

Optimising treatment strategies for ADHD in adolescence to minimise ‘lost in transition’ to adulthood

J. K. Buitelaar*

Department of Cognitive Neuroscience, Donders Institute for Brain, Cognition and Behaviour, Radboudumc, and Karakter Child and Adolescent Psychiatry, Nijmegen, The Netherlands

The persistence of attention-deficit hyperactivity disorder (ADHD) from adolescence to adulthood is not matched by continuity of care in this transition period. Many adolescents with ADHD have poor medication adherence or even stop medication treatment, and use of behavioural interventions is also suboptimal. The present commentary focuses on treatment strategies that might improve effects of ADHD medication treatment by improving adherence in adolescents with ADHD and/or optimise behavioural interventions for ADHD in adolescence. Most treatment strategies in adolescents with ADHD are merely copied from treatments offered to children. Instead however treatment should be focused on what makes adolescents special and vulnerable, such as poor insight into own functioning and poor decision making. Techniques that offer promise for adolescents are motivational interviewing, use of ecological momentary assessments and interventions, mindfulness-based training and serious games. Systematic studies into the effects of these techniques alone and in combination with medication are lacking.

First published online 17 April 2017

Key words: Attention-deficit hyperactivity disorder, transition, adolescence, mental health services.

Attention-deficit hyperactivity disorder (ADHD) is a rather common neurodevelopmental disorder with an estimated prevalence of at least 5% in children and adolescents and 2.5% in adults (Polanczyk *et al.* 2007; Simon *et al.* 2009). Onset of the disorder is mostly during the preschool years or in childhood. From the three defining symptoms of ADHD, inattentiveness tends to be rather stable over development, whereas hyperactivity and impulsivity tend to decline more over age (Biederman *et al.* 2000). Despite these age-related symptomatic improvements, ADHD is a highly persistent disorder with between one third and half of ADHD children still meeting clinical threshold criteria and the majority of children with ADHD being functional impaired at adult age (Faraone *et al.* 2015).

Despite claims of overdiagnosis and overtreatment of ADHD, survey data about treatments received for ADHD among children with special needs tell a different story (Visser *et al.* 2015). Of all adolescents of a national representative USA sample of 12–17 year old with ADHD, 27.9% were reported to have received both medication and behavioural interventions in the

last year, 48.3% received medication only, 12.5% received behavioural interventions only and 14.3% did receive neither medication nor behavioural interventions (Visser *et al.* 2015). Furthermore, the persistence of the disorder over adolescence into adulthood is not matched by continuity of care in this important phase of life. For example, prescription data of ADHD medication by UK general practitioners show a significant drop from age 15 to 21 years. This discontinuation of medication treatment is much greater than the age-related decline in symptoms, suggesting that young adults with ADHD receive insufficient treatment (McCarthy *et al.* 2009). This is more alarming, since adolescence is a vulnerable period of development with complex changes of the youngsters’ social, educational and occupational environment and increased risk for emergence of new psychiatric disorders and comorbidities. Data indicate that continued medication use during adolescence improves academic outcomes and postpones substance initiation (Barbaresi *et al.* 2007; Wilens *et al.* 2008; Biederman *et al.* 2009; Groenman *et al.* 2013). A factor with great bearing on the discontinuity of care is that mental health services for children and adolescents in most countries are provided till age 18, and in some exceptions till age 21. Thereafter, services for ADHD in young adults are to be provided by general psychiatry teams. This is called the transition gap. How to optimally organise mental health care services around the transition from adolescence to adulthood, facilitate

*Address for correspondence: J. K. Buitelaar, M.D. Ph.D., Department of Cognitive Neuroscience, Donders Institute for Brain, Cognition and Behaviour, Radboudumc, and Karakter Child and Adolescent Psychiatry, Nijmegen, The Netherlands.
(Email: Jan.Buitelaar@radboudumc.nl)

collaboration between child and adolescent psychiatry and adult services, and reduce treatment discontinuity is the topic of a companion commentary (Coghill, 2016).

The present commentary focuses on treatment strategies that might improve effects of ADHD medication treatment by improving adherence in adolescents with ADHD and/or optimise behavioural interventions for ADHD in adolescence.

Medication

Both stimulant and non-stimulant (atomoxetine) medication leads to strong and clinically relevant improvements of ADHD symptoms in placebo-controlled randomised clinical trials in adolescents (Chan *et al.* 2016). The effects of ADHD medication however are short-lived, and benefits of medication are generally maintained only if medication is continued. Therefore one important reason for suboptimal outcomes in adolescence and early adulthood may be poor medication adherence (Charach & Fernandez, 2013). Many children with ADHD start using medication for 2 or 3 years but discontinue use once they reach adolescence (Barbarelli *et al.* 2006; Meaux *et al.* 2006). Fluctuations in use are common; some children use medications regularly, others discontinue and still others stop and restart medications, sometimes more than once. Predictors of adherence to prescribed medication are more severe ADHD symptoms, additional learning and behaviour conditions and, at the same time, absence of comorbidity with oppositional defiant disorder, younger age at initiation of medication prescription (Thiruchelvam *et al.* 2001) and the presence of a good working relationship between the patient, the family and the clinician. Medication nonadherence is more prevalent in immediate-release *v.* extended-release psychostimulants in children and adolescents with ADHD (van den Ban *et al.* 2010). Very important for adolescents is how peers perceive them. For many it is a real fear that medication use will create stigma and isolate them from their peers, which may lead them to avoid treatment. In any case, by far the most powerful predictor of non-adherence are past experiences that medication is effective with few adverse effects (Charach & Fernandez, 2013). The problem is that initially perceived benefits in terms of improvements of school work and peer relationships may be later 'mentally washed-out' and/or not remembered due to the more limited capacities for self-observation and self-reflection that are inherent to most adolescents with ADHD. At the same time, growing older brings about a greater weight to self-report on symptom severity and the various functional impairments and an increasingly less reliance of reports by parents

and teachers. Finally, it is unclear whether adolescents are more sensitive to and suffer more from common (such as loss of appetite, insomnia, irritability, abdominal pain, headache for stimulants and decreased appetite, dizziness, abdominal pain, fatigue, somnolence and vomiting for atomoxetine and clonidine or guanfacine) or less common (moodiness, dysphoria, loss of creativity) side effects of ADHD medication, or are better able to observe these effects. Results of prospective studies to document side-effects of ADHD medication using newly developed instruments are pending (Inglis *et al.* 2016; Kovshoff *et al.* 2016).

Behavioural treatments

Psychosocial treatments incorporating behaviour contingency management, motivational enhancement, and academic, organizational and social skills training techniques are associated with inconsistent effects on ADHD symptoms but greater benefit for academic and organisational skills (Chan *et al.* 2016). There is no evidence that cognitive enhancement trainings, such as working memory training or neurofeedback improved the functioning of adolescents with ADHD (Sibley *et al.* 2014). Many studies on behavioural treatments in adolescents with ADHD suffer from methodological limitations such as small sample sizes, lack of blinding and not taking into account concomitant medication use and presence of comorbidities (Chan *et al.* 2016). Thus, behavioural interventions for ADHD in adolescents have not been studied as well as in preschoolers and children with ADHD, and also systematic studies into the effects of combination treatments of medication and behavioural interventions are lacking.

Optimising treatment strategies in adolescence

For too long time, treatment of ADHD in adolescents has just been an extension of strategies applied in children with ADHD. To ensure a successful transition to adulthood requires redesigning and optimising treatment strategies for ADHD in adolescents. These should be targeted to what makes adolescents and in particular adolescents with ADHD special and vulnerable (Chan *et al.* 2016). Most important ones are poor insight into own functioning and limited capacity for self-reflection, poor decision making, being overly sensitive to immediate gratification at the cost of pursuing long-term goals with high reward value, difficulty organising and planning activities, poor time estimation, being prone to emotional lability and moodiness together with still maturing self-regulation skills, poor conflict resolution skills and tendency to be an autonomous person who

rejects to be dependent on significant others like parents, teachers and other adults.

A key factor is to steer that adolescents become to feel responsible and take responsibility for dealing with ADHD. No one else but the adolescent themselves can decide whether to use medication or not and to adhere to prescription advice. The complex set of ambivalences of being dependent on medication and of being a patient in need of treatment asks for extensive and repeated motivational interviewing. Motivational interviewing is a directive, client-centred counselling style for eliciting behaviour change by helping patients to explore and resolve ambivalence. It is most centrally defined not by technique but by its spirit as a facilitative style for interpersonal relationship. The concept of motivational interviewing evolved from experience in the treatment of problem drinkers and has been successfully extended to many other areas of problem behaviour (Miller & Rollnick, 2012). Motivation to change is elicited from the patient and is not imposed from outside forces. In short, it is the patient's task, not the clinician's, to articulate and resolve the patient's ambivalence. Direct persuasion is not an effective method for resolving ambivalence. The clinician is directive by helping the patient to examine and resolve ambivalence, whereby the therapeutic relationship resembles a partnership.

Providing optimal care to adolescent patients is time consuming. Clinicians should be able and willing to make additional phone calls to schools and mental health professionals outside of usual office hours. Explaining and clarifying treatment options should be done not once but repeatedly. Probing for potential side-effects of medication should be done pro-actively and repeatedly, as well as discussing issues of stigma and risk for social isolation. Implementing shared decision making is a next and important step. It might be very helpful to prophylactically predict to all adolescents with ADHD that they will try, sooner or later, to cheat their parents, teachers and the clinician by skipping their medication. In all of this, the clinician's ability to maintain a treatment alliance with the adolescent and family is crucial to success.

Currently, adolescents' main communication channels are based on the internet, social media, whatsapp and many other newer means rather than on traditional means of communication. While clinicians might and should adapt to these new methods, it poses new questions about how to deal with cyber security and privacy (Naeem *et al.* 2016). Use of smartphone apps (m-health) for more sophisticated assessment and treatment approaches to ADHD in adolescence is still beginning and largely unexplored. Smartphone apps can be used for ecological momentary assessment (EMA) that has several important

advantages over conventionally used methods as questionnaires and interviews. The app generates a beep at semi-randomised moments and presents a questionnaire that allows for prospective in-the-moment assessments, several times a day. Thus EMA techniques provide methods by which patients can report on symptoms, affect, behaviour and cognitions close in time to experience (Bos *et al.* 2015; Rosen & Factor, 2015). This will enable to assess contextual variability of ADHD symptoms (Rommelse *et al.* 2015). Next, feedback can be provided to the patient, based on the sampled and processed data. This feedback can be given online and in-app: ecological momentary intervention, and can be used to monitor and improve adherence and redirect behavioural attitudes and strategies to deal with daily stressors.

Adolescents with ADHD appear to be very attracted to gaming, but this has not been exploited sufficiently as a powerful adjunct therapeutic strategy. Serious games are designed to enhance behaviour strategies for children and adolescents with ADHD to enhance skills as time management, planning/organising and cooperation skills and deserve more systematic study (Bul *et al.* 2015, 2016).

Another promising treatment strategy for adolescents with ADHD is mindfulness-based training. This has in essence at its core the encouragement of individuals to independently self-manage and adapt to the challenges created by their condition, rather than focusing on just eliminating their symptoms. Mindfulness is the trainable capacity to pay attention to experience in the present moment, on purpose and without judgement. It originates from Buddhist meditation traditions and is increasingly integrated with contemporary theories and clinical approaches to form brief manualised interventions (Modesto-Lowe *et al.* 2015). Research shows that mindfulness training is associated with improved attention systems and self-regulation, and that it therefore fosters those skills that are underdeveloped in individuals with ADHD (Chiesa *et al.* 2011; Mitchell *et al.* 2015; Modesto-Lowe *et al.* 2015). Although only few studies have investigated the effectiveness of mindfulness training in ADHD (many of which showing methodological limitations), the findings do suggest that mindfulness may be a useful intervention in adolescents with ADHD (van de Weijer-Bergsma *et al.* 2012). The basis for a successful transition to adulthood is to sit firmly in the driving seat when navigating through the challenges and hazards of adolescence.

Acknowledgement

This work has benefitted from discussions in the European ADHD Guidelines group, and has been

supported by the European Union FP7 programmes ADDUCE (260576) and TACTICS (278948).

Financial support

This research received no specific grant from any funding agency, commercial or not-for-profit sectors.

Conflict of interest

Jan Buitelaar has been in the past 3 years a consultant to / member of advisory board of / and/or speaker for Janssen Cilag BV, Eli Lilly, Lundbeck, Shire, Roche, Novartis, and Servier. He is not an employee of any of these companies, and not a stock shareholder of any of these companies. He has no other financial or material support, including expert testimony, patents, royalties.

References

- Barbaresi WJ, Katusic SK, Colligan RC, Weaver AL, Leibson CL, Jacobsen SJ (2006). Long-term stimulant medication treatment of attention-deficit/hyperactivity disorder: results from a population-based study. *Journal of Developmental and Behavioural Pediatrics* **27**, 1–10.
- Barbaresi WJ, Katusic SK, Colligan RC (2007). Modifiers of long-term school outcomes for children with attention-deficit/hyperactivity disorder: does treatment with stimulant medication make a difference? Results from a population-based study. *Journal of Developmental and Behavioural Pediatrics* **28**, 274–287.
- Biederman J, Mick E, Faraone SV (2000). Age-dependent decline of symptoms of attention deficit hyperactivity disorder: impact of remission definition and symptom type. *American Journal of Psychiatry* **157**, 816–818.
- Biederman J, Monuteaux MC, Spencer T, Wilens TE, Faraone SV (2009). Do stimulants protect against psychiatric disorders in youth with ADHD? A 10-year follow-up study. *Pediatrics* **124**, 71–78.
- Bos FM, Schoevers RA, aan het Rot M (2015). Experience sampling and ecological momentary assessment studies in psychopharmacology: a systematic review. *European Neuropsychopharmacology* **25**, 1853–1864.
- Bul KC, Franken IH, Van der Oord S, Kato PM, Danckaerts M, Vreeke LJ, Willems A, van Oers HJ, van den Heuvel R, van Slagmaat R, Maras A (2015). Development and user satisfaction of 'plan-it commander,' a serious game for children with ADHD. *Games Health Journal* **4**, 502–512.
- Bul KC, Kato PM, Van der Oord S, Danckaerts M, Vreeke LJ, Willems A, van Oers HJ, Van Den Heuvel R, Birnie D, Van Amelsvoort TA, Franken IH, Maras A (2016). Behavioral outcome effects of serious gaming as an adjunct to treatment for children with attention-deficit/hyperactivity disorder: a randomized controlled trial. *Journal of Medical Internet Research* **18**, e26.
- Chan E, Fogler JM, Hammerness PG (2016). Treatment of attention-deficit/hyperactivity disorder in adolescents: a systematic review. *JAMA* **315**, 1997–2008.
- Charach A, Fernandez R (2013). Enhancing ADHD medication adherence: challenges and opportunities. *Current Psychiatry Reports* **15**, 371.
- Chiesa A, Calati R, Serretti A (2011). Does mindfulness training improve cognitive abilities? A systematic review of neuropsychological findings. *Clinical Psychology Reviews* **31**, 449–464.
- Coghill DR (2016). Organisation of services for managing ADHD. *Epidemiol Psychiatr Sci* **22**, 1–6. doi: 10.1017/S2045796016000937. [Epub ahead of print] PubMed PMID: 28004618.
- Faraone SV, Asherson P, Banaschewski T, Biederman J, Buitelaar JK, Ramos-Quiroga JA, Rohde LA, Sonuga-Barke EJ, Tannock R, Franke B (2015). Attention-deficit/hyperactivity disorder. *Nature Reviews Disease Primers* **6**, 15020.
- Groenman AP, Oosterlaan J, Rommelse NN, Franke B, Greven CU, Hoekstra PJ, Hartman CA, Luman M, Roeyers H, Oades RD, Sergeant JA, Buitelaar JK, Faraone SV (2013). Stimulant treatment for attention-deficit hyperactivity disorder and risk of developing substance use disorder. *British Journal of Psychiatry* **203**, 112–119.
- Inglis SK, Carucci S, Garas P, Häge A, Banaschewski T, Buitelaar JK, Dittmann RW, Falissard B, Hollis C, Kovshoff H, Liddle E, McCarthy S, Nagy P, Neubert A, Rosenthal E, Sonuga-Barke E, Wong I, Zuddas A, Coghill DC; ADDUCE Consortium (2016). Prospective observational study protocol to investigate long-term adverse effects of methylphenidate in children and adolescents with ADHD: the Attention Deficit Hyperactivity Disorder Drugs Use Chronic Effects (ADDUCE) study. *BMJ Open* **6**, e010433.
- Kovshoff H, Banaschewski T, Buitelaar JK, Carucci S, Coghill D, Danckaerts M, Dittmann RW, Falissard B, Grimshaw DG, Hollis C, Inglis S, Konrad K, Liddle E, McCarthy S, Nagy P, Thompson M, Wong IC, Zuddas A, Sonuga-Barke EJ (2016). Reports of perceived adverse events of stimulant medication on cognition, motivation, and mood: qualitative investigation and the generation of items for the medication and cognition rating scale. *Journal of Child and Adolescent Psychopharmacology* **26**, 537–547.
- Rommelse N, Bunte T, Matthys W, Anderson E, Buitelaar J, Wakschlag L (2015). Contextual variability of ADHD symptoms: embracement not erasure of a key moderating factor. *Eur Child Adolesc Psychiatry* **24**(1), 1–4 doi: 10.1007/s00787-014-0665-1. PubMed PMID: 25534928.
- McCarthy S, Asherson P, Coghill D, Hollis C, Murray M, Potts L, Sayal K, de Soysa R, Taylor E, Williams T, Wong IC (2009). Attention-deficit hyperactivity disorder: treatment discontinuation in adolescents and young adults. *British Journal of Psychiatry* **194**, 273–277.
- Meaux JB, Hester C, Smith B, Shoptaw A (2006). Stimulant medications: a trade-off? The lived experience of

- adolescents with ADHD. *Journal for Specialists in Pediatric Nursing* **11**, 214–226.
- Miller WR, Rollnick S** (2012). *Motivational Interviewing*, 3rd edn. Guilford Press: New York. ISBN 978-1-60918-227-4.
- Mitchell JT, Zylowska L, Kollins SH** (2015). Mindfulness meditation training for attention-deficit/hyperactivity disorder in adulthood: current empirical support, treatment overview, and future directions. *Cognitive Behavioural Practice* **22**, 172–191.
- Modesto-Lowe V, Farahmand P, Chaplin M, Sarro L** (2015). Does mindfulness meditation improve attention in attention deficit hyperactivity disorder? *World Journal of Psychiatry* **5**, 397–403.
- Naeem F, Gire N, Xiang S, Yang M, Syed Y, Shokraneh F, Adams C, Farooq S** (2016). Reporting and understanding the safety and adverse effect profile of mobile apps for psychosocial interventions: an update. *World Journal of Psychiatry* **6**, 187–191.
- Polanczyk G, de Lima MS, Horta BL, Biederman J, Rohde LA** (2007). The worldwide prevalence of ADHD: a systematic review and metaregression analysis. *American Journal of Psychiatry* **164**, 942–948.
- Rommelse N, Bunte T, Matthys W, Anderson E, Buitelaar J, Wakschlag L** (2015). Contextual variability of ADHD symptoms: embracement not erasure of a key moderating factor. *European Child and Adolescent Psychiatry* **24**, 1–4.
- Rosen PJ, Factor PI** (2015). Emotional impulsivity and emotional and behavioral difficulties among children with ADHD: an ecological momentary assessment study. *Journal of Attention Disorders* **19**, 779–793.
- Sibley MH, Kuriyan AB, Evans SW, Waxmonsky JG, Smith BH** (2014). Pharmacological and psychosocial treatments for adolescents with ADHD: an updated systematic review of the literature. *Clinical Psychology Reviews* **34**, 218–232.
- Simon V, Czobor P, Bálint S, Mészáros A, Bitter I** (2009). Prevalence and correlates of adult attention-deficit hyperactivity disorder: meta-analysis. *British Journal of Psychiatry* **194**, 204–211.
- Thiruchelvam D, Charach A, Schachar RJ** (2001). Moderators and mediators of long-term adherence to stimulant treatment in children with ADHD. *Journal of the American Academy of Child and Adolescent Psychiatry* **40**, 922–928.
- van den Ban E, Souverein PC, Swaab H, van Engeland H, Egberts TC, Heerdink ER** (2010). Less discontinuation of ADHD drug use since the availability of long-acting ADHD medication in children, adolescents and adults under the age of 45 years in the Netherlands. *Attention Deficit Hyperactivity Disorders* **2**, 213–220.
- van de Weijer-Bergsma E, Formsma AR, de Bruin EI, Bögels SM** (2012). The effectiveness of mindfulness training on behavioral problems and attentional functioning in adolescents with ADHD. *Journal of Child and Family Studies* **21**, 775–787.
- Visser SN, Bitsko RH, Danielson ML, Ghandour RM, Blumberg SJ, Schieve LA, Holbrook JR, Wolraich ML, Cuffe SP** (2015). Treatment of attention deficit/hyperactivity disorder among children with special health care needs. *Journal of Pediatrics* **166**, 1423–30.e1–2.
- Wilens TE, Adamson J, Monuteaux MC, Faraone SV, Schillinger M, Westerberg D, Biederman J** (2008). Effect of prior stimulant treatment for attention-deficit/hyperactivity disorder on subsequent risk for cigarette smoking and alcohol and drug use disorders in adolescents. *Archives of Pediatric and Adolescent Medicine* **162**, 916–921.