an early review of CBT for depression across 64 studies, Durlak and colleagues (1991) identified 42 permutations of eight core skills: task-oriented problem solving, social problem solving, self-instructions, role playing, rewards, social cognition training, other CBT elements, and social skills training. Weersing, Rozenman, and Gonzalez (2009) reviewed three CBT manuals and five core CBT techniques: basic psychoeducation, behavioral activation, cognitive restructuring, problem solving, and "other techniques" (e.g., relaxation training). Despite the fact that each manual represented the same treatment modality (i.e., CBT), the techniques used were quite heterogeneous.

To catalogue the skills being taught in various treatments for depression in youths ages 7–17, we (Frankel et al. 2012) identified randomized controlled trials (RCT) and then obtained the treatment manuals used in these trials. We reviewed 23 depression treatment manuals representing several theoretical orientations (e.g., CBT, BA, and IPT) and formats (e.g. individual, group, family), and generated a detailed component list of therapeutic techniques for each individual manual. We then consolidated the 23 component lists into an overall summary, which included higher order "core" or over-arching techniques comprised of multiple subskills, typically taught across multiple sessions. We identified a total of 18 core

therapy techniques (e.g., cognitive restructuring; problem-solving), which included 173 subskills (e.g., examine accuracy of thoughts; generate solutions). The core techniques were subcategorized into three domains: Cognitive, Social, and Emotional/Behavioral (see Table 1). We also noted six foundational techniques (30 subskills) (e.g., Goal Setting), which were considered essential to successful therapy, but typically were not identified by manuals as "skills training."

Of the 18 core therapy techniques identified, 100% were taught in at least one CBT manual, and 16 were covered by at least half the CBT manuals. Of the 173 subskills, 90% were in at least one CBT manual. In addition to cognitive techniques, all CBT manuals contained some Social, Emotional/Behavioral, and Foundational techniques as well. Other treatment modalities also consisted of techniques from each of these four categories, including many of the cognitive techniques typically associated with CBT. Given the overlap in skills across different treatments, the emphasis on skills training in CBT, and the inclusion of the greatest number of different skills in CBT manuals, this review focused on techniques used in CBT in particular.

Identifying the relevant developmental abilities linked to each therapy technique is complicated. First, different labels of the techniques are used across manuals. A more common language is needed to facilitate comparisons of different techniques across studies. Second, varied activities are used to teach the skills. For example, the subskill of "connecting thoughts and feelings" requires both metacognition and causal reasoning. However, acquiring this subskill becomes differentially complex when the "connecting thoughts and feelings" is regarding the self, which involves self-reflection, as opposed to others, which requires social perspective taking. Awareness of the subskills that comprise the core techniques is necessary, as different combinations of subskills require different developmental abilities. Thus, systematically cataloguing the various therapeutic techniques used in the treatment of depression in youth is an important first step toward pairing these skills with the necessary developmental abilities.

Developmental Skills Needed to Engage in Cognitive Behavior Therapy

The next step involves bridging clinical and developmental research by connecting the various therapy techniques with the developmental abilities necessary for engaging in them. Whereas treatment studies provide the scientific basis for selecting the most efficacious techniques for improving symptoms, developmental research supplies the empirical foundation of the growth of the various developmental abilities over time. Linking these two distinct lines of research in the service of improving treatments for depression in youth is a primary goal. Determining which developmental abilities children need in order to learn and implement a specific therapy technique is neither simple nor intuitive (Durlak et al. 1991; Weisz & Hawley 2002). Developmental skills spanning cognitive, social, and emotional domains have been implicated as being important for effectively engaging in therapy (Durlak et al. 1991; Sauter et al. 2009), but little empirical evidence exists explicitly demonstrating the link between these abilities and therapy procedures.

To effectively tailor children's treatment for depression to their developmental level, we also need to know about the normative development of the relevant abilities; such familiarity with the typical course of skill acquisition can help determine if a particular child is advanced, on track, or delayed. Knowing the developmental norms will guide expectations and decrease faulty assumptions, and thereby improve the quality of the intervention provided (e.g., Holmbeck & Kendall 1991; Weisz & Weersing 1999).

Especially important is knowing the extent of variability possible across individuals. Although, on average, we might expect a child to have a particular skill (e.g., meta-cognition) by a certain age, we also know that not all children function the same way at the same chronological age. Therefore, it is not sufficient to use age as the sole guide for deciding whether or not a child is *ready* to learn a therapy strategy requiring a particular skill. Rather, assessing a child's developmental level on the specific skill will provide a more precise index of his or her ability.

Given the large quantity of therapy techniques, the wide range of potential abilities that may be implicated in learning and using these strategies (Grave & Blissett 2004), and the lack of empirical evidence precisely linking each therapy technique with an exact developmental ability, we instead have undertaken a more achievable goal. We describe here potential relations between some key therapy techniques and several salient developmental abilities, and briefly review the normative developmental trajectory of these abilities. In addition, we list assessment tools for measuring these developmental abilities, and suggest several ways to incorporate this information into treatment planning.

Prior to intervening with a depressed child, we recommend evaluating the child's actual abilities in the salient developmental domains necessary for learning the therapy techniques (Durlak et al. 1991; Kinney 1991). Although clinicians and researchers have recognized the importance of conducting this type of assessment, they have been hampered by not having a "tool box" of measures of the relevant developmental skills (Holmbeck et al. 2006; Sauter et al. 2009). Most clinical assessments used for treatment planning typically focus on children's symptoms and diagnoses rather than their developmental strengths and limitations. Assessments for developmentally tailoring treatments should include ecologically valid measures that capture children's abilities in both the therapeutic setting and the more challenging "real-world" context. A few studies that have attempted to assess development separate from age have used measures of intelligence (e.g., Doherr et al. 2005), but IQ tests do not examine all therapy relevant cognitive sub-domains or assess social or emotional competencies (Sauter et al. 2009).

Cognitive abilities especially have been considered integral for successful engagement in CBT (e.g., Grave & Blissett 2004; Holmbeck et al. 2006). Given that cognition has been a main focus of theoretical arguments for developmental tailoring, we highlight several especially relevant cognitive abilities: scientific reasoning (Sandberg & McCullough 2010), and metacognition (Grave & Blissett 2004). In addition, we address a critically important social ability (i.e., perspective taking; Kinney 1991) and an emotional ability (i.e., emotion understanding; Suveg, Southam-Gerow, Goodman, & Kendall 2007). Clearly, this review is not exhaustive. Rather, we provide a prototype for examining developmental abilities

important in treating depression in youth that can be used in future attempts to further map the developmental demands of therapies for depression in children.

Cognitive Development

Cognitive development is considered to be central to the process of engaging in cognitive therapy. In general, researchers have suggested that children are unlikely to be able to comprehend, learn, and use the kinds of strategies taught in CBT for depression until they have sufficient formal operational and abstract thinking abilities (Shirk 1999). Given the breadth of these developmental milestones and the challenges of measuring them efficiently, we chose to focus on a two specific cognitive skills that can be linked directly to CBT techniques: scientific reasoning and metacognition.

Scientific Reasoning

Scientific reasoning is the process of using evidence to examine theories and hypotheses, and drawing conclusions based on this examination (Kuhn 2002; Sandberg & McCullough 2010). In scientific reasoning, individuals' theories are used to create a testable prediction of specific outcomes. To test such predictions systematically, people collect evidence and examine how well the data fit with their theory-driven hypothesis (Sandberg & McCullough 2010).

Kuhn (2002) highlighted four phases of scientific reasoning: inquiry, analysis, inference, and argument. In the *inquiry phase*, goals are formulated and questions are identified. Tasks include accessing data, recognizing the relevance of the data to the theory, and formulating questions to ask of the data. The *analysis phase* includes representing theory and evidence separately, making comparisons, and detecting patterns through the use of different experimentation strategies. The control of variables strategy (COV) has received the most attention in this literature. COV involves holding all but one variable in an experiment constant in order to systematically examine the effects of each variable on the outcome individually, and testing the experimental space (Inhelder & Piaget 1958); that is, examining all possible combinations of variables (Zimmerman 2007).

The *inference phase* involves using data to draw conclusions about whether the relation between each variable and the outcome is causal, non-causal, or indeterminate. Causal inferences can be made following a single experiment, whereas non-causal inferences require combining data across multiple experiments. Finally, in the *argument phase*, the task is to debate the claims produced in the inference phase. The end product of this process is an updated theory that incorporates new evidence in an unbiased and logical manner.

Another aspect of scientific reasoning, which is particularly relevant for children's ability to learn CBT skills, is the development of epistemological understanding -- the awareness of the process of reasoning and of the separation between theory and evidence. Specifically, epistemological understanding includes knowledge that two people can hold different beliefs, and although beliefs are neither absolutely "right" nor "wrong," some beliefs have more validity and evidence to support them (Kuhn, Iordanou, Pease, & Wirkala 2008).

Development of Scientific Reasoning—Individuals develop theories about the world in order to understand their experiences. Young children's theories typically are incorrect and incomplete, but as they acquire new information, their theories are updated and revised, although not necessarily intentionally. With maturation, children engage in more deliberate knowledge seeking and more explicit examination of evidence and revision of their theories (Kuhn 2002). The development of scientific reasoning is complex, beginning in early childhood and continuing through adulthood, with great variability in scientific reasoning skills even among adults (Kuhn et al. 1995).

The ability to use effective reasoning strategies in complex contexts typically develops around 5th grade (Klahr, Fay, & Dunbar 1993; Kuhn et al. 1988). Most studies of the development of scientific reasoning have compared children around this age to adults. Although more information is needed about the developmental trajectory of these skills across a more diverse and continuous age range, these studies have shown clear developmental trends in the progression of reasoning abilities in terms of gross differences between children and adults.

The strategies children use to examine evidence progress over time (Schauble 1996). On a simplified scientific reasoning task with only two possible options, children as young as six understood the idea of testing a hypothesis, distinguished between effective and ineffective strategies, and identified appropriate experiments when presented with choices (Bullock & Ziegler 1999; Sodian, Zaitchik, & Carey 1991). In more complex experimental paradigms, however, children had more difficulty designing systematic experiments, and their experimental strategies were less efficient and less methodical than those of adults (Penner & Klahr 1996). On COV tasks, when given multiple variables to manipulate, children in grades 2 and 4 are more likely than those in grade 6 or adults to use the "Change All" strategy, which is the most inefficient method for drawing conclusions about individual effects of separate variables on an outcome (Bullock & Ziegler 1999; Tschirgi 1980). Although the ability to use the COV strategy in isolated experiments is developed by about 6^{th} grade, it is not implemented consistently or across contexts at this age (Kuhn et al. 2008). The progression from less to more efficient experimentation strategies occurs gradually and continues into adulthood.

Studies of the development of the inference phase focus on the ability to draw accurate conclusions about causality, non-causality, and indeterminacy, and show that children's model of causality and their ability to draw valid inferences from this model develop over time. Younger children use a co-occurrence model of causality (Kuhn, Black, Keselman, & Kaplan 2000), assuming that if a variable and an outcome co-occur, then they have a causal relation. Older children typically display more advanced models of causality, identifying individual effects of variables as well as additive and interactive effects (Kuhn 2002).

Children have greater difficulty than adults making valid exclusion (non-causal) and indeterminacy inferences (Kuhn et al. 1995; Schauble 1996), which are more complex than inclusion (causal) inferences, because they require examining a pattern of evidence across multiple experiments. Although adults made significantly more correct inferences (80%) than children (30%), children's use of exclusion and indeterminacy inferences increased

over repeated trials (Schauble 1996). As with experimentation strategies, however, after children were able to use more valid inference strategies (e.g., better understanding of non-causal or indeterminate inferences), they continued to use both valid and invalid approaches (Kuhn et al. 1995).

The ability to set aside a prior belief in order to accurately and objectively evaluate evidence increases from grade 2 into adulthood (Kuhn et al. 1988), although many adults are still not proficient at this. Children are more likely than adults to ignore or distort evidence that does not fit with a prior belief (Kuhn et al. 1988; Schauble 1996), and to interpret minor differences in observations as valid when they are consistent with prior beliefs, but as error when they are discrepant from their beliefs (Schauble 1996). In general, however, both children and adults tend not to change their prior beliefs when dealing with anomalous data, although the reasons for this are not entirely clear (e.g., Kuhn et al. 1988; Schauble 1996). In a series of studies, Chinn and Malhotra (2002) demonstrated that children in middle school had difficulty accurately observing phenomena when the data were inconsistent with their prior beliefs. More ambiguous anomalous data were least likely to affect conceptual change. This difficulty of accurately observing anomalous data is especially relevant to children's ability to modify cognitive distortions based on observations of contradictory experiences highlighted in CBT.

Epistemological understanding is the awareness of the relation between empirical evidence and theory. The three levels of epistemological understanding develop over time (Kuhn et al. 2008). At the *absolutist* level, children understand that two people can hold different beliefs, but they also think that one of these beliefs is objectively wrong and can be corrected using accurate information. At the *multiplist* level, children realize that even with knowledge, people can still disagree, because knowledge has a subjective component. At this level, however, all knowledge is viewed as opinion, so neither party is believed to be right or wrong. At the *evaluatist* level, children understand that some opinions are more "right" than others based on the facts that support them (Kuhn et al. 2008).

Epistemological understanding is more advanced when engaging in reasoning about scientific constructs than for social constructs. Kuhn and colleagues (2008) found that children used more absolutist explanations for social problems, whereas they used more multiplist and evaluatist explanations for scientific problems. Although a similar pattern was found for adults, children had more difficulty with problems related to familiar experiences.

The theories involved in scientific reasoning in traditional science vary greatly from those used in everyday thinking, which are supported more by context and affect than scientific facts. Everyday topics may be easier to think about, as they are familiar and more concrete, although the affect associated with them may interfere with the use of accurate reasoning skills (Kuhn et al. 1995). One important implication of this distinction between scientific and social constructs is that clinicians should assess not only scientific reasoning ability about "cold" (i.e., scientific) cognitions, but also about "hot" social cognitions.

In summary, children's performance on scientific reasoning tasks improves over time. Initially, children tend to draw inferences based on inconclusive data, ignore or disregard

inconsistent data, focus on causal rather than non-causal variables, and are influenced by and have trouble modifying prior beliefs. Although the use of effective strategies may improve with practice during childhood, the conceptualization and integration of theory and evidence may not develop as rapidly. In general, the development of scientific reasoning takes a long time and continues throughout the lifespan (Schauble 1996). Mature scientific reasoning abilities are likely essential to engage effectively in many of the skills taught in CBT for treating depression in children and adolescents. Little empirical evidence exists, however, demonstrating the direct link between these various developmental skills and the cognitive demands of therapy.

Connection between Scientific Reasoning and Cognitive Behavioral Therapy

Scientific reasoning is especially relevant to children's ability to engage in cognitive therapy. The capacity to conduct objective experiments, examine evidence, and incorporate incongruent observations into a modified belief are important for learning and implementing cognitive restructuring (CR). CR requires the ability to differentiate thoughts (theories) from evidence, examine evidence, and modify thoughts (draw conclusions) based on this examination. Systematically reviewing data is particularly relevant for seeking evidence of the accuracy of a belief. Children who lack the ability to understand experimentation may struggle with a central procedure used in CBT of asking *"What is the evidence that your belief is true or not true?"*

Children tend to use experimentation to demonstrate the correctness of their current beliefs, rather than to collect new data in a more unbiased, methodological fashion (Klahr et al. 1993). In the context of therapy, children at this stage of reasoning may have difficulty examining evidence or searching for alternative explanations in order to modify their cognitive distortions. Given that evaluating evidence in non-scientific and affectively charged domains is especially difficult, many CBT techniques likely will be challenging even for persons with well-developed scientific reasoning skills. In fact, if children tend to distort observed evidence to support their beliefs, then encouraging examination of evidence without appropriate support and guidance, might actually solidify prior beliefs rather than change them.

Cognitive restructuring relies heavily on the ability to make valid non-causal or indeterminacy inferences after comparing evidence accumulated over time. Children who have not yet developed the ability to reason consistently in this manner may have problems with this technique. Difficulty with accurately observing anomalous data and incorporating this information into belief change has direct implications for a child's ability to engage in CR (Chinn & Malhotra 2002). First, because conceptual change often is impeded during observation, clinicians may need to focus on improving the accuracy of children's observations (e.g., collecting data with the child so they can compare observations). Children then will be better able to engage in the other three processes of integrating anomalous data (i.e., interpretation, generalization, and retention) and more effectively use CR techniques. Chinn and Malhotra (2002) suggested that it is more difficult to incorporate anomalous data and to modify beliefs that are more personally relevant or entrenched. In

therapy, beliefs are likely to be both personally and affectively salient, and as such, may be especially resistant to modification.

The final phase of scientific reasoning is argumentation in order to solidify one's beliefs in the inferences that have been drawn. Often people are more confident when arguing about social issues than scientific ones (Kuhn et al. 2008). Reasoning regarding social domains, however, tends to be less advanced than reasoning used in scientific domains. As such, children will argue with more confidence about social domains even though they use poorer reasoning to draw their inferences. This could be a particular in therapy when children are asked to evaluate their beliefs about socially and personally relevant contexts.

Developmental limitations related to scientific reasoning may hinder engagement in therapy more broadly. For example, children take fewer notes and check their notes less frequently than adults, for whom record keeping is associated with making more valid inferences (Garcia-Mila & Andersen 2007). CBT often requires record keeping (e.g., homework, mood, and thought monitoring, activity scheduling). Failure to engage in these activities or to utilize these systems effectively may make reasoning about the concepts being recorded especially difficult (Zimmerman 2007). When children work with an adult, however, more of the possible experimental space can be covered. Therefore, working with a therapist or parent can help build a child's ability to engage in more systematic experimentation (Gleason & Schauble 1999).

Scientific reasoning skills show intra- and inter-individual variation, such that changes do not always follow a consistent age-related progression (Zimmerman 2007). That is, children of the same age may perform differently on the same tasks, and some adults may struggle with certain reasoning tasks that younger individuals can do (Kuhn 2002; Zimmerman 2007). Because of this variability in reasoning ability among individuals of the same age as well as at different ages, obtaining an accurate assessment of a person's reasoning ability is important for the successful outcome of interventions that require such reasoning.

Assessment of Scientific Reasoning

Scientific reasoning ability most often is assessed with experimental tasks (see Table 2a) such as use of the control of variables strategy (COV). For example, story problems, such as "the cake baking problem" (Tschirgi 1980) present a series of binary variables (e.g., sweetener = sugar or honey), and a hypothesis related to an outcome (e.g., the honey made the cake taste good). Children are then asked to design an experiment to prove this hypothesis, and their responses are evaluated for the use of valid experimentation strategies (i.e., the COV strategy).

In order to examine children's evidence evaluation strategies, independent from experimentation strategies, children are typically presented with data in which two variables covary; then, they are asked to infer a causal relation between the two variables. In these tasks, more sophisticated approaches are associated with more correct inferences, and, as such, more developed reasoning ability.

More complex tasks assessing the combination of experimentation and evidence evaluation allow for a better understanding of the relations among the four phases of scientific reasoning. These tasks typically include both hands-on and computer simulated experimental tasks administered across several sessions. The child's theories about the relations among variables typically are assessed at the beginning of the experiment and again at intermediate stages throughout the experimentation, so that theory modifications that occur after accumulation of evidence can be examined. Use of controlled experimentation strategies as well as the number and type (causal, non-causal, or indeterminate) of inferences made, the validity of these inferences, and the justifications offered for them are all measured (Zimmerman 2007).

Finally, tasks also have been designed that assess children's epistemological understanding. For example, Kuhn and colleagues (2008) presented children with two opposing views (e.g., dinosaurs became extinct due to either a meteorite crash or a volcanic eruption) and then asked them whether one could be certain about what happened, and what would help with increasing someone's certainty. Responses are coded based on the complexity of the child's epistemological understanding (i.e., the extent to which children understood that beliefs may be supported by extant evidence, but cannot be definitively proven). These tasks address children's awareness of the reasoning process, rather than just their reasoning abilities.

In summary, a variety of tasks assess aspects of children's scientific reasoning abilities, separately and in combination, using both single experiments and repeated experiments that assess change in scientific reasoning through learning. Tasks focusing on use of the COV strategy can help determine children's ability to implement effective experimentation, whereas tasks focusing on covariation can provide data on children's evidence evaluation skills independent of experimentation strategies. Hands-on variable manipulation and computer simulation tasks assess the ability to engage in the multi-step scientific reasoning process (i.e., hypothesis formation, evidence gathering, and data interpretation). Finally, newer tasks have been designed to measure children's understanding of the reasoning process, rather than just their ability to reason itself. Overall, these tasks can delineate the normative development of scientific reasoning skills, and can be used to assess a particular child's scientific reasoning level.

Metacognition

Another facet of cognitive development implicated in children's ability to engage in CBT is metacognition. When the construct of metacognition, or "thinking about thinking," was introduced (Flavell 1971), research on metacognitive development was largely about meta-memory (i.e., the study of individuals' knowledge of their own memory processes). The definition of metacognition was later broadened to be "any knowledge or cognitive process that is involved in the appraisal, monitoring, or control of cognition" (Flavell 1979, p. 906), which includes learning, memory, comprehension, and problem solving (Schneider & Lockl 2002). Taken together, these metacognitive processes refer to the ability to use knowledge about one's own cognitive processes strategically to achieve goals (e.g., find a solution to a problem).

Metacognition is defined here as the ability to engage in cognitive monitoring -- that is, to know the contents of one's mind from moment-to-moment (Wellman 1985). For example, a child noticing: "I am thinking a lot about my presentation later today" is engaging in cognitive monitoring. In this sense, metacognition involves reflecting on one's own cognitions with a resultant understanding of one's mental state (Flavell 1979). Such awareness of one's mental activity is crucial for learning and implementing skills taught in therapy, and hence represents the aspect of metacognition that may be most pertinent to youth engaging in CBT.

Development of Metacognition—Metacognition generally develops between the ages of 8 and 13. By about age 8, children have a sound understanding of thinking (Quakely, Reynolds, & Coker 2004), recognize that thinking is a process and that thoughts can be difficult to control, and thoughts and feelings are linked (Flavell, Green, & Flavell 1997, 1998). Children become aware of their own inner speech, often through noticing their covert self-talk while reading, writing, and adding. By age eight, children can report that they have thoughts even when instructed not to think, describe mental strategies used to try to prevent certain thoughts, and indicate why not thinking is difficult. Thus, children become increasingly aware of mental events, particularly the spontaneous nature of cognitions (Flavell, Green, & Flavell 2000). In addition, they begin to recognize that thinking can trigger subsequent thoughts and feelings (Flavell, Flavell, & Green 2001) and appreciate that the mind interprets events and generates thoughts (Barquero, Robinson, & Thomas 2003). By middle childhood, they can recognize that people's pre-existing biases may influence the way they interpret ambiguous events (Pillow & Henrichon 1996).

More advanced understanding of mental experiences continues to develop during adolescence (Cartwright-Hatton et al. 2004). Between the ages of 9 and 13, children improve in their understanding of the mind's uncontrollability (Flavell et al. 1998). Young adolescents recognize that, when awake, people experience a continuous "stream of consciousness," even when not engaged in a cognitive task (Flavell, Green, & Flavell 1993). Thus, by about age 13, youth are aware that thoughts sometimes can happen automatically, involuntarily, and with varied controllability (Flavell 1999).

In summary, metacognitive abilities progress over development. Children can monitor their own thinking and later can report their understanding to others (Grave & Blissett 2004). Increased capacity for observing the consistency and accuracy of one's thinking and reflecting on one's thoughts improves thereafter (Keating 1990). As children become more psychologically minded, they engage in more spontaneous reflections on their thinking (Sauter et al. 2009) and become aware of regulating their thoughts (Doherr et al. 2005). Thus, children's ability to observe their own cognitive processes advances through adolescence into adulthood. Knowledge about the normative developmental trajectory of metacognition will facilitate more effective delivery of interventions (e.g., CBT) that place strong metacognitive demands on children (Bacow, Pincus, Ehrenreich, & Brody 2009; Quakley, Reynolds, & Coker 2004).

Connection between Metacognition and Cognitive Behavioral Therapy—Thinking about thinking" affects multiple domains relevant to successful participation in

therapy. Having an awareness of one's thoughts and being able to monitor mental processes may impact children's capacity to participate successfully in many of the cognitively demanding CBT techniques (Remmel & Flavell 2004). Three types of metacognitive knowledge are relevant to children's ability to engage in CBT: 1) person, 2) task, and 3) strategy (Flavell 1979).

Person metacognitive knowledge refers to awareness of self and others as cognitive processors, both inter-individually (i.e., self as compared to others) and intra-individually (i.e., variations within oneself). Regarding inter-individual knowledge, depressed children may lack awareness that they think more negatively about situations than others. Intra-individually, they may not realize that they engage in cognitively distorted thinking. CBT demands active use of intra-individual knowledge and relies on understanding and applying the cognitive model, such that children are asked to reflect on, monitor, and draw connections among their thoughts, feelings, and behaviors (e.g., Grave & Blissett 2004; Steiner 2004)

Task knowledge involves children understanding the cognitive or affective tasks that must be accomplished (Flavell 1979). For example, CBT teaches depressed individuals to recognize that negative thoughts can maintain their depressed mood, to identify their negative thoughts, and to use cognitive restructuring to challenge them. Children who lack metacognitive awareness of task knowledge may have difficulty noticing their thoughts and recognizing the need to restructure them.

S*trategy* knowledge refers to understanding what strategies are likely to be effective for accomplishing a cognitive or affective task. In CBT, children first are encouraged to notice their automatic negative thoughts, and then to examine them for accuracy, both of which involve metacognition. CBT for depression also requires recognizing one's cognitive distortions (e.g., catastrophizing, all-or-none thinking) in order to modify them. Metacognitive abilities are needed to notice one's thoughts, identify specific distortions, and then select and implement strategies aimed at restructuring those thoughts.

Mindfulness-Based Cognitive Behavior Therapy (MB-CBT; Segal, Williams, & Teasdale 2002), which has been used with children and adolescents (Kallapiran, Koo, Kirubakaran, Hancock 2015), involves impartially observing one's thoughts in a purposeful, nonjudgmental way (Kabat-Zinn 2005). Becoming a "mindful observer" is cultivated by instructing individuals to attend to their breathing and to recognize any judgmental thoughts without pursuing them. They are encouraged to imagine their thoughts passing by as clouds, logs, or bubbles rising from the ocean. Without the metacognitive ability to notice their own thoughts, children would not be able to follow these instructions. In summary, the capacity to "think about thinking," is essential for engaging in many of the techniques that are fundamental to CBT.

Assessment of Metacognition—An early assessment of a child's metacognitive ability may provide important information for treatment planning (Quakley et al. 2004; Reynolds, Girling, Coker, & Eastwood 2006). Informal assessments used to gather information about metacognition include questions such as, "What is going through your mind right now?" and

"What went through your head when…" (Holmbeck et al. 2006). Although these questions can be useful, they do not provide a complete picture of a child's level of metacognitive development. A more formal assessment battery of metacognitive abilities could give clinicians valuable information for tailoring treatment appropriately.

Only a few measures of metacognition for youth exist (see Table 2b). The Metacognitions Questionnaire for Adolescents (MCQ-A; Cartwright-Hatton et al. 2004) and the Metacognitions Questionnaire for Children (MCQ-C; Bacow et al. 2009) measure metacognitive beliefs and monitoring capabilities, although mostly emphasize intrusive thinking and worry rather than the normative developmental processes of metacognition. The MCQ-C was developed and validated on a clinical sample of children with anxiety disorders and a smaller non-clinical sample. Both the MCQ-C and MCQ-A narrowly focus on cognitions associated with anxiety, worry, and rumination, thereby limiting their utility for evaluating metacognitive abilities more broadly. The Cognitive Monitoring and Cognitive Self-Consciousness subscales from the MCQ-C and MCQ-A, respectively, are probably the best available measures of children's ability to reflect on their own thoughts are questionnaires. These subscales focus on cognitive monitoring capabilities and are the only psychometrically validated self-report measures of metacognitive skills in youth relevant to the techniques taught in CBT.

A serious limitation of existing measures is that the very method of collecting information about metacognition (i.e., self-report) requires the recursive cognitive process of *thinking about* one's ability to think about thinking. That is, self-report measures of metacognition may be confounded by their demand for the very ability that they are trying to assess. Therefore, more sophisticated measurement development is needed, particularly multi-method approaches.

Social Development

Several aspects of social development are relevant to children's ability to engage in CBT for depression. We focus here on social perspective taking, because of its centrality to one of the key strategies for cognitive reconstruction – generating alternative explanations for situations that may be counter to one's own beliefs. Other important social developmental skills that should be reviewed in the future are *Theory of Mind*, social problem-solving, seeking and maintaining social support, and interpersonal communication.

Social Perspective Taking

Social perspective taking, sometimes referred to as "role-taking," involves the ability to understand another person's thoughts or feelings from that person's point of view (Enright & Lapsley 1980). Social perspective taking is comprised of cognitive and affective perspective taking (e.g., Enright & Lapsley 1980). Cognitive perspective taking refers to the ability to think about what another is *thinking,* whereas affective perspective taking is the ability to think about what another is *feeling*. Such cognitive and affective perspective taking have been described as "putting oneself in another's shoes" (e.g., Flavell & Botkin 1968).

Selman (1980) argued that unlike simple role taking, perspective taking is more than merely inferring another's mental or emotional content, and includes understanding how "human points of view are *related* and *coordinated* with one another" (emphasis in original) …"Person A truly understands the view of Person B only in terms of how Person B's perspective stands in relation to their own perspective" (Selman 1980, p. 22). Thus, social perspective taking involves momentarily suspending one's own point of view in order to consider how someone else is thinking or feeling about a topic (Selman 1980).

Development of Social Perspective Taking—*Theory of Mind*, which develops by about age 4 or 5, likely precedes and facilitates children's developmental progression into social perspective taking. *Theory of Mind* enables children to understand that other people have beliefs, desires, emotions, and intentions that (a) are distinct from their own, and (b) influence the way others behave (Fireman & Kose 2010; Wellman, Cross, & Watson 2001). This knowledge lays the foundation for children to begin making inferences about others' mental states and emotions (Astington & Baird 2005).

Prior to the development of *Theory of Mind*, children have an egocentric view of the world (Piaget 1965), which involves being firmly rooted in their own perspective, and failing to realize that other perspectives exist (Remmel & Flavell 2004). This does not mean, however, that children have a fully developed understanding of their own perspective from the start; very young children lack an understanding about even their own view (Elfers, Martin, & Sokol 2008). Knowledge of one's own and others' perspectives is thought to develop simultaneously (Elfers et al. 2008). Piaget (1926) initially postulated that children under age 7 or 8 communicate egocentrically (i.e., without taking account of what their listener needs to know). More recent research, however, has found evidence of perspective taking at earlier ages, suggesting that Piaget's tasks may have been too abstract and disconnected from children's everyday experiences (Remmel & Flavell 2004).

Adolescents also tend to be egocentric and preoccupied with the self, which leads to the "imaginary audience" phenomenon, in that adolescents overestimate how much others are paying attention to them (Elkind 1967). Although adults are capable of recognizing others' views, they still tend to discount the fact that their own beliefs are subjective interpretations of reality, resulting in even adults thinking that those who disagree with them as ill-informed and irrational (i.e., "naïve realism," Ross & Ward 1996). Thus, the process from egocentrism to mature social perspective taking does not occur all at once, but rather follows a protracted developmental course with some difficulties continuing into adulthood (Remmel & Flavell 2004).

Social perspective taking matures over time as the brain structures underlying this skill (e.g., medial prefrontal cortex, superior temporal sulcus, and temporo-parietal junction) develop (Blakemore 2009). This brain development makes possible such processes as recursive thinking (i.e., capacity to hold an increasing number of embedded perspectives in one's mind simultaneously), which probably underlies perspective taking (Landry & Lyons-Ruth 1980). The cognitive advances occurring in tandem with social development allow children to realize that perspectives are created by a mind that interprets and represents the world rather than simply photocopying what they see. Such awareness promotes an understanding

that multiple-perspectives about the same situation can exist, and that both external and internal factors create personal perspectives that drive behavior (Fireman & Kose 2010; Keating 1990). Finally, increased motivation to take another's perspective develops with children's emerging desire to engage in prosocial behavior (Eisenberg, Cumberland, Guthrie, Murphy, & Shepard 2005).

In summary, young children are very limited in their ability to understand another's point of view. As perspective taking abilities mature due to a variety of biological and psychosocial factors, children become increasingly capable of integrating another's perspective with their own. Nevertheless, adolescents and adults, though considerably more mature in their cognitive and social abilities, continue to encounter challenges in perspective taking. Such a protracted developmental trajectory may have important implications for using certain techniques to treat depression during childhood and even throughout adulthood. Importantly, significant individual differences in the timing of social perspective taking abilities means that therapists can't simply rely on children's age to determine their ability to take another's perspective.

Connection between Social Perspective Taking and Cognitive Behavioral Therapy—Social perspective taking theory (Selman 1980) can help guide both treatment planning in CBT (Kinney 1991) and the assessment of children's abilities to self-reflect (Habermas 1987). Selman noted that a clinician's knowledge of how capable a child is in taking another's perspective (i.e., understanding the child's "conceptual lens") will allow the therapist to tailor treatment to the child's current skill set, rather than placing undue demands on the child that exceed and strain his or her abilities.

A considerable portion of child and adolescent treatment manuals for depression aim to promote children's ability to interact successfully with others. The quality of children's relationships partially depends on their ability to take the perspective of others including peers, friends, teachers, coaches, siblings, parents (Bosacki & Astington 1999; Selman 1981). If the ability to understand others is critical for social functioning (Flavell & Botkin 1968; Grave & Blissett 2004), and if social impairment contributes to the onset and/or maintenance of depressive symptoms (e.g., Brendgen, Lamarche, Wanner, & Vitaro 2010), then improving children's social perspective taking ability may facilitate positive treatment outcomes.

In CBT, patients often are asked to consider and anticipate the effects of their behavior on others (e.g., Grave & Blissett 2004; Holmbeck et al. 2006; Weisz & Hawley 2002). Social perspective taking demands are especially apparent when children are taught to imagine hypothetical interpersonal situations, and to anticipate the various ways they might respond, the ways others in the situation might respond, and the range of possible outcomes (Weisz & Weersing 1999). Empathy and prosocial behavior, which may be developmental correlates of social perspective taking, also are linked with being able to see another's perspective and integrate it with one's own (Elfers et al. 2008).

One important CBT technique used to help depressed people examine their beliefs is to ask them "Is there an alternative explanation for what happened?" This is especially useful when

dealing with interpersonal issues. Can children with depression generate more than one possible reason for another's behaviors? For example, if a child's friend is in a bad mood, and at first the child believes that the friend doesn't like him or her any more, then the child might feel sad. The therapist can help the child consider other possible reasons for the friend's mood by asking the child to think about (i.e., take the friend's perspective) what else might have been going on (e.g., the friend was in a bad mood because he got into trouble at home). The therapist then can have the child role play the friend to help prepare him or her to talk with the friend about what was going on. Such alternative thinking is facilitated by being able to see another's viewpoint.

The commonly used therapeutic technique of role-playing calls upon the ability to view situations through another's cognitive and affective lens. Clinicians often incorporate role-playing strategies into assertive behavior training, which is a core therapeutic technique in the treatment of depression. Successful assertive behavior demands that one recognizes both one's own and the other person's thoughts and feelings. In contrast, poor perspective taking ability often leads to miscommunication and conflict (Remmel & Flavell 2004). Thus, social perspective taking is a critical developmental ability necessary for engaging in and learning numerous CBT skills, particularly the negotiation of conflicts through assertive behavior.

Assessment of Social Perspective Taking—Several perspective taking tasks are available (see Table 2c); most elicit open-ended responses to questions about hypothetical scenarios involving multiple characters with different perspectives. In a comprehensive review of the assessment of perspective taking, Enright and Lapsley (1980) concluded that the Bystander Task (Chandler 1973), Nickel-Dime Task (Flavell & Botkin 1968), and Interpersonal Interview (Selman, 1976, 1980) had the best psychometric properties. Conceptualization of the construct of perspective taking was somewhat different across the measures reviewed, however.

At the time of the Enright and Lapsley (1980) review, most existing tasks did not have the number of items needed for rigorous psychometric analyses, and therefore they recommended that new perspective taking measures be developed. Since the 1980's, little attention has been given to developing empirical methods for assessing perspective taking abilities. One exception is the Perspective Taking subscale of the Interpersonal Reactivity Index (Davis 1983), although it has not been used with children. Thus, the armamentarium for evaluating children's developmental level of social perspective taking is still rather limited. Further construction of psychometrically rigorous measures of perspective taking is needed.

Emotional Development

Emotion Understanding

The emotional skills that enable individuals to interact effectively with the social world has been conceptualized in several ways (Mayer, Salovey, & Caruso 2000; Saarni 1999). Most models include skills that can be categorized as either "emotion understanding" or "emotion regulation" (Suveg et al. 2007). "Emotion understanding" abilities have been described as necessary precursors to the development of effective regulation (Larsen 2000). Although

both “emotion understanding” and “emotion regulation” strategies are relevant to children’s ability to engage effectively in CBT, we focus here on competence in “emotion understanding” because the development of these abilities are more directly related to specific CBT techniques such as understanding the cognitive model, behavior activation, and assertiveness training. The relevant abilities considered to be components of “emotion understanding” are: (1) emotion perception and identification (in both the self and others), (2) understanding of causes and consequence of emotions, (3) understanding simultaneity of emotions (i.e., that more than one emotion can occur at the same time), (4) understanding emotional intensity, and (5) recognizing the distinction between inner experience and outer expression.

Development of Emotion Understanding

Emotion Perception and Identification: The ability to recognize and label emotions is a fundamental aspect of emotion understanding (Mayer et al. 2000; Saarni 1999). Although emotion identification improves with age, *when* this skill emerges depends on the type of task used and the particular emotion studied. In general, children are able to identify and label positive emotions before negative ones (Camras & Allison 1985). Recognition of happiness develops first, with anger, fear, and surprise developing later (Markham & Adams 1992; Wintre & Vallance 1994). Children often confuse disgust with anger, whereas adults can distinguish between these emotions accurately (Markham & Adams 1992; Widen & Russell 2010). In general, identification and labeling of emotions emerges for basic emotions at a young age (i.e., 4 to 8 years), but extension of these skills to more subtle or complex emotions (e.g., guilt, embarrassment) continues throughout development (Saarni 1999).

Recognition and labeling of simple emotions emerges at a young age, but not all children attain proficiency at identifying and labeling complex emotions at the same time (Ciarrochi, Heaven, & Supavadeeprasit 2008); the capacity to describe emotional experiences continues to develop during adolescence (Luebbers, Downey, & Stough 2007). The typical developmental course for acquisition of emotion perception skills involves the ability to recognize increasingly complex emotions during early to middle childhood, and faster processing of facial expressions from early adolescence through adulthood.

Emotion Causality: The ability to understand that emotions arise in reaction to a combination of situational experiences and thoughts, memories, and attributions about these experiences is an important aspect of emotional development relevant to treating depression. Children 4- to 6-years-old typically can connect emotions to a situational cause, although they assume that all people would experience the same emotion if put in the same situation (Banerjee 1997; Donaldson & Westerman 1986; Harris & Olthof 1982). As *Theory of Mind* improves and children increasingly understand that people are capable of holding distinct thoughts, beliefs, and desires, children begin to understand that emotions are also related to thoughts, memories, and causal attributions (Banerjee 1997; Donaldson & Westerman 1986). This understanding increases gradually, and by about age 11, many children realize that internal processes (e.g., memories, desires) can produce emotional experiences (Donaldson & Westerman 1986; Harris & Olthof 1982). Younger children may demonstrate

a more complex understanding of emotion causality when tasks are simplified (e.g., yes/no questions; Harris, Guz, Lipian, & Man-Shu 1985), but typically are less able to express this understanding or generate it independently when asked in an open-ended question format.

Simultaneous Emotions: Understanding the experience of simultaneous emotions, valence of emotions, and emotions directed at a target progresses through several developmental levels (Harter & Buddin 1987; Vitulić 2009). Around age five, emotion understanding is characterized by the ability to identify a single emotional experience. Children can comprehend that two different emotions can follow each other in a temporal sequence, but not that they can be experienced simultaneously. Around age 7 to 8, children begin to realize that multiple, contradictory feelings can be experienced in the same situation or toward the same target, and that these feelings may impact one another, although they continue to have difficulty understanding the simultaneity of these emotions; they often keep the emotions separated temporally, however, and by about age 10, children typically understand that simultaneous emotions of different valences can be experienced, but only when directed at different targets. Finally, around age 11, children begin to understand that one can concurrently experience two opposite valence emotions directed at the same target (Harter & Buddin 1987), and can comprehend ambivalence (Donaldson & Westerman 1986).

Emotion Intensity: Understanding the intensity of emotional experience also develops over time, and interacts with the understanding of simultaneity and valence. The ability to understand degrees of intensity in emotional experiences only requires mental representation of a single emotion at varying levels of intensity, and develops earlier than the more complex recognition of the simultaneity of opposite valence emotions (Wintre & Vallance 1994). When children first begin to recognize that multiple emotions of the same valence (e.g., sadness and anger) can be experienced simultaneously, they cannot yet understand that these simultaneous emotions can have different intensities. Eventually children learn that simultaneous, same-valence emotions can occur at different intensities, and that multiple emotions of different valences can be experienced concurrently and at different intensities (Wintre & Vallance 1994). Between ages 4 to 8, children begin to understand these concepts, but generally these skills are not solidified until after age eight (Donaldson & Westerman, 1986).

Distinguishing Internal Experience from Outer Expression: The “appearance-reality distinction” is the ability to recognize that one’s inner emotional state and outer emotional expression may differ. This ability begins to emerge around age 10 or 11 (Gnepp 1983; Saarni 1999). Younger children may be able to understand that internal states and outer expression can differ when this possibility is suggested to them, but they have trouble explaining how or why this happens (Harris, Donnelly, Guz, & Pitt-Watson 1986). Children likely would not be able to spontaneously conclude this, however, without significant scaffolding.

In summary, the ability to perceive and identify emotions, understand emotion causality, simultaneity, and intensity, and recognize the distinction between inner experience and outer expression emerge over childhood and adolescence. These abilities initially develop for basic emotions and then for more complex emotions over time. Although these various

aspects of emotion understanding are considered important for engaging successfully in CBT, evidence of this relation in children remains to be demonstrated empirically.

Connection of Emotion Understanding to Cognitive Behavior Therapy— Emotion understanding and competence likely underlie the ability to engage in many of the cognitive, social, and emotional/behavioral techniques outlined in Table 1. In order for children to engage in the skills involved in understanding and using the cognitive model, they need to be competent in emotion perception and identification, and understanding of emotional intensity and causality of emotions. For example, identifying and rating moods requires children to be able to label their emotional experiences and to understand differences in emotional intensity. Connecting feelings with thoughts, behaviors, and situations requires understanding that emotions have causes and consequences, and that these causes are a function of both internal processes and external circumstances.

Several socially relevant therapy techniques also are likely to be affected by level of emotional competence. For example, emotion perception and identification are connected with several subskills of assertiveness training including recognizing one's own and others' emotions, letting the other person know how you feel, and expressing emotions using "I statements." Many aspects of assertiveness training and social problem solving require individuals to deliberately behave in a manner that may be inconsistent with their inner emotional experience. This skill will be harder to teach to children who do not yet understand the distinction between inner emotional experience and outer emotional expression.

Some treatments for depression teach children to recognize, explore, or accept mixed feelings, which requires the ability to understand simultaneous emotions. Emotion perception and identification are necessary for understanding that feelings can be conveyed verbally and nonverbally, identifying bodily responses to stress, and recognizing signs of depression. In addition, the ability to perceive and identify one's own feelings underlies some emotion regulation techniques such as leaving the situation, taking a break, and calming down.

Given the importance of emotion understanding abilities to effectively engaging in a wide range of therapy strategies, and given the considerable heterogeneity of these abilities within age (Vitulić 2009), it will be important to assess a child's level of emotion understanding prior to trying to implement the therapy. That is, the likelihood of children benefiting from treatment may depend, in part, on the extent of their emotional development. Therefore, when teaching skills that require various aspects of emotion understanding, clinicians must not presume that all older children or adolescents are competent, but rather should conduct an actual assessment.

Assessment of Emotion Understanding—Emotional abilities have been assessed with performance-based measures, interviews, and questionnaires (see Table 2d). Performance tasks assess emotion identification abilities by presenting pictures of emotional facial expressions. "Situation discrimination tasks" describe scenarios that typically evoke a given emotion and ask the child to point to the picture of the person experiencing the

emotion (e.g., Camras & Allison 1985). “Free labeling tasks” ask children how a person in a photograph was feeling when the picture was taken (Izard 1971), and appear to be the most difficult for young children (Markham & Adams 1992), probably because they also tap into children’s developing emotion vocabulary. Nonetheless, these tasks may be particularly relevant to children’s ability to engage in therapy, because they require labeling and describing emotions rather than selecting among a predetermined set of emotion choices.

In interviews, children are presented with a hypothetical story about a fictional character or about themselves involved in an emotion-eliciting situation. The child is asked questions about the feeling(s) experienced in the story (e.g., emotion comprehension task; Cermele, Ackerman, & Izard 1995). Interviews also ask about what emotions would be experienced, as well as about the timing of these emotional experiences, and how these emotions are related to one another.

Both performance-based and interview tasks can be conducted regarding many different emotions, although typically focus on “basic” emotions (e.g., happy, sad, mad, and scared). These tasks have been used to study children’s understanding of the valence of emotion (Markham & Adams 1992), simultaneity of emotions (Harter & Buddin 1987), ambivalence (Donaldson & Westerman 1986), and the distinction between inner emotional experience and outer emotional expression (Gnepp 1983). Some measures also combine performance-based and interview tasks to assess a range of emotion understanding abilities in children. These tasks provide information about various aspects of emotional competence, although a child’s performance may depend on the specific stimuli used and the type of responses required.

Finally, some self-report measures of emotional understanding, originally designed for adults, have been modified for children. For example, the Toronto Alexithymia Scale (Bagby, Parker, & Taylor 1994) was revised for children (Rieffe, Oosterveld, & Terwogt 2006) and has two relevant factors: difficulty identifying feelings (e.g., “I am often confused about the way I am feeling inside”), and difficulty describing feelings (e.g., “I find it hard to say how I feel about other people”). These measures may be useful for tracking developmental changes in emotional competence from childhood through adolescence, although they have not yet been evaluated empirically with regard to treating depression in youth in particular.

Treatment Planning

When a depressed child first presents for treatment, clinicians lack information about the child’s level of cognitive, social, or emotional development. Therefore therapists typically rely on knowing the child’s age and use a trial-and-error process to determine the child’s ability to learn the skills taught in CBT. An alternative approach would be to explicitly assess the child’s relevant abilities prior to or as part of treatment (Quakley et al. 2004; Reynolds et al. 2006). How can clinicians use this assessment information to construct a developmentally sensitive treatment plan? At least three approaches are possible: (a) modify the treatment to fit the developmental level of the child; (b) enhance the child’s developmental competencies in preparation for more advanced therapeutic techniques

(Holmbeck & Kendall 1991); or (c) combine assessment and treatment into an ongoing dynamic process.

First, the therapist can adapt the treatment to fit the developmental level of either the individual child or for children fitting a certain developmental profile (Weisz & Weersing 1999). Examples of modifying the treatment include altering activities to be more or less complex, concrete, behavioral, cognitive, or visual (e.g., Sauter et al. 2009; Stallard 2002). Different versions of treatment protocols can be designed for children of various levels of maturation (Holmbeck et al., 2006). Such modifications should be made on the basis of a child's developmental level rather than age alone, however.

A second approach is to enhance the child's developmental competencies prior to introducing more advanced therapeutic techniques (Holmbeck & Kendall 1991). This involves the clinician beginning treatment by building the child's developmental skills (Shirk 1999). The expectation is that providing scaffolding and tapping into the zone of proximal development (Vygotsky 1978) will facilitate the subsequent mastery of the relevant techniques (Holmbeck et al. 2006; Sauter et al. 2009). To improve children's developmental capacities, interventions could focus directly on these abilities, rather than on clinical symptoms, by targeting skills that are within the child's learning potential (Remmel & Flavell 2004). In turn, these improved developmental abilities could facilitate the subsequent mastery of the relevant skills taught in therapy (Holmbeck et al. 2006; Sauter et al. 2009).

Some evidence exists indicating that development can be primed in this way (Keating 1990). For example, children taught with a curriculum designed to improve thinking skills, later performed better on cognitive-behavioral tasks than did children in a more typical curriculum (Doherr et al. 2005). Several studies have shown improvement in scientific reasoning skills through training, although some forms of training (e.g., practice in use of experimental space; schema induction) have been more effective than others (e.g., general lessons on experimental strategies; Chinn & Malhotra 2002; Siegler & Liebert 1975). For example, the control-of-variables strategy (Inhelder & Piaget 1958) can be taught effectively, although use of this strategy does not necessarily generalize to other contexts following these interventions (Chen & Klahr 1999; Klahr & Nigam 2004).

Additionally, the process of explicitly justifying one's claims or strategies to others helps increase children's awareness of the meta-level processes they are engaging in, and in turn, may increase their utilization of these strategies (Olson & Astington 1993). Therapists and parents may be able to scaffold children's progress by asking questions such as "How do you know?" or "What evidence supports that?" Interventions geared toward priming the development of scientific reasoning skills may need to support the development of epistemological understanding, helping the child to recognize why certain strategies are better than others. That is, it is important to teach children not only how to use a strategy, but also when and why that strategy is effective (Kuhn & Dean, 2005).

Several interventions are available that aim to improve emotional understanding (PATHS: Greenberg, Kusche, Cook, & Quamma 1995; ENVI: Grinspan, Hemphill, & Nowicki 2003; EC: Izard, Trentacosta, King, & Mostow 2004), and have been found to successfully

improve children's emotion perception, identification, and vocabulary. Identifying feelings is a therapeutic technique already addressed in many interventions. Given the breadth of skills taught in these interventions, however, the effectiveness of teaching these emotion understanding abilities, in particular, is unclear (Ciarrochi et al. 2008).

A third approach that builds on the second one is to use dynamic assessment, which involves a direct link between the process of assessment and intervention (Lidz 1991; Grigorenko & Sternberg 1998). Rather than evaluating the salient developmental skills prior to beginning therapy, the assessment becomes part of the treatment. In this approach, the child is considered to be a "learner who is capable of change" (Lidz & Elliot 2000, p. 6); the therapist actively evokes this change through questioning, providing feedback, and mediating new thinking and learning skills (Haywood & Lidz 2007). Dynamic assessment (DA) captures children's ability to learn and apply new skills, and is not simply a static measure of existing knowledge. Thus, DA measures *potential* rather than just current *ability* (Lidz 1991; Grigorenko & Sternberg 1998).

Which of these three strategies will be most beneficial for children and adolescents in therapy is not yet known. Elements of each approach could be combined into a comprehensive assessment and treatment package. Overall, a child's developmental level in salient domains should inform all aspects of treatment planning, from case conceptualization and goal setting to intervention selection and outcome assessment (Holmbeck & Kendall 1991; Sauter et al. 2009). Future research should examine which method(s) most effectively tailor interventions to meet the developmental needs of particular children across the age span.

Limitations

Given the breadth of topics covered in the current review, it was beyond the scope of this paper to address every domain of development that could be relevant to a developmental approach to therapy. For example, the current review only touched upon the development of language skills and executive functioning as they relate to effective therapy practice. In addition, children's developmental level has important implications for therapy parameters (e.g., length and frequency of visits) and the context of therapy (e.g., individual, group, family). It also is important to recognize that psychopathology and development impact each other in complex ways that may affect the assessment of developmental level as well as appropriate treatment targets. Each of these areas should be considered when taking a developmentally informed approach to therapy.

Several practical barriers also exist that interfere with making treatments for depression developmentally appropriate in practice. First, clinicians might not know what developmental skills are most relevant or know how best to assess them. The aim of the current paper was to provide some of this basic knowledge by identifying several salient developmental skills and suggesting measures for assessing them.

Second, clinicians have a limited amount of time within any one session (i.e., 50 minutes) and a limited number of sessions, at least which are covered by most insurance companies.

Is it realistic to think that a clinician can conduct the relevant assessments and still have time to do therapy? Relatedly, is doing developmental assessments cost effective? That is, are the time and resources necessary to do the evaluation worth the expense?

Finally, are these developmental assessments really necessary? Does the knowledge gained from these evaluations actually increment the efficacy of the treatment beyond what is provided from the treatment without this information? The studies necessary for addressing these questions have not yet been done. We will not know whether the developmental approach described here "works" and is worth the effort until the appropriate empirical trials have been run. Given the relatively modest effects of existing treatments for depression in children and adolescents (Weisz et al. 2006), we suggest that such experimental trials should be conducted.

Conclusions and Future Directions

Much of therapy focuses on individuals' thoughts, feelings, and behaviors. Clinicians aim to understand the complex interplay among these factors and to recognize patterns of thinking, feeling, and acting that are not serving the individual well. Treating depression involves identifying recurrent negative thoughts and the associated emotions and behaviors. Clinicians and patients together explore what triggers and perpetuates certain thoughts, feelings, and behaviors. An absence of knowledge of a child's specific developmental level and a failure to adapt interventions for less developmentally advanced children who lack awareness of their own mental activity, however, likely will result in a poorer treatment outcome. In contrast, well-developed cognitive, social, and emotional abilities will facilitate children's participation in the process of therapy, and thereby likely result in improved outcomes.

Conducting a formal, developmentally-sensitive assessment of the various skills reviewed here could identify children's areas of strengths and weaknesses with regard to these salient domains. With such a developmental profile, clinicians will have more relevant information for selecting age-appropriate therapeutic techniques, and thereby conduct a more efficient and effective intervention. Tailoring treatments to be more in line with the developmental level of the child should increase the efficacy of the intervention.

Strategies for making treatments developmentally appropriate include (a) using treatment manuals designed for specific developmental levels or profiles; (b) altering therapeutic activities to be more or less concrete, complex, cognitive, behavioral, or visual depending on the target population; and (c) modifying parents' role in therapy to fit the developmental level of the child (e.g. active "coaching" from parents who have been properly trained). To date, these modifications have been made based on children's age, rather than on the basis of an empirically determined evaluation of a child's developmental level. It may be possible to both modify the treatment to match a child's development, and work directly to improve the child's abilities so he or she can maximally participate in and benefit from the treatment process.

The current paper reviewed only a sample of developmental abilities hypothesized to be necessary for engaging in treatment (i.e., CBT) for depression in youth, and addressed several fundamental questions including: “What developmental abilities are required for children to acquire the skills being taught in therapy?” “How do these abilities typically develop?” and “How can we assess a child’s level of these abilities?” Each of the skills (e.g., scientific reasoning, metacognition, social perspective taking, and emotion understanding) reviewed here theoretically can be linked to particular therapeutic techniques, but evidence of an empirical association remains to be established. Several additional questions need to be addressed such as: Does knowledge of a child’s level with regard to specific developmental abilities actually improve the prediction of how well he or she will learn and apply the therapeutic techniques, over and above age? Can measures of these abilities designed for use with non-clinical samples also be used to determine depressed children’s developmental levels and, in turn, to predict their potential success in therapy?

In conclusion, the current review highlighted several salient cognitive, social, and emotional developmental abilities that may be especially important for a child to successfully engage in CBT for depression. In addition, we described the typical developmental trajectories of these abilities and suggested several assessment tools for determining children’s developmental level in these domains. Finally, we described three possible methods for incorporating information from the assessment into treatment planning. Further research is needed to clarify the relations between specific skills taught to children in therapy and various developmental abilities, to determine the adequacy of existing assessment tools for creating a developmental profile for children entering therapy, and to identify the most effective strategies for tailoring treatment to a child’s specific developmental level in the relevant domains.

We recommend the following future research directions:

1. Further outline other developmental abilities needed for children to engage in the techniques taught in CBT (e.g., conditional reasoning; self-reflection).
2. Conduct a similar review of executive functioning abilities (e.g., working memory, cognitive flexibility) needed for children to benefit from CBT.
3. Construct a comprehensive assessment battery (i.e., tool box) for measuring the developmental abilities needed for children to successfully engage in CBT for depression.
4. Create a developmental dynamic assessment approach that measures not only children’s current abilities, but also their potential for learning the skills taught in therapy.
5. Conduct micro-interventions and RCTs to test the incremental benefits of supplementing existing CBT for depression in youth with the developmental dynamic assessments recommended here.

Acknowledgments

This work was supported in part from grants from the National Institute of Mental Health (R01MH100258; R01MH64735; T32MH018921; T32MH083745). We would like to thank Steven Hollon, Bruce Compas, and David A. Cole for their helpful comments on an earlier version of this work.

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Table 1

Therapeutic techniques and associated cognitive, social, and emotional developmental skills

Cognitive Techniques	Cognitive Developmental Skills
Understanding the Cognitive Model	
Identify thoughts	*Metacognition*
Differentiate situations, thoughts, feelings, & behaviors	*Metacognition*
Connect situations, thoughts, feelings, and behaviors; use "if-then" statements (e.g. "If I think ____, then I will feel ____").	*Metacognition* *Reasoning*: conditional, scientific, & causal
Cognitive Restructuring	
Examine evidence for and against their beliefs; Recognize that thoughts are not always true and that thoughts can be changed	*Metacognition; Theory of Mind* *Reasoning:* scientific & logical
Generating alternative explanations	*Cognitive flexibility; perspective taking*
Thought monitoring; reflect on past and future patterns of thinking and behaving	*Hypothetical reasoning* about the past; anticipation of the future
Recognize Types of Thoughts	
Identify and recognize negative thoughts and cognitive distortions in order to modify them	*Metacognition; Theory of Mind* *Reasoning*
Modify attributions of causality for events	*Implicit theories* of personal attributes
Social Techniques	**Social Developmental Skills**
Social Problem Solving/Conflict Resolution	
Social problem solving	*Self-reflection*: recognize the role of one's own behaviors on social problems; identify what perpetuates their maladaptive behaviors *Cognitive flexibility*
Conflict resolution; interpersonal negotiation	*Social perspective-taking*; reciprocity; appraise others' intentions
Dispute negative thoughts about others: step outside one's own perspective and take the viewpoint of another	*Social perspective-taking*; realize the validity of another's view, not just that other views exist
Improve and enhance social relationships	*Social skills*: conversational skills
Develop/Maintain/Seek Social Support	
Seek social support	*Self-reflection*: recognize when help is needed
Understand how moods, words, and behaviors can impact relationships; relationships can affect mood	*Social perspective taking*
Recognize others' feelings instead of only their own	*Empathy; social perspective taking*
Assertiveness Training	
Assertiveness training: understand the impact of one's statements and actions on others	*Self-reflection; social perspective taking;* understand cause-and-effect sequences that involve others; predict others' social behaviors *Emotion perception, identification, expression*
Emotional & Behavioral Techniques	**Emotional Developmental Skills**
Emotion Understanding	
Mood monitoring; rate intensity	*Emotion labeling; emotion intensity*
Describe their emotional experiences	*Emotion vocabulary*
Thoughts or behaviors can impact emotions	*Emotion causality*
Understand the causes and consequences of emotions	*Emotion causality; emotional intelligence*
Recognize and understand mixed feelings	*Simultaneity of emotions*

Cognitive Techniques	Cognitive Developmental Skills
Manage the type and intensity of emotions	*Emotion regulation*
Differentiate internal experience from outer expression	*Emotion understanding; display rules*
Problem solving	
Problem-solving: generate & evaluate solutions	*Reasoning; metacognition; cognitive flexibility*

Annu Rev Clin Psychol. Author manuscript; available in PMC 2017 May 23.

Table 2

Measures of cognitive, social, and emotional developmental skills relevant to therapeutic techniques for treating depression in children and adolescents

Scientific Reasoning		**Table 2a. Cognitive Developmental Skills**		
Measures	**References**	**Ages**	**Number of items & sessions**	**Description**
Analysis Phase				
Story Problems (e.g., cake baking)	Tschirgi (1980)	7 yrs.-adult	8 stories Adults = about 10 min. Children = about 20min.	Children are presented with several binary variables (e.g., sweetener = sugar or honey) and then are informed that one level of the sweetener variable (i.e., honey) is suspected to have contributed to an outcome (e.g., good tasting cake). Then the child is asked to design an experiment to prove the hypothesis that the honey is responsible for the outcome.
Mouse Story	Sodian et al. (1991)	6–9 yrs.	2 conditions duration not listed	Children are told about a house that has two sizes of mice (i.e., big and small). Then they are asked to produce an effect -- select the right size hole (i.e., big or small) that will enable mice of both sizes to eat (i.e., big hole). Or they test a hypothesis -- choose the right size hole to determine the size of a given mouse (i.e., small hole).
Colorless Liquid Task	Inhelder & Piaget (1958)	7–15 yrs.	n/a	Children first are shown an effect (e.g., clear liquid changing to color), and then are asked to determine the combination of liquids that results in the effect.
Train Task	Siegler & Liebert (1975)	11–13 yrs.	3 conditions: 2 experimental + 1 control Instruction time: 20–25min, followed by task	Requires children to determine the combination of 4 switches that starts an electric train; children must systematically explore the possible combinations of variables, in order to arrive at the correct conclusion.
Inference Phase				
Contingency Tables	Shaklee et al., 1988; Shaklee & Mims, 1981; Shaklee & Paszek, 1985	9 yrs.-adult	Varies	Examine evidence of evaluation strategies independent from experimentation strategies, through the use of covariation evidence; use of conditional probability rule is the highest level
Experiment Observation	Chinn & Malhotra (2002)	9–12 yrs.	Varies 4 different experiments	Assesses how children handle anomalous data (e.g., ignore, distort, or incorporate into existing theory). Draw inferences from data
Integrated Phase				
Controlled variable experimentation strategies	Zimmerman (2007)	Grades 1–6	Multiple experiments	Measures how children modify their theories after accumulating evidence; the number and type (causal, non-causal, or indeterminate) of inferences made, the validity of these inferences, and the justifications offered for them
Manipulation Tasks (e.g., Spring or Canal task)	Schauble (1996) Schauble, Klopfer, & Raghavan (1991)	10 yrs.-adult	2 counter-balanced within subjects conditions, over 3 sessions each; 4 hours or two 2 hour tasks comprised of three 40 min. sessions each	Microgenetic studies: multiple trials over multiple sessions Provide data about how participants learn about manipulating variables and observing outcomes through experience
Computer Tasks (e.g., Earthquake Forecaster; Ocean Voyage)	Kuhn et al. (2009) Kuhn & Dean (2005)	9–12 yrs.	(2005): 1 exp. condition, 1 control, and 1 alternative control; twelve 45-	Microgenetic studies; experimenters test children's ability to apply the strategies learned in the original task to novel

Scientific Reasoning		Table 2a. Cognitive Developmental Skills		
Measures	**References**	**Ages**	**Number of items & sessions**	**Description**
			min experimental sessions over 8 weeks + assessment (2009): 3 exp. conditions; twelve 45-min sessions, over 6 weeks, include assessment	scientific reasoning problems, thereby ascertaining the generalizability of the skill acquisition.
Epistemological Understanding Problems	Kuhn et al., (2008)	11 yrs. -adult	3 counter-balanced tasks, within subjects	Measures the extent to which children understand that beliefs can be supported by extant evidence, but cannot be definitively proven. Measures children's awareness of the reasoning process, rather than just their reasoning ability

Metacognition			Table 2b. Cognitive Developmental Skills		
Measure	**Authors**	**Method**	**Ages**	**Items & subscales**	**Description**
Metacognitions Questionnaire for Adolescents (MCQ-A)	Cartwright-Hatton et al., 2004	self-report	13–17 yrs.	30 items *5 subscales*	Measures awareness of one's own thoughts; assesses metacognitive skills outside the context of worry; narrow focus on cognitions associated with anxiety and rumination. One subscale measures cognitive monitoring capabilities – Cognitive Self-Consciousness
Metacognitions Questionnaire for Children (MCQ-C)	Bacow et al., 2009	self-report	7–17 yrs.	24 items *4 subscales*	Cognitive Monitoring subscale measures monitoring capabilities, and is the only psychometrically validated self-report measure of metacognitive skills in youth relevant to the therapeutic techniques used in CBT
Thought-Feeling-Behavior Card Sort Task (TFB-CST)	Quakley et al., 2004	performance task	4–7 yrs.	6 stories 18 items	Measures ability to discriminate among thoughts, feelings, and behaviors, which is a core therapeutic technique taught in the CBT; children are presented with six short stories either with or without scaffolding cues.
Mental Uncontrollability Task (MUT)	Flavell, Green, & Flavell, 1998	Short story & Interview	5, 9, 13 yrs. & adults	2 stories	Assesses children's understanding that people have only limited control over their mental activity, and recognition that people can have thoughts that are unwanted or hard to prevent. Questions about the controllability of thinking following the 2 scenarios; scores given regarding the adequacy of children's justification for their responses.

Social Perspective Taking			Table 2c. Social Developmental Skill		
Role Taking Task (RTT)	Feffer & Gourevitch, 1960	task	6–13 yrs.	3 scenes, 9 items	Child is asked to tell a story about a scene, from the point of view of each of three persons in the story. Each new role that the child takes adds to the perspective taking complexity of the situation. Measures the ability to cognitively shift from one person's role to the next and keep the whole story and characterizations of each person in mind
Nickel-Dime Task (NDT)	Flavell & Botkin, 1968	task	7–13 yrs.	One task; questions vary	Assesses role-taking ability by eliciting children's thoughts about an opponent's thinking during a strategy game. More complex responses involve children's ability to think about the opponent's thoughts about the task and the other child
Bystander Task (BT)	Chandler, 1973	task	11 & 13 yrs.	ten 8-frame sequences	A bystander views the main character acting in a way that is causally related to the event that occurred prior to the bystander's arrival. Measures the degree to which children

Social Perspective Taking			Table 2c. Social Developmental Skill		
					are able to keep their knowledge of the antecedent event from influencing their report of the bystander's account of the main character's reaction.
Interpersonal Interview (IPI)	Selman, 1976, 1980	Social dilemma stories	7 yrs. -adult	Interview: open-ended questions	Assesses Selman's stages of social perspective taking; questions about hypothetical scenarios involving a social dilemma; evaluates the extent to which children recognize and integrate multiple perspectives in their responses
Interpersonal Reactivity Index (IRI)	Davis, 1980, 1983	self-report	Older teens & adults	28 items (4 subscales)	Perspective Taking (PT) subscale (7 items) measures the tendency to spontaneously take the psychological viewpoint of others (i.e., empathy)

			Table 2d. Emotional Developmental Skills		
Measure	**Authors**	**Method**	**Ages**	**Items & Subscales**	**Description**
Mayer-Salovey-Caruso Emotional Intelligence Test-Youth Version (MSCEIT-YV)	Mayer, Salovey, Caruso (2011)	Performance-based	10–18 yrs.	101 items *4 subscales*	Presents child with pictures of emotional facial expressions
Emotions Situation Questionnaire (ESQ)	Donaldson & Westerman (1986); Wintre et al. (1990)	Interview task	7yrs. -adult	10 items *5 subscales*: angry, sad, happy, fearful, loving	Presents short scenarios and ask children what their emotional response would be. Code content and complexity of responses for extent child recognized multiple, simultaneous, and contradictory feelings.
Assessment of Children's Emotion Skills (ACES)	Schultz & Izard (1998); Schultz et al. (2004); Trentacosta & Izard (2007)	Free-labeling performance task & 2 interviews (45 min.)	school age	16 facial expressions; 12 social situations; 12 social behaviors *4 subscales*: happy, sad, mad, scared	One interview describes an emotional situation, and the other describes emotional behaviors
Diagnostic Analysis of Nonverbal Accuracy (DANVA)	Nowicki & Duke (1994)	Forced choice labeling performance task	6–10 yrs.	*4 Receptive subscales:* RF=32; RP=12; RG=12; RPar=16; *3 Expressive subscales:* EF=8; EG=12; EPar=8	Assesses nonverbal emotional receptive abilities and emotional expressive abilities; identify emotions based on body posture hand gestures, and tone of voice
Diagnostic Analysis of Nonverbal Accuracy (DANVA2)	Nowicki (2009)	Forced choice labeling performance task	3 yrs.-adult	*6 Receptive subscales*: AF=24; CF=24; APar=32; CPar=32; APos=32; CPos=16	Assess children's ability to understand intensity of emotion in addition to type and valence
Levels of Emotional Awareness Scale – Child (LEAS-C)	Bajgar et al. (2005)	Interview: rate children's open-ended responses (20 min.)	9–12 yrs.	12 interpersonal scenarios *3 subscales*: self, other, and total awareness	Scenarios elicit 1 of 4 emotions (happy, sad, angry, fear); children describe their own and the other person's feelings in each scenario. Responses scored for complexity of emotional awareness
Alexithymia Questionnaire for Children (AQC)	Bagby, et al., (1994); Rieffe et al. (2006)	Self-report (20 min.)	9–15 yrs.	20 items *2 subscales*: DIF; DDF	Measure of emotion identification skills. Assesses difficulty identifying feelings (DIF) and difficulty describing feelings (DDF)
Swinburne University Emotional Intelligence Test (SUEIT)	Luebbers et al. (2007); Palmer & Stough (2001)	Self-report (45 min.)	11–18 yrs.	64 items *5 subscales:* Total, U&AE, P&EE, EMC; EDC	Measure of emotional abilities (modified for adolescents)

yrs. = years; exp. = experimental; RF=receptive facial expressions; RP=receptive postures; RG=receptive gestures; RPar=receptive paralanguage; EF=expressive facial expression; EG=expressive gestures; EPar=expressive paralanguage; AF=Adult Facial Expressions; CF=Child Facial Expressions; APar=Adult Paralanguage; CPar=Child Paralanguage; APos=Adult Posture; CPos=Child Posture; U&AE= Understanding and Analyzing Emotions; P&EE=Perception and Expression of Emotion; EMC=Emotional Management and Control; EDC=Emotions Direct Cognition