ADHD is a medical term for individuals who exhibit a persistent, pervasive, impairing, and developmentally inappropriate pattern of inattention, impulsivity, and hyperactivity (American Psychiatric Association, 2000). It is a prevalent neurodevelopmental condition that occurs in approximately 5% of school-age children worldwide (Polanczyk et al., 2007) and in which both the symptoms and impairment tend to persist into adolescence and adulthood. Thus, elementary and high school teachers are likely to have at least one or two students with ADHD in the classroom.

Inattentive behaviour is a developmental risk factor for poor academic outcome

Children and adolescents with ADHD are at high risk for poor academic outcomes (Curry & Stabile, 2006; Frazier et al., 2007). Notably, it is the inattentive behavioural dimension, and not the hyperactive/impulsive behavioural dimension, that is associated with academic risk (Spira & Fischel, 2005). For example, inattentive behaviour in kindergarten children, but not hyperactive-impulsive behaviour, predicts poor reading outcomes in Grade 1 and also in Grade 5, independent of kindergarten reading-related skills and concurrent levels of hyperactivity/impulsivity (Dally, 2006; Rabiner & Coie, 2000). Inattentive behaviour in the classroom is also strongly associated with mathematics difficulties in elementary school children (Dobbs et al., 2006; Fuchs et al., 2005). Moreover, inattentive behaviour has been found to predict poor response to evidence-based reading and math instruction (Fuchs et al., 2005; Rabiner & Malone, 2004). Accordingly, the presence of even a few persistent symptoms of inattention in childhood is considered a developmental risk factor (Warner-Rogers et al., 2000).

Cognitive problems underpin both inattentive behaviour and poor academic outcome

Current theoretical and empirical work emphasizes that cognitive difficulties, and not poor attitude or laziness, underpin both inattentive behaviour and poor academic functioning (reviewed by Barkley, 1997; Castellanos & Tannock, 2002; Spira & Fischel, 2005). In particular, poor working memory, which is impaired in ADHD, is linked most closely with inattentive behaviour but not with hyperactivity/impulsivity (Lui & Tannock, 2007; Martinussen et al., 2005; Martinussen & Tannock, 2006). Working memory is a term used to refer to the ability to hold and manipulate information temporarily (for a few seconds only) in one’s head, despite ongoing distractions such as conversation or other classroom activities (Baddeley, 2000). Adult research has shown that individuals with poor working memory capacity are more likely than those with good working memory to have difficulties sustaining task-relevant thought and behaviour in the presence of competing mental and environmental distracters, and are more prone to mind-wandering and other off-task behaviour (e.g., Kane et al., 2007).

Working memory is prerequisite for performing complex tasks such as mental arithmetic, listening and reading comprehension, and reasoning, and predicts future academic achievement in literacy, mathematics, and science (reviewed by Alloway, 2006). For example, working memory predicts growth in reading fluency and comprehension, and subsequent academic achievement in mathematics and science as well as in literacy (St. Clair-Thomson & Gathercole, 2006; Swanson & Jerman, 2007).

Educational prevention and intervention approaches should address both cognitive and attention problems

Inattentive behaviour, poor working memory and poor academic achievement are interrelated and constitute a risk triad. Thus, intervention that aims either to reduce inattentive behaviour or to improve cognitive function would be expected to enhance the children’s academic outcomes. Two of the main approaches used to improve inattention are medical treatment (e.g., medication, such as Ritalin) and psy-
Promising instructional practices: Child-focused skill training

A small but growing body of research shows that direct intervention, involving intensive and progressive taxing and training of attention skills (Attention Process Training: APT) results in improvements in cognitive and/or academic attainment as well as in inattentive behaviour (e.g., Kerns et al., 1999; Shalev et al., 2007). Notably, this approach has shown promising results for students with childhood cancer, traumatic brain injury, and ADHD (reviewed by Penkman, 2004). Also, one study showed that prior and individualized attention training with the APT materials potentiated the effects of writing instruction for children with dyslexia (Chenault et al., 2006).

Another type of direct intervention, or process-specific approach, involves computerized training of working memory (Klingberg et al., 2005). Intensive and progressive challenge and practice of working memory skills not only enhances working memory capacity, but also results in training-related changes in brain activity, with training effects generalizing to behavioural ratings of inattention, tests of attention, reasoning, and problem-solving in healthy adults, as well as in children with ADHD (Klingberg et al., 2005).

Promising instructional practices: Teacher professional development

Teacher-focused approaches aim to enhance teachers’ awareness and understanding of ADHD (e.g., Sayal et al., 2006; Tymms & Merrell, 2004) and/or their use of effective instructional approaches as well as effective behaviour management techniques. For example, findings from a large-scale study in the United Kingdom demonstrate that simply screening and “labelling” children who meet diagnostic criteria for ADHD has no effect on child outcomes. By contrast, providing teachers with an information book on ADHD, effective behavioural management strategies, and effective instructional practices was found to improve the children’s behaviour, attitudes toward school, and their reading, as well as improving teachers’ self-reported quality of life (Tymms & Merrell, 2004).

Provision of comprehensive training and in-depth consultation to teachers about ADHD (i.e., targeting characteristics, instructional and/or behaviour management strategies) has also been found to have positive effects on students with ADHD including reductions in their primary symptoms, antisocial behaviour, teacher-student relationships, and academic gains (DuPaul et al., 2006; Miranda et al., 2002; Owens et al., 2005). Also, teachers report improvements in knowledge and reduction in stress regarding working with students with ADHD (Miranda et al., 2002). Even a brief but focused professional development program on effective use of instructional language has been found to be effective in reducing children’s inattentive behaviour and enhancing their academic attainment (Rowe, Pollard & Rowe, 2005).
ATTENTION PROCESS TRAINING

Premise
Attention Process Training (APT) is based on the premise that repeated and intensive practice of tasks that are designed to progressively tax specific aspects of attention can increase the ability to control attention, because practice produces changes in the efficiency of the underlying attentional networks of the brain.

Materials
APT materials are designed to be engaging and include visual and auditory stimuli. Materials are colourful and tasks focus on familiar concepts, such as features of people (e.g., hair colour, clothing, gender), family relationships (siblings, parents, grandparents), household objects and characteristics (purpose of rooms, objects in those types of rooms); as well as common concepts such as relative size, counting, similarities and differences. Task difficulty is progressively increased as the child attains criterion performance.

Tasks
APT tasks are designed to tap the following components:

- **Sustained attention**—the ability to maintain concentration during continuous repetitive or effortful activity. Examples of tasks are: sorting cards into categories (by single features, such as card colour, hair colour); searching for designated objects in pictures of a house; listening to an audiotape and pressing a buzzer when specific words or word patterns are heard.

- **Selective attention**—the ability to attend to task-relevant information and block out irrelevant stimuli. Individuals who have problems at this level are easily distracted from the appointed task. Tasks are similar to those used for training sustained attention but the child must complete the task with distracting stimuli superimposed (e.g., background noise).

- **Alternating attention**—the ability to switch rapidly from one task to another. Tasks involve sorting cards by one criterion, then switching criteria as indicated by the trainer, or buzzing to one type of word, then changing to buzzing for another type when instructed by the trainer.

- **Divided attention**—the ability to multi-task, such as taking notes while listening to a lecture, or holding thoughts in mind while discussing a point or writing an essay. Tasks involve sorting cards on the basis of a specified criterion, but with an additional rule (e.g., sort cards by family, put boys face down, or sorting cards while also monitoring audiotape and buzzing for target sounds or words).

Summary and Commentary
Persistent and marked inattention in childhood is a developmental risk factor for poor academic outcome and also predicts poor response to educational intervention. Thus it is essential that educators learn to recognize behavioural indicators of inattention in the classroom and to develop both child-focused (e.g., self-monitoring intervention of behaviour and engagement; targeted academic skills/strategy instruction) and contextual strategies (e.g., instructional supports and approaches that maximize student engagement) for promoting these students’ academic success. Interventions that monitor and target both the behavioural symptoms of inattention and underlying cognitive difficulties show efficacy in that they improve both the academic and behavioural outcomes of inattentive students.

References


