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Interventions for Transitioning Adolescents with ADHD to Emerging Adulthood: Developmental Context and Empirically-Supported Treatment Principles

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ABSTRACT

The developmental transition between adolescence to emerging adulthood (ages 18–25) is a critical juncture—particularly for individuals with attention-deficit/hyperactivity disorder (ADHD). However, there are no known published studies on treatments for ADHD that aim to improve the transition from adolescence to emerging adulthood. We sought to facilitate future transition intervention research and provide empirically-supported treatment principles and corresponding targets for clinicians with this manuscript. We review two key areas of research to inform transition planning interventions for adolescents with ADHD: (a) domains of impairment (e.g., occupational, social) within the developmental context of the transition to emerging adulthood and (b) existing treatment research on interventions for adolescents and adults with ADHD. After evaluating and synthesizing these areas of research, we highlight and discuss targets for treatment that are promising for addressing the unique needs of adolescents with ADHD transitioning to emerging adulthood. We also discuss treatment modalities which may be particularly suited for ADHD within this developmental context. Many treatment elements were indicated, ranging from empirically-supported focuses on compensatory skills (e.g., organization, time management, planning [OTMP]) to more theoretically relevant techniques, such as health and lifestyle behaviors (e.g., physical exercise). Further, certain treatment modalities, such as parent-teen collaborative models and group-based approaches, seemed particularly suited for adolescents with ADHD transitioning to emerging adulthood. Limitations of existing research on the transition to emerging adulthood for those diagnosed with ADHD and areas for future research are discussed in greater detail.

Although attention-deficit/hyperactivity disorder (ADHD) has traditionally been viewed as a disorder of childhood, a growing body of literature demonstrates its cardinal symptoms of inattention, hyperactivity, and impulsivity continue to manifest in significant impairment across adolescence and into adulthood (Barkley, Murphy, & Fischer, 2008). While the treatment literature regarding adolescents and adults with ADHD has been growing, it still lags behind that amassed on childhood ADHD (Knouse, Cooper-Vince, Sprich, & Safren, 2008). Little attention has been given to those transitioning from adolescence (ages 13–17) to emerging adulthood (ages 18–25). This is concerning since adjustment during this phase of development often predicts adaptive functioning in adulthood (Schulenberg, Sameroff, & Cicchetti, 2004), where those with ADHD often evidence problems with

self-esteem, interpersonal relationships, education and vocational attainment, risk management, and law-breaking (Barkley et al., 2008).

The years from the late teens through the mid-twenties, referred to as *emerging adulthood* (ages 18–25; Arnett, 2000), are a time of profound change, in which adolescents finish secondary school, reach the legal age of adulthood, and experience an abrupt loss of parental support and structure. In addition to the excitement of pursuing their ambitions, including the possibilities of work and love life, emerging adults must adapt to new stresses and adult responsibilities (for a detailed review of typical development during emerging adulthood, see Arnett, 2000). The adjustment from adolescence to emerging adulthood (hereafter referred to as *the transition period*) may have enduring ramifications for outcomes in

adulthood. Indeed, adults most often name events that took place during the transition period when reporting the most important events in their lives (Martin & Smyer, 1990). Since ADHD often impairs many skills critical for navigating the transition period (e.g., problem solving, mood regulation, long-term planning), improving adaptive functioning during this time may have powerful impacts on the long-term outcomes of individuals with ADHD.

The long-term risks for those with ADHD adjusting to the stressors of emerging adulthood highlights the importance of engaging in mental health services. However, the opposite occurs and there is almost complete disengagement from services by age 21 (McCarthy et al., 2009). This is unlikely to be attributed to remission, since two-thirds of children diagnosed with ADHD report enduring impairment at age 25 (Barkley et al., 2008). Although several factors may contribute to this trend, such as medication side effects, the lack of effective, empirically-supported strategies for individuals during the transition period merits consideration. Developing transition planning interventions targeting this age group may improve engagement and help protect against negative life outcomes.

The current review combines evidence from two key areas of research to inform transition planning interventions for adolescents with ADHD: (a) the domains of impairment and the developmental context of emerging adults with ADHD, and (b) existing research on interventions for adolescents and adults with ADHD. After evaluating and synthesizing the aforementioned areas of research, we propose targets for treatment tailored to the unique presentation of ADHD during the transition period.

Impairment associated with ADHD in emerging adulthood

An increasing body of research describes the wide-ranging impairment associated with ADHD in emerging adulthood. The following section provides an overview of impairment associated with ADHD in emerging adulthood with an emphasis on identifying targets for transition planning interventions.

Academic functioning

For an increasing percentage of those in the United States, with or without ADHD, college is the dominant context in which the majority of developmental progress and adjustment to adulthood occurs. It is estimated that the prevalence of ADHD on college campuses is between 2 and 8% (DuPaul, Weyandt, O'Dell, & Varejao, 2009) and account for 25% of students receiving disability services (Wolf, 2001).

Emerging adults with ADHD are at greater risk for poor academic achievement, failure, and attempting and failing to complete postsecondary education (Kuriyan et al., 2013). College students with ADHD experience greater academic problems than their non-ADHD peers, including lower grade point averages (GPAs) and graduation rates; and higher rates of academic probation (Frazier, Youngstrom, Glutting, & Watkins, 2007).

Studies that have independently examined inattentive and hyperactive-impulsive symptom clusters suggest inattentive behaviors predict most of the variance in academic impairment (van der Kolk, van Agthoven, Buitelaar, & Hakkaart-van Roijen, 2015). This suggests inattention symptoms interfere with behaviors which promote college success—notably, organization, time management, and planning (OTMP) skills. Recently, OTMP skills have been found to mediate the relationship between ADHD status and first-year GPA (Gormley et al., 2018). Additionally, prior year GPA and end of year GPA has recently been found to be mediated by depression symptomatology (Eddy et al., 2018). Together, these results suggest OTMP skills and internalizing symptoms are likely to be important targets for interventions to improve academic functioning for students with ADHD during the transition period.

Psychological and emotional functioning

Relative to their non-ADHD peers, emerging adults with ADHD report having poorer quality of life (Grenwald-Mayes, 2002), self-esteem (Shaw-Zirt, Popali-Lehane, Chaplin, & Bergman, 2005), and psychological distress (Ramirez et al., 1997). During the transition period, individuals with ADHD experience higher rates of internalizing symptoms than

would be expected by chance (Meinzer et al., 2013), with data suggesting a childhood diagnosis of ADHD predicts both higher depression and anxiety in emerging adulthood (Biederman et al., 2006; Jarrett, 2016; Meinzer et al., 2013).

As is the case for children and adolescents with ADHD, emotion regulation often remains a persistent difficulty in emerging adulthood (Shaw, Stringaris, Nigg, & Leibenluft, 2014). Emerging adults with ADHD exhibit more state and trait anger, and express it in less controlled and socially acceptable ways (Sacchetti & Lefler, 2017)—in particular, by being more “confrontative” and “aggressive” than their non-ADHD peers when under stress (Kern, Rasmussen, Byrd, & Wittschen, 1999). These difficulties with emotion regulation are particularly troublesome since ADHD is associated with more difficulties in self-monitoring stress levels and accessing social support (Kern et al., 1999).

In sum, for those with ADHD, internalizing symptoms increase during the transition period as expectations increase in school, work, and social activities—domains in which those with ADHD tend to fare badly (Barkley et al., 2008). Thus far, emotion regulation (Anastopoulos et al., 2011; Seymour, Chronis-Tuscano, Iwamoto, Kurdziel, & MacPherson, 2014), history of alcohol use disorders (Meinzer et al., 2016), and parental support (Meinzer, Hill, Pettit, & Nichols-Lopez, 2015) have been empirically associated with covariation between ADHD and internalizing problems. As such, parental support, alcohol abuse, and emotion regulation are empirically-indicated for clinicians to target as a means to improve psychological and emotional functioning associated with ADHD during the transition period.

Social functioning

Adolescents with ADHD transitioning to college report poorer social adjustment and social skills than age-, sex-, and GPA-matched peers (Shaw-Zirt et al., 2005). Emerging adults with ADHD are described by their parents as having fewer close friends, more difficulty maintaining friends, and greater social problems (Barkley et al., 2008). Relative to non-ADHD peers, emerging adults with ADHD report having lower quality dating

relationships, fewer and more difficulty keeping friends, more frequent social arguments, and poorer relationships with their parents (Barkley et al., 2008; Fischer & Barkley, 2006; Grenwald-Mayes, 2002). Additionally, emerging adult males with ADHD, especially those with a history of conduct problems and problematic drinking, are more likely to be verbally aggressive and violent with romantic partners (Wymbs et al., 2012, 2017).

Emerging adults tend to endorse more negative than positive adjectives to describe peers with ADHD (Chew, Jensen, & Rosén, 2009) and are less likely to want to interact with affected individuals (Canu, Newman, Morrow, & Pope, 2008). In fact, even emerging adults *with* ADHD endorse significantly more negative adjectives for ADHD (Chew et al., 2009). It is notable, however, that in Chew et al. (2009) these effects were mediated by the frequency of contact with individuals diagnosed with ADHD, suggesting the importance of peer normalization in prospective interventions for this population.

Overall, the literature on ADHD-related social impairments suggests alcohol abuse, interactions with ADHD peers, and conduct problems are the most encouraging targets for improving social functioning during the transition period.

Occupational functioning

Although individuals with ADHD represent a small portion of the workforce population, the cost of lost productivity resulting from ADHD-related impairment in 2003 was estimated to be between \$67 billion and \$116 billion (Biederman & Faraone, 2006). Emerging adults with ADHD attain lower status employment and fewer full-time jobs, change employment more frequently, are rated more poorly by employers, and are more often fired than their non-ADHD peers (Barkley et al., 2008; Kuriyan et al., 2013). While the association between occupational outcomes and ADHD is attenuated by postsecondary education (Kuriyan et al., 2013), individuals with ADHD still attain lower occupational status, despite having the same educational background (Biederman et al., 2008).

The areas of occupational functioning endorsed most frequently as impaired mimic those in academics: (1) completion of assigned work, (2)

management of daily responsibilities, and (3) time management and work-related deadlines (Shifrin, Proctor, & Prevatt, 2010). In interview situations, emerging adults with ADHD may also exhibit an increase in symptoms (e.g., disorganized responses to interview questions) and be rated as less enjoyable by interviewers (Fabiano et al., *in press*). These results suggest that occupational functioning deficits are more associated with inattention than hyperactive-impulsive symptoms and are mediated by problems in executive functioning (Stavro, Ettenhofer, & Nigg, 2007). Accordingly, it may be that interventions targeting compensatory skills, such as OTMP skills, may also ameliorate deficits in key areas of occupational functioning.

Financial management

Given the poor impulse control and self-regulation associated with ADHD, problems handling money would be reasonable to anticipate as adolescents transition to greater financial responsibility and independence. The Milwaukee study followed children with ADHD into adulthood, examining financial management at age 21 (Barkley et al., 2008). Relative to a community control group, the ADHD group was found to owe significantly more money to other individuals (\$950 vs. \$412). In addition, a lower proportion of the ADHD group (52% vs. 70%) reported having a savings account, while a greater proportion indicated they had trouble saving to pay bills (44% vs. 30%). In a second study that compared outcomes of children with and without childhood diagnoses of ADHD in early emerging adulthood (*M* age = 20 years), those with childhood diagnoses were more than three times as likely to have gone without food and more than five times as likely to have been homeless during the short period since leaving high school (Fischer & Barkley, 2006).

Problems exacerbate as more time elapses. A subsequent follow-up at age 27 of the Milwaukee sample suggests money problems become more prominent over time (Barkley et al., 2008). Relative to a community control group, a larger proportion of the ADHD group reported having problems with saving money (71% vs. 20%), making impulsive purchases (78% vs. 24%), missing rent or credit card payments (58% vs.

39%), never having a savings account (61% vs. 27%), and having a poor credit rating (54% vs. 8%).

While no known research has examined the mechanisms through which these financial problems manifest, they likely occur in part from impairments in self-regulation and occupational functioning. As such, OTMP skills may also be useful to ameliorate financial management difficulties among individuals with ADHD during the transition period.

Health-related functioning

A diagnosis of ADHD has been shown to be associated with being at increased risk for several health risks, as well as increased use of medical services and resulting expenses (Cuffe, Moore, & McKeown, 2009; Nigg, 2013). In the only known large-scale study evaluating the lifestyle and health outcomes of emerging adults with ADHD, Barkley et al. (2008) found that affected individuals have more problematic eating habits, sleeping patterns, physical activity regimens, and tobacco and other nonmedical drug use than those without ADHD. Additionally, those in the ADHD group had higher body mass index and poorer cholesterol profiles, and were at greater risk for heart disease and atherosclerosis within the next 10 years (Barkley et al., 2008).

Overall, these findings suggest physical health is an area of serious concern regarding the present and future welfare of emerging adults with ADHD. Promising areas for intervention are likely those targeting lifestyle behaviors, such as diet, sleep, and exercise.

Substance use and abuse

Rates of tobacco, alcohol, and illicit drug use peak in the general population during emerging adulthood (Substance Abuse and Mental Health Services Administration [SAMSHA], 2012), and an ADHD diagnosis is associated with an increased risk for substance use disorders (Charach, Yeung, Climans, & Lillie, 2011). Notably, it does not appear that substance use and abuse are mediated by conduct problems, as emerging adults with ADHD exhibit maladaptive patterns of tobacco and alcohol use, including alcohol-related aggression, even after

controlling for conduct problems (Rooney, Chronis-Tuscano, & Yoon, 2012).

Given these results, it is somewhat counterintuitive that ADHD in emerging adulthood does not appear to specifically predict greater frequency or quantity of alcohol consumption; rather, emerging adults with ADHD appear to be more vulnerable to dependence and negative consequences associated with use (Smith, Molina, & Pelham, 2002). These results are consistent with research showing individuals with ADHD are more susceptible to developing dependence to nicotine due to its effect on the dopamine-modulated reward system, a primary neural network implicated in ADHD behavior (Wilens et al., 2008). As such, consistent use of a stimulant medication and emotion regulation may be particularly effective treatment targets to reduce the risk of future substance abuse. However, prescribing physicians may determine that stimulant medication is contraindicated for those with ADHD who are presenting with substance use concerns.

Family functioning

For both children and families of children with ADHD, the transition to emerging adulthood is a challenging period. Parental stress and conflict with their child is likely to increase during the transition period as those with ADHD are at increased risk for unemployment, academic underachievement, unstable interpersonal relationships, negative health outcomes, and substance use and abuse. Because of the persistence of ADHD symptoms and associated impairment, emerging adults are less likely to achieve independence in early adulthood, increasing the burden of financial, medical, and emotional support by their families.

Within the ADHD literature, research consistently suggests that parent-child interactions in these families result in high parental stress and parent-child conflict, reduced warmth, and less positivity (Harpin, 2005). Over time, the resulting pattern of parenting difficulties (e.g., low positivity, low responsiveness, inconsistency) may maintain or exacerbate conduct problems (Chronis et al., 2007).

Recent studies show that adaptive parenting skills are protective against negative outcomes in adolescents and emerging adults with ADHD. For example, parenting difficulties and parent-child relationship have been implicated in increasing the risk for substance use disorders and delinquency (Walther et al., 2012). Also, supportive relationships with parents are associated with improved affect regulation and perceived stress among emerging adults with ADHD (McCarthy, Moller, & Fouladi, 2001) and may partially account for covariation between ADHD and depressive symptomatology (Meinzer et al., 2015). Accordingly, improved parent-child relationships have been implicated as a means to improve outcomes in older adolescents and emerging adults with ADHD (Gordon & Hinshaw, 2017). Thus, interventions aimed at parenting behavior and relationships with parents may have the potential to provide avenues to prevent serious negative outcomes (e.g., substance use, depression, delinquency) and improve affective coping abilities in ADHD.

Developmental context of ADHD in emerging adulthood

The previous section described impairment associated with ADHD in emerging adulthood. Next, we consider how the developmental context of this transition period influences functioning of those with ADHD. Emerging adulthood is characterized by considerable developmental and environmental changes that yield a distinctive set of challenges, especially for those with ADHD. Emerging adulthood brings dramatic changes in lifestyle, autonomy, and responsibility, often including a marked decrease of parental oversight and structure, and corresponding increases in independence in several life domains (for a detailed review of typical development and challenges during emerging adulthood, see Arnett, 2000). These changes heighten demand for self-regulation, which may yield significant disadvantages for individuals with ADHD, given its cardinal symptoms.

Fleming and McMahon (2012) and Knouse and Fleming (2016) discuss the nature of this intersection of developmental challenge and disorder-related deficit for emerging adults with ADHD. These authors emphasize that ADHD is a disorder of executive functioning (EF) and that the neurological structures

underlying EF continue the process of maturation throughout emerging adulthood (Giedd, 2004) and, furthermore, develop at a delayed rate in ADHD (Shaw et al., 2013). EFs underlie self-regulation, including abilities such as organization, planning, behavioral inhibition (including reward delay), and emotion regulation (Barkley et al., 2008)—each of which improve throughout emerging adulthood in general (Gogtay et al., 2004; Steinberg et al., 2009) and in ADHD samples (Fischer, Barkley, Smallish, & Fletcher, 2005). However, longitudinal research on EF in ADHD shows that deficits continue to manifest into adolescence (Loo et al., 2007), emerging adulthood (Biederman et al., 2007; Fischer et al., 2005), and adulthood (Barkley et al., 2008), with core deficits persisting over time. Furthermore, because emerging adulthood is a time when external support is decreasing and self-regulation demands are increasing, those with ADHD transitioning to emerging adulthood experience disadvantage at the intersection of both their disorder and their developmental stage (Fleming & McMahon, 2012).

In sum, the context of emerging adulthood places the highest functional demands on the very abilities that are characteristically impaired in those with ADHD (Fleming & McMahon, 2012). As such, transitional interventions for adolescents must ameliorate the self-regulation demands created by this developmental context. This can be achieved through bolstering external supports, developing compensatory skills (e.g., OTMP), and limiting environmental demands. Such strategies might include: (a) obtaining and maintaining social supports (e.g., peer and parental relationships) and institutional supports (e.g., testing accommodations); (b) creating external contingencies (e.g., study groups); (c) gaining exposure to independent living skills associated with a post-adolescent lifestyle prior to emerging adulthood (e.g., obtain a job, practice financial management); and (d) OTMP strategies (e.g., breaking down large tasks, using a planner).

Empirically-supported elements of treatments for ADHD

The unique challenges faced by emerging adults with ADHD as a result of developmental and environmental changes merit tailored interventions that maximize treatment effects. Although there is a

lack of intervention research on ADHD among adolescents who are transitioning to emerging adulthood, the relatively extensive literature on empirically supported treatments for adolescents and adults with ADHD can inform transition interventions. Emerging adults share similarities to both adults and adolescents. As with adolescents, emerging adults have a still-maturing self-regulatory system that is vulnerable in demanding socio-emotional contexts; on the other hand, emerging adults are similar to adults in that they are largely autonomous in daily life routines, including work, academic, social, and lifestyle behaviors (e.g., diet, sleep, exercise). The following section provides an overview of intervention research for adolescents and adults with ADHD with an emphasis on identifying treatment elements that may be effective in improving transition outcomes.

Pharmacological interventions

Medications are moderately effective in improving core ADHD symptoms and are popularly recommended as a first-line treatment for adolescents and adults with ADHD (American Academy of Pediatrics, 2011; Wilens, Biederman, & Spencer, 2002); however, they have several limitations. For example, 80–90% of teens desist medication in adolescence (McCarthy et al., 2009; Molina et al., 2009), medications are effective only during the times in which they are pharmacologically active (4–12 hours), their long-term effectiveness as a sole intervention for ADHD has not been established (Molina et al., 2009), and they carry risk for misuse and diversion—namely, among college students without ADHD (Wilens et al., 2008). While stimulant medications may ameliorate ADHD symptoms such as distractibility, they have not been shown to improve global functioning. In sum, medication alone is inadequate for most persons with ADHD, emphasizing the need for effective psychosocial interventions; however, medication may be necessary for many and a combined approach may be optimal.

Psychosocial interventions

Unlike pharmacological interventions, psychosocial treatments tend to emphasize improvements in daily functioning rather than symptom severity

(Knouse et al., 2008; Sibley, Kuriyan, Evans, Waxmonsky, & Smith, 2014). The rationale for these interventions emphasize that ADHD *symptoms* are not often cited as the reason for seeking treatment, but instead the related *impairments*.

Psychosocial interventions for adolescents with ADHD

Efficacy of both school- and family-based behavioral interventions have been shown in randomized controlled trials (RCTs) and are the two primary behavioral interventions categories for adolescents with ADHD (Sibley et al., 2014). These behavioral interventions monitor and manage specific behaviors (e.g., noncompliance) with external contingencies (e.g., internet privileges). Behavioral strategies include daily report cards (DRCs; O’Leary, Pelham, Rosenbaum, & Price, 1976), contracts, and point systems to shape behavior. Additionally, several studies have used skills-based approaches in which adolescents received training to manage their symptoms in the classroom, at home, and with peers (e.g., Langberg, Epstein, Becker, Girio-Herrera, & Vaughn, 2012). These skills-based interventions prioritize developing OTMP and academic skills (e.g., note taking).

While efficacious, many traditional behavioral interventions have limitations to dissemination and implementation for adolescents. Teacher non-participation is often cited as a barrier to school-based interventions (e.g., Sibley et al., 2013). Secondary school teachers typically instruct over 100 students a day and cannot afford to provide much support to students (Eccles, 2004); thereby, teachers expect their adolescent students to function independently, and often refuse to implement behavioral protocols (DuPaul & Weyandt, 2006). For instance, Evans, Serpell, Schultz, and Pastor (2007) reported that less than half of teachers trained to use behavioral interventions for adolescents with ADHD in their classrooms implemented the interventions appropriately (Evans et al., 2007). Notably, these teachers volunteered to receive training in behavioral interventions and received regular consultation from a certified school psychologist. Further, most intervention programs require substantial staff, considerable financial resources, and are time intensive (10–40 hours per week; Evans, Schultz, DeMars, &

Davis, 2011; Sibley et al., 2011). Therefore, more cost-effective interventions should be considered until alternative models for school-based interventions are developed.

In the family setting, treatment dropout by parents and adolescents with ADHD tends to be the primary barrier to effective intervention (Sibley et al., 2014). Parents and their adolescents with ADHD may disengage from treatment due poor parent-child relationship and increasingly high levels of parenting stress (Harpin, 2005). However, recent treatment outcome studies of Supporting Teens’ Academic Needs (STAND) suggest collaborative parent-child treatment can address these limitations and yield significant improvements in parent-child relationship, caregiver strain, and functional impairment (Sibley et al., 2013, 2014). STAND (a) provides families with training in academic, organizational, and behavioral parenting skills and (b) enhances family engagement by assigning adolescents an active role coordinating treatment and incorporating motivational interviewing.

The core components of the first iteration of STAND consisted of eight weekly 60-min parent-child sessions and four monthly group parent sessions (Sibley et al., 2013). An RCT indicated that, relative to treatment as usual, families of middle school children who received STAND improved more significantly in several key areas, such as ADHD and oppositional defiant disorder severity, planner use, parent-child conflict, and academic problems (Sibley et al., 2013). Significant effects were generally large ($d = .65 - 5.15$), except for GPA ($d = .25$). Further, improvements in academic and symptom domains were noted on parent-report and objective measures, and treatment satisfaction and adherence were very high (e.g., 100% completion, as compared to 18–38% elsewhere; Barkley, Edwards, Laneri, Fletcher, & Metevia, 2001). Additionally, two-thirds of families reported consistent use of a daily privilege contract one month after treatment, suggesting preliminary treatment maintenance effects. All in all, this suggests that incorporating *motivational interviewing* and *parent-child collaboration* may improve engagement and thereby be indicated treatment elements.

Supporting Teens’ Academic Needs Daily-Group (STAND-G) was a subsequent low-intensity iteration of the intervention targeting

families of high school students rather than middle schoolers (Sibley et al., 2014). STAND-G consisted of eight weekly 90-min mixed group treatment sessions. The weekly sessions were broken up into three parts: (a) parents and adolescents review homework in a mixed group, 10 min; (b) separate parents group (skill-building) and adolescents group (academics, organization, and communication), 60 min; (c) parents and adolescents rejoin mixed group, complete a collaborative task, 20 min. Unique to STAND-G is an emphasis on developing adolescent autonomy. In a pilot trial of STAND-G, Sibley et al. (2014) reported high parent and adolescent satisfaction, parent compliance with behavioral strategies, and parent-rated therapeutic effects (i.e., OTMP, academic conscientiousness, parent-teen communication, adolescent autonomy). Indicators of adolescent autonomy were also improved, as fewer parents reported excessive involvement in their child's academics (e.g., checking assignments for errors, completing assignments for them).

As a whole, research on treatments for adolescents with ADHD suggest managing symptoms through external contingencies and adaptive skills (e.g., planner use) are key elements. This further emphasizes the difficulties created by the loss of external contingencies from school mental health providers, teachers, and parents during the transition to emerging adulthood. Although only a small number of studies are available, parent-child collaborative models offer an appealing approach to improving outcomes for ADHD during the transition period. The use of motivational interviewing provides a novel way to ameliorate otherwise poor parental adherence in this population and has also been shown to enhance family engagement for adolescent conduct problems (Dishion & Kavanagh, 2003) and single mothers of children with ADHD (Chacko et al., 2009). Otherwise poor treatment adherence among emerging adults with ADHD may be improved by having them take an active role in coordinating treatment, which also promotes autonomy and self-efficacy. By fostering autonomy and self-efficacy in treatment, this approach addresses the need for adolescents to be better prepared for the increasing demands and level of independence associated with emerging adulthood (Steinberg & Morris, 2001) and

prepares them for adult psychosocial models of treatment (Knouse et al., 2008). Lastly, this model is unique in that studies evidence improvements in parent-child relationship and parental stress—both of which have been associated attenuating the risk for negative outcomes in emerging adulthood (Gordon & Hinshaw, 2017).

Psychosocial interventions for adults with ADHD

Over the past 15 years, several psychosocial treatments for adults with ADHD have been developed and shown to be efficacious in RCTs (Knouse & Safren, 2010). Empirical investigations have yielded promising results for individual cognitive-behavior therapy (CBT; e.g., Safren et al., 2010), group-based CBT (e.g., Solanto et al., 2010), and group-based mindfulness training (e.g., Mitchell et al., 2017). In general, results suggest psychosocial intervention provide adults with skills to overcome some of the primary functional impairments of ADHD. Psychosocial treatments for ADHD among adults can vary considerably in content and presumed mechanisms of change, and relatively little work has been done to critically evaluate “active ingredients” in treatment models (Knouse et al., 2008).

Knouse and Safren (2014) suggested the issue with there being little critical evaluation of “active ingredients” is analogous to the early stages of treatments for anxiety disorders. In the latter part of the 1900s, several treatments for anxiety disorders proliferated, such as systematic desensitization, implosive therapy, flooding, and in vivo exposure. It was only after an intensive series of comparative and dismantling studies that exposure was identified as the “active ingredient” of these approaches (McNally, 2007). Similarly, focused investigations on the efficacy of intervention elements are paramount to determine the most efficient and effective intervention components (LaCount, Hartung, Shelton, & Stevens, 2018).

In a recent review examining effect sizes of psychosocial interventions for adults with ADHD, Knouse and Safren (2010) concluded the implementation, repetition, and reinforcement of compensatory skills (e.g., planner use, mindfulness) appeared to be the cornerstone of the most effective treatments. This conclusion dovetails with a recent study examining the efficacy of a low-intensity (3-week) group organizational skills

training intervention, in which LaCount et al. (2018) reported, relative to a control group, moderate-to-large effects on measures of academic impairment and ADHD symptom severity ($d = .59 - .70$). Knouse and Safren (2010) also noted that the most effective interventions targeted the overly positive automatic thoughts associated with failures to engage in compensatory strategies (Knouse & Mitchell, 2015). These hypotheses are consistent with executive dysfunction models of ADHD that emphasize that impairments do not manifest out of skill *deficiencies* but are problems with skill *implementation* (Ramsay, 2010). Indeed, Solanto et al. (2010) reported that homework completion—a measure of skill implementation—mediated treatment outcomes. Thus, compensatory skills training can be considered a necessary but insufficient element of psychosocial interventions for ADHD.

Proposed treatment principles and corresponding targets

As has been outlined above, the transition to emerging adulthood among those with ADHD is ubiquitous with functional impairment across several domains and increased risk for serious negative outcomes. However, the lack of published studies in this area emphasizes the urgent need for empirically-supported intervention targets and principles to guide treatment development and implementation. The following section outlines proposed treatment elements and targets tailored to the unique needs of individuals with ADHD during the transition period, based on empirical research of impairment, the developmental context, and treatment outcome research for adolescents and adults with ADHD.

Comprehensive assessment

Prior to beginning treatment, it is critical to perform a thorough assessment to elucidate the nature of the presenting problems. ADHD is a relatively difficult disorder to diagnose due to symptoms and impairments bearing resemblance to other disorders (Barkley, 2015). Performing a comprehensive assessment provides a means to accurate differentiation of ADHD from other

disorders and problems of life, as well as valuable insight for subsequent treatment recommendations. Additionally, a comprehensive assessment also attends to the intersectionality of individual and cultural diversity (e.g., biological sex, gender identity, race, ethnicity, socioeconomic status, comorbid psychopathology), as these factors may be associated with differences in symptom expression, impairment levels, or treatment effectiveness. Childhood symptom and impairment information has to be gathered when assessing ADHD to establish age of onset, and can also be used to identify factors (e.g., childhood oppositionality) that correspond with elevated risks for negative outcomes (e.g., substance abuse). From this, the clinician may choose specific empirically-supported treatment strategies (e.g., motivational interviewing, cognitive restructuring) as a means to reduce the risk for relatively likely negative outcomes. Second, the requirement of establishing ADHD-related impairment allows for the clinician to perform an individualized case conceptualization. Due to the heterogeneous nature of ADHD, evaluation of underlying mechanisms of impairment will also improve subsequent approaches to treatment.

Treatment modality

Of the various modalities of treatments for adolescents and adults reviewed, the STAND-G intervention (Sibley et al., 2014) for adolescents seems particularly promising for addressing the unique circumstances and impairments associated with the transition period among individuals with ADHD. Relative to other psychosocial treatments for adolescents, it addresses the barriers associated with school-based interventions (e.g., poor treatment implementation) and improves upon typical family-based behavioral interventions by addressing difficulties within the family (e.g., parent-teen conflicts) and fostering self-efficacy in the adolescent. A parent-child collaborative approach also works toward fostering autonomy and self-efficacy through collaborations, which has been evidenced to also improve parent-child relationships. Further, it allows adolescents to engage in supervised practice of adult-expected behaviors with minimal consequences to their current functioning (e.g., managing weekly allowance, being responsible for their laundry). Lastly, the adolescent group

environment may facilitate peer normalization and treatment adherence, due to receiving advice and encouragement from peers rather than just authority figures (e.g., parent, clinician; LaCount, Hartung, Shelton, Clapp, & Clapp, 2015).

Treatment engagement and adherence

The rate of treatment discontinuation associated with ADHD during the transition period far exceeds the associated change in ADHD prevalence rates in emerging adulthood (McCarthy et al., 2009). As Knouse and Safren (2010) noted, effective treatments for adults with ADHD often involve implementation, repetition, and reinforcement of compensatory skills. Therefore, the following approaches are recommended to enhance pharmacological and psychosocial treatment engagement and adherence for ADHD during the transition period.

Psychoeducation

One of the strongest predictors of overall satisfaction with treatment and subsequent effectiveness is being provided detailed information by clinicians regarding ADHD (Solberg, Haavik, & Halmøy, 2015). Clinicians should be prepared to provide psychoeducation about the neurobiological mechanisms associated with ADHD symptoms and how they can manifest in functional impairment (e.g., Safren, Perlman, Sprich, & Otto, 2005). Assessing and deliberately targeting misconceptions of ADHD may enhance treatment acceptability among families and clients with ADHD (Sciutto, 2015). Lastly, clinicians should be prepared to provide empirically-informed answers to questions pertaining to basic questions about medications (e.g., Should I be worried about becoming dependent/addicted?) and referrals to prescribing physicians when questions are beyond this scope.

Maladaptive positive thinking

Adults with ADHD may be more likely than non-ADHD peers to exhibit overly positive automatic thoughts that result in the failures to engage in compensatory skills (Knouse & Mitchell, 2015). The implication of this is that clients with ADHD are unlikely to recognize maladaptive patterns of behavior or accurately appraise the

difficulties they might face in challenging tasks. Thus, positive framing (e.g., performing X skill will help obtain Y goal) and motivational interviewing (Miller & Rollnick, 2013) may be useful to influence change in clients with ADHD exhibiting overly positive automatic thoughts.

Skill maintenance and generalization

To increase the likelihood that skills developed in treatment are maintained and generalized following termination, clinicians should incorporate take-home exercises, including subsequent in-session feedback and problem solving. Given the chronicity of ADHD, it is critical to facilitate incorporation of new skills into the client's daily behavior to promote long-term improvement. Further, external contingencies inherent in group-based interventions allow for vicarious reinforcement, encouragement, and modeling of adaptive behavior change (LaCount et al., 2015).

Transition planning

The need for mental health providers to provide anticipatory guidance to families and emerging adults is critical to improving outcomes of ADHD during the transition period. The increasing demands for self-management and diminution of parental support that is typical with the transition period make those with ADHD particularly vulnerable. The key areas for anticipatory planning include:

Mental health services

After reaching the legal age of adulthood, fewer young people receive services from mental health professional who specialize in children (e.g., school psychologists, pediatricians). Conversely, adult mental health providers may be less comfortable with managing treatment with emerging adults. Although those attending college may have relatively more consistent access to mental health services for much of emerging adulthood, families and emerging adults should be cognizant that college mental health services cannot be expected to provide comprehensive services outside the school calendar year. Therefore, it is important to consider and plan how to transition adolescents into the adult mental health system.

Insurance coverage

In addition to coordinating care to adapt during the transition period, insurance coverage issues can create a barrier to accessing mental health services in emerging adulthood. At a time where parental support tends to decrease, adolescents' ability to find and fund mental health services decreases precipitously. Emerging adults are more likely than any other age group to be uninsured (31% vs. 12% for those ≤ 18 years of age; Newacheck, Park, Brindis, Biehl, & Irwin, 2004; White, 2002). Because the cost of health services are twice as high as those without ADHD (Nigg, 2013), planning for health-related expenses or obtaining health insurance deserves attention during the transition period. For those not enrolled full-time in college, consideration should be given toward possible private health insurance options or seeking employment with health insurance benefits for employees to mitigate costs and improve access to mental health services.

Institutional supports

Associated with the transition period is a loss of institutional supports (e.g., special education). For clients entering the workforce, they may be able to negotiate accommodations through the Americans with Disabilities Act of 1980 (ADA). For clients seeking postsecondary education, they may be able to receive accommodations for high-stakes tests (e.g., ACT, GRE, SAT) and have access to a variety of support services, including disability services, tutoring programs, and academic skills centers.

It is important for clinicians to evaluate whether their client may seek accommodations in any of the aforementioned areas to tailor the previously recommended comprehensive assessment. This is due to the differences in documentation needed to obtain accommodations. As such, clinicians should be familiar with what is involved in their client receiving accommodations through any of the aforementioned mechanism (for a detailed review, see Gordon, Lewandowski, & Lovett, 2015).

Organization, time management, and planning (OTMP) skills

Inattention/disorganization behaviors have consistently been shown to account for a large portion of

variance in overall adaptive functioning, depression symptomatology, academic functioning, occupational functioning, and may be the behavioral pathway through which deficits of self-regulation in cases of ADHD lead to adaptive impairment (Stavro et al., 2007). Thus, organization, time management, and planning (OTMP) skills should be a key component for treatment, as they can be broadly applied to compensate for ADHD-related executive function deficits during the transition period and beyond.

For instance, dysfunctional response inhibition may manifest in failing to interrupt maladaptive behaviors in favor of more adaptive behaviors (e.g., stop playing video games and go grocery shopping). In this example, clients could incorporate alarms or timers to help them better monitor time. Impairments in working memory may manifest in failing to act on a request made by their romantic partner due to that information being "bumped" out of working memory before the client could use it (Fleming & McMahon, 2012). In this example, clients should be encouraged to act on new information (e.g., *immediately* recording new appointments). Lastly, impairments in delay aversion may manifest in consciously choosing a smaller, immediate reward (e.g., spending residual income on social events) rather than a larger, more distal reward (e.g., spending residual income to pay down student loan debt). In this example, clinicians may recommend breaking down a large task into more manageable "chunks" to make them less aversive. Other common OTMP skills include using planners, maintaining to-do lists, and prioritizing items on to-do lists.

Emotion regulation

Emerging adults with ADHD often have difficulty managing their emotions, which often manifest in greater anger, depressive and anxiety symptoms, overall psychological distress, and maladaptive expression of anger. In addition to the cognitive restructuring of maladaptive thoughts included in multiple CBT treatments for ADHD adults (e.g., Safren et al., 2005), mindfulness meditation training has been found to improve anxiety and depressive symptoms (Zylowska et al., 2008) and emotion regulation (Mitchell et al., 2017). Lastly,

encouraging physical exercise may prove to be useful based on the extensive literature documenting the positive effects on depressive, anxiety, and stress symptoms (Salmon, 2001).

Daily life routines

As most students graduate high school and enter into full-time work or postsecondary education, external sources of structure and routine (e.g., parents' reminders, consistent school schedule) are lost, or at least greatly diminished. In general, the transition period is likely to correspond with increased disruption in daily life routines—especially for individuals with ADHD. Thus, interventions should aim to mitigate dysregulated patterns of daily life with healthy behaviors, such as the following.

Physical exercise

Unfortunately, virtually no published research documents the putative positive effects of exercise on ADHD symptomatology or impairment in adolescents or adults. However, in samples of school-aged children prior research suggests that physical exercise can yield acute (i.e., immediately following a single bout of physical exercise) and chronic (i.e., cumulative effects of physical exercise over a specified period of time) improvements in cognitive functioning and ADHD symptom severity (Neudecker, Mewes, Reimers, & Woll, 2015). Additional research is needed to further examine the effects of physical exercise among emerging adults; however, based on the existing literature, it seems plausible that emerging adults with ADHD may benefit from planned and regular physical exercise (LaCount & Hartung, 2018).

Sleep hygiene

In general, the amount and consistency of sleep among adolescents and emerging adults are below recommended standards (Wolfson, 2010). However, emerging adults with ADHD are at greater risk for poor sleep hygiene, in part because a common side effect of stimulant medication is impaired sleep (Surman & Roth, 2011). Additionally, emerging adults with ADHD have higher rates of substance use and abuse, which is associated with poorer sleep hygiene (Singleton &

Wolfson, 2009). Overall, emerging adults with ADHD are two to five times more likely to experience sleep problems than their non-ADHD peers (Gau et al., 2007). Although it has not been formally tested in samples of emerging adults with ADHD, sleeping patterns may be improved by regular physical exercise (Driver & Taylor, 2000).

A robust research literature has documented the consequences of poor sleep hygiene, including emotion dysregulation, poor academic performance, diminished alertness, driving accidents related to drowsiness, and decrements in executive function such as working memory, response inhibition, and sustained attention (Danner & Phillips, 2008; Durmer & Dinges, 2005). As these consequences of poor sleep hygiene are areas in which individuals with ADHD struggle, sleep hygiene should be integrated as a component of interventions for ADHD during the transition period.

Healthy diet

A burgeoning area of research suggests that blood glucose levels may be associated with self-regulatory functioning (e.g., affect regulation, attention control). Baumeister, Vohs, and Tice (2007) found that blood glucose levels are inversely related to self-regulatory functioning. Engaging in self-control diminishes blood glucose levels, and subsequently depletes one's capacity for self-control (Gailliot et al., 2007). Therefore, it is recommended that clinicians assess and assist in developing balanced dietary routines that affect self-regulation. This may include eating periodic meals/snacks throughout the day and limiting high glycemic index carbohydrates, which result in increases in blood glucose.

Summary

The transition from adolescence to emerging adulthood is a critical juncture, particularly for individuals with ADHD. Despite this, there are no known published research studies on interventions specifically for adolescents with ADHD transitioning to emerging adulthood. In the absence of such intervention, this manuscript facilitates future transition intervention research and provides empirically-informed guidance for clinicians by combining (a) domains of impairment for

emerging adults with ADHD and the developmental context in which they manifest and (b) treatment development research for ADHD among adolescents and adults. Many potential treatment elements are indicated, given the skill deficits, symptomatic expression, and developmental challenges of this population, ranging from the empirically-supported organization, time management, and planning (OTMP) and focus to more theoretically relevant techniques such as physical exercise. Clinicians and treatment developers are encouraged to consider both comprehensive interventions targeting multiple areas of difficulty and targeted, brief treatments that may be more transportable and manageable for clients and mental health professionals, alike. As emphasized by others reviewing ADHD treatment development work (Knouse, Teller, & Brooks, 2017), we recommend researchers work collaboratively to elucidate empirically-supported treatment principles by examining mechanisms through which change occurs (mediators) and the conditions under which they occur (moderators) to aid dissemination and adaptation of interventions to the unique needs and presentations of patients. Further research on the unique treatment needs of people with ADHD at the developmental transition to emerging adulthood is consistent with these aims.

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