



ORIGINAL ARTICLE

Does level of attention deficit-hyperactivity disorder symptoms predicts poor transition into adulthood?

Stéphanie Baggio^{1,2} · Joseph Studer³ · Ana Fructuoso¹ · Véronique S. Grazioli³ · Patrick Heller¹ · Hans Wolff¹ · Gerhard Gmel^{3,4,5,6} · Nader Perroud⁷

Received: 3 May 2018 / Revised: 9 July 2018 / Accepted: 19 July 2018 / Published online: 25 July 2018
© Swiss School of Public Health (SSPH+) 2018

Abstract

Objectives Transition into adulthood is a risky period for young people with attention deficit-hyperactivity disorder (ADHD), but empirical studies on this topic are scarce. This study investigated the association between the level of ADHD symptoms and transition into adulthood.

Methods Data were collected in the Cohort Study of Substance Use and Risk Factors among a representative sample of young Swiss men ($n = 4681$) over three waves. Measures included the level of ADHD symptoms and emerging adulthood assessed with the Inventory of the Dimensions of Emerging Adulthood and indicators of successful transition into adulthood.

Results The level of ADHD symptoms was associated with a lower success in the transition into adulthood. Young people with high level of ADHD symptoms had a reduced increase in indicators of successful transition over time. Inattention symptoms were more strongly associated with emerging adulthood measures in comparison with hyperactive symptoms.

Conclusions The level of ADHD symptoms may delay the transition into adulthood, especially inattentive symptoms. Providing tailored interventions to emerging adults with ADHD symptoms may decrease the substantial impairments adults with ADHD experience in life.

Keywords Functional impairment · Health care · IDEA · Mental health

This article is part of the special issue “Adolescent transitions”.

✉ Stéphanie Baggio
stephanie.baggio@hcuge.ch

Joseph Studer
joseph.studer@chuv.ch

Ana Fructuoso
ana.fructuosocastellar@hcuge.ch

Véronique S. Grazioli
veronique.grazioli@chuv.ch

Patrick Heller
patrick.heller@hcuge.ch

Hans Wolff
hans.wolff@hcuge.ch

Gerhard Gmel
gerhard.gmel@chuv.ch

Nader Perroud
nader.perroud@hcuge.ch

¹ Division of Prison Health, Geneva University Hospitals and University of Geneva, Geneva, Switzerland

² Life Course and Social Inequality Research Centre, University of Lausanne, Lausanne, Switzerland

³ Alcohol Treatment Centre, Lausanne University Hospital CHUV, Lausanne, Switzerland

⁴ Addiction Switzerland, Lausanne, Switzerland

⁵ Centre for Addiction and Mental Health, Toronto, Canada

⁶ University of the West of England, Bristol, UK

⁷ Division of Psychiatric Specialties, Department of Mental Health and Psychiatry, University Hospitals of Geneva, Geneva, Switzerland

Introduction

Increasing attention has been dedicated to the transition from adolescence into adulthood, which is an important life stage. Emerging adults are a high-risk population for mental health problems (Arnett et al. 2014). Among others, attention deficit-hyperactivity disorder (ADHD) is one of the most common mental health disorders in childhood and adolescence (on average 5% of the general population) (Polanczyk et al. 2014; Sayal et al. 2017). It is characterized by difficulty paying attention and hyperactivity/impulse control problems. It affects several areas of life, with for example, impaired academic, occupational, and psychosocial functioning, lack of access and continuity of health care, comorbid psychiatric disorders, and delinquency and criminality (Caci et al. 2014, 2016; Sayal et al. 2017; Sciberras 2014; Shaw et al. 2012). ADHD starts in childhood, but there is a growing evidence that this disorder persists in adulthood (40–60% of the cases) (Ramos-Quiroga et al. 2013). The interplay between ADHD and transition into adulthood is therefore of crucial interest but is still understudied.

Features of ADHD

Based on inattention and hyperactive/impulsive symptoms, three subtypes of ADHD have been described recently referred as “presentations” in the DSM-5: the inattentive presentation comprising individuals with mainly inattentive symptoms, the hyperactive/impulsive presentation comprising subjects with few or no inattention symptoms and mainly hyperactive/impulsive symptoms, and the combined presentation used to describe patients with both attentional and hyperactive/impulsive symptoms. Young people with inattention symptoms experience more difficulties with access to care, because they are more likely to be underdiagnosed (Caci et al. 2016). They also have a lower academic achievement in comparison with the hyperactive/impulsive presentation (Polderman et al. 2010). On the contrary, young people with the hyperactive presentation are more likely to use substances and to have aggressive behaviors (De Alwis et al. 2014; Evans et al. 2015; Liebreinz et al. 2016). Additionally, the manifestation of ADHD symptoms differs across the life span. There are more hyperactive/impulsive symptoms in childhood and adolescence, and more attentional symptoms in adulthood (Wilens et al. 2009). The prevalence of inattentive symptoms is stable or increase across ages, whereas the prevalence of hyperactive/impulsive symptoms decreases during school years (Döpfner et al. 2015). However, the way ADHD presentations influence the transition into adulthood have scarcely been studied.

ADHD has been extensively studied in the two last decades, but most studies focused on clinical samples or used a taxonomic definition of ADHD. Studies conducted among psychiatric populations are often non-representative of the whole population because they may exclude young people with undiagnosed and untreated ADHD (Sciberras 2014). Therefore, population-based approaches are needed to provide robust evidence of the association of ADHD with outcomes, such as transition into adulthood. Previous studies on the general population often focused on college students and included modest sample sizes (Abecassis et al. 2017), and thus, further data among large sample sizes of non-college youths are needed. Additionally, there is an increasing evidence that ADHD can be conceptualized as a continuum, with some symptoms that may occur without meeting the threshold of the disorder diagnostic (Frazier et al. 2007; Larsson et al. 2012). For example, Sayal et al. (2017) reported that 5% of children do not meet the threshold for ADHD diagnostic, but have substantial difficulties. Considering ADHD as a continuum would help to include subthreshold individuals, and investigations on the general population would provide an ecological overview of the difficulties that people with ADHD symptoms meet.

ADHD and transition into adulthood

Transition into adulthood is a risky period for ADHD young people. For example, problems in health care continuity are well studied (Ginsberg et al. 2014; Lotstein et al. 2008; Moscoso et al. 2015; Okumura et al. 2013; Parsons et al. 2014; Taylor et al. 2010; Treuer et al. 2017). However, empirical studies investigating how ADHD influences the transition into adulthood are scarce (Abecassis et al. 2017). Emerging adulthood is a time during which young people start to endorse the responsibilities of adults and have increased demands for self-regulation and organization (Abecassis et al. 2017). As a consequence, young people with ADHD may therefore meet difficulties in their transition into adulthood.

Measuring transition into adulthood is challenging. It has often been assessed using social roles of adulthood, which are sometimes called the “big five” social roles: educational attainment, employment, partnership, residential independence, and parenthood (Settersten 2007). Unfortunately, two major shortcomings reduce the reliability of these indicators of successful transition into adulthood (Baggio et al. 2015). First, nowadays, the transition into adulthood is no longer a linear sequence (Seifge-Krenke 2013). There are multiple transition patterns with discontinuities and reversals. Therefore, the adulthood markers are no longer good indicators of the transition into adulthood (Baggio et al. 2015). Second, emerging adulthood is not only associated with social roles, but also with

psychological correlates, such as considering oneself as an adulthood (Arnett et al. 2014). Adulthood markers do not capture the way young people feel about their own emerging adulthood. To overcome these limitations, a specific scale has been developed, namely the Inventory of Dimensions of Emerging Adulthood (IDEA, Baggio et al. 2015; Lisha et al. 2012; Reifman et al. 2007). The IDEA scale tests whether young people are undergoing the transition into adulthood and the corresponding psychological changes.

Therefore, this study investigated how ADHD was associated with transition into adulthood. Using a population-based sample of young Swiss men, we compared how emerging adults experienced their transition into adulthood and how they achieved to make this transition depending on their level of ADHD symptoms (including inattention and hyperactivity presentations in a dimensional perspective). For this purpose, we used the classic measures of markers of adult social roles and psychological states associated with the transition into adulthood (IDEA scale).

Methods

Participants and procedures

This study is a sub-analysis of data collected in the Cohort Study on Substance Use and Risk Factors (C-SURF), a longitudinal study designed to assess addictive behaviors and associated risk factors in a representative population-based sample of young Swiss men (Gmel et al. 2015). Data of the three first waves were used for this study. Participants were enrolled in 2010–2011 during the conscription in three Swiss national military recruitment centers (covering 21 of the 26 cantons of the country). All young men around 20 were eligible for the conscription process, and the participation was independent from the military recruitment. The research staff informed all the conscripts about the cohort study and invited them to participate. Only participants who were ill during the enrollment or were randomly selected for another study (CH-X, see Studer et al. 2013) were not enrolled ($n = 627$). Of the remaining 6384 conscripts, 4430 (69.4%) agreed to participate and signed an informed consent. Within two weeks after enrollment, participants were invited to complete the questionnaire (online or paper and pen). Reminders were used to increase the response rate. More information on the procedures is available in Studer et al. (2013).

At baseline (T_0), 5987 conscripts participated in the study (79.2% of those who gave written consent). The first follow-up (T_1) took place on average 15 months later (2012–2013). A total of 6020 participants filled out this follow-up questionnaire (retention rate = 91.2%), but the

study sample also included participants who provided written consent but did not complete the baseline questionnaire. At the second follow-up (T_2) (on average 49 months after T_1 , 2016–2017), 5445 participants filled out the questionnaire (retention rate from $T_1 = 88.2\%$, retention rate from $T_0 = 84.5\%$). This study used participants who answered to T_0 , T_1 , and T_2 questionnaires ($n = 4924$, 82.2% of the baseline sample). Missing values were listwise deleted, which left a final sample of 4681 (95.1%).

The Lausanne University Medical School's Clinical Research Ethics Committee approved the study protocol (No. 15/07). A previous study reported a small non-response bias between respondents and non-respondents (Studer et al. 2013).

Measures

ADHD

Adult ADHD symptoms were assessed at T_0 with the Adult ADHD Self-Report Scale Screener (ASRS-v1.1, Kessler et al. 2007). It covers six symptoms based on the DSM-IV diagnostic criteria over a 12-month period (American Psychiatric Association 2000). Symptoms are reported on a five-point scale. We computed a total score for the six symptoms following Kessler et al. (2007) recommendations (score ranging from 0 to 24), and also mean scores for attentional and hyperactive symptoms (respectively, four and two symptoms) (range 0–4). For descriptive purposes, we computed the dichotomized ADHD diagnostic, with a cutoff score of 14 or more, as recommended by van de Glind et al. (2013). A score of 14 or more means that individuals fulfill the screener diagnostic criteria for ADHD.

Psychological states associated with emerging adulthood

We used the Inventory of Dimension of Emerging Adulthood short form (IDEA-8, Baggio et al. 2015) to assess psychological issues of emerging adulthood at T_1 and T_2 . Participants answered eight questions related to identity exploration, optimistic lifeview, and instability and uncertainty associated with emerging adulthood (e.g., “is this period of your life...” “a time of experimentation?”, “... a time of feeling adult in some ways but not others?”). We computed a mean score of all questions, ranging from 1 to 4. A higher score indicates that the participants are transitioning into adulthood, whereas a lower score indicates that they have not started yet the transition or that they have reached adulthood.

Markers of adulthood

Markers of adulthood included completed education (have completed education or not), living arrangements (independent living from parents or not), financial independence (cover living expenses or not), stable relationship (live with a partner or not), and parenthood (have children or not) (Settersten 2007). A total score of markers of adulthood was computed at T0, T1, and T2, ranging from 0 to 5. Five corresponds to participants who have transitioned into all social roles of adulthood.

Covariates

Demographic covariates included age, language (French- or German-speaking), and parental financial situation at T0 (“below average”, “average”, and “above average”). Participants were also asked whether they were using any ADHD medication in the previous 12 months (e.g., Ritaline®, Modasomil®, Concerta®, Equasym®, Focalin®, Methylphenidat®, or Strattera®). This question was only assessed in the second follow-up with a “yes/no” answer.

Statistical analyses

We first computed descriptive statistics for all variables. Then, multilevel modeling for repeated measures was used to test the relationship between ADHD and emerging adulthood measures, with measurement occasions nested within participants (second-level unit) and a random intercept. The first set of models was used to predict the number of adulthood markers: (1a) a model with the whole ADHD score (between-subject factor) and time (within-subject factor); (2a) a model with the inattentive and hyperactive symptoms scores (between-subject factor) and time (within-subject factor); (1b) the same model as (1a) including the interaction between the whole ADHD score and time; and (2b) the same model as (2a) including the interaction between inattentive symptoms and time and hyperactive symptoms and time. The second set of models was used to predict the IDEA score (same four models). Models (a) tested the main effects of ADHD and time; and models (b) tested the interaction between ADHD and time in order to test how participants with high ADHD severity evolved over time. We controlled for demographic variables (language, age, and parental financial situation) and for ADHD medication at T2. We used a Bonferroni correction to control for family-wise error rate (eight models). Analyses were performed using R 3.4.3 and the package lme4 1.1–14.

Results

At T0, participants were on average 20.0 ± 1.2 years. They were 21.3 and 25.4 at T1 and T2, respectively. A total of 55.9% spoke French and 44.1% German, and 13.6% of the participants reported a parental financial situation below average, whereas 45.1% reported being above average. On average, the ADHD score was 5.67 ± 4.23 and 4.0% ($n = 188$) of the participants met the threshold score of 14. The mean scores of ADHD inattentive symptoms and hyperactive symptoms were, respectively, 0.85 ± 0.73 and 1.14 ± 1.00 . At T2, 1.8% of the participants ($n = 83$) reported having medications to treat ADHD symptoms. On average, the participants had 0.64 ± 0.91 adulthood markers at T0, 1.14 ± 1.04 at T1, and 1.79 ± 1.23 at T2.

The results of the multilevel models are reported in Table 1. The number of adulthood markers was significantly associated with the ADHD whole score ($b = -0.02$, $p < 0.001$) and the ADHD inattentive score ($b = -0.15$, $p < 0.001$). A higher level of ADHD symptoms was associated with a lower number of adulthood markers. The hyperactive score was not significantly associated with adulthood markers ($b = 0.03$, $p = 0.232$). The time was also associated with the number of adulthood markers (models 1a, 1b: $b = 0.58$, $p < 0.001$; models 2a, 2b: $b = 0.51$, $p < 0.001$), with the number of adulthood markers increasing over time. Finally, there was an interaction between time and ADHD whole score (model 1b: $b = -0.01$, $p = 0.032$) and inattentive score (model 2b: $b = -0.04$, $p = 0.044$). This negative estimate could be interpreted as follows: the number of adulthood markers increased less over time when ADHD severity increased. In other words, the increase in adulthood makers over time was less steep for participants with a high ADHD score. The interaction plot for the ADHD whole score is depicted in Fig. 1.

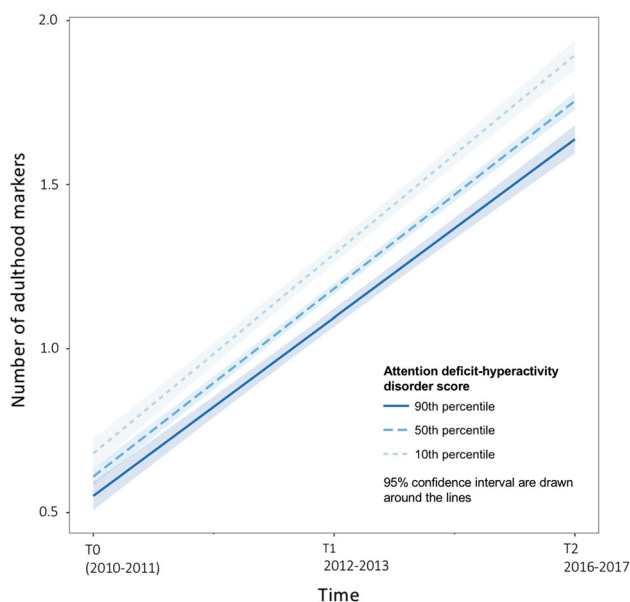
IDEA score was also associated with ADHD: a higher level of ADHD symptoms was associated with a higher IDEA score for the ADHD whole score ($b = 0.02$, $p < 0.001$), the inattentive score ($b = 0.12$, $p < 0.001$), and the hyperactive score ($b = 0.02$, $p = 0.001$). The strongest association was for inattention (b standardized = 0.16) standardized in comparison with hyperactivity (b standardized = 0.04, not shown in Table 1). There were no significant effects of time ($b = -0.02$, $p = 0.072$) and no interaction between time and ADHD scores ($b \geq -0.02$, $p \geq 0.272$).

Table 1 Associations of baseline the level of attention deficit-hyperactivity disorder symptoms with emerging adulthood measures over time, Switzerland (2010–2017)

Model	Independent variables	Adulthood markers		IDEA score	
		<i>b</i>	<i>p</i>	<i>b</i>	<i>p</i>
Model 1a ^a	ADHD whole score	– 0.02	< 0.001	0.02	< 0.001
	Time	0.58	< 0.001	– 0.02	0.072
Model 1b ^a	ADHD whole score	– 0.01	< 0.001	0.03	< 0.001
	Time	0.61	< 0.001	– 0.01	1
	ADHD whole score × time	– 0.01	0.032	– 0.01	0.592
Model 2a ^a	ADHD inattentive score	– 0.15	< 0.001	0.12	< 0.001
	ADHD hyperactive score	0.03	0.232	0.02	0.001
	Time	0.51	< 0.001	– 0.02	0.072
Model 2b ^a	ADHD inattentive score	– 0.01	< 0.001	0.12	< 0.001
	ADHD hyperactive score	0.03	0.704	0.03	< 0.001
	Time	0.61	< 0.001	0.01	1
	ADHD inattentive score × time	– 0.04	0.044	0.01	1
	ADHD hyperactive score × time	– 0.01	0.934	– 0.02	0.272

ADHD attention deficit-hyperactivity disorder, IDEA Inventory of Dimensions of Emerging Adulthood

^aMultilevel models for repeated measures were performed. The models controlled for age, language, parental financial level, and ADHD medication

**Fig. 1** Interaction plot of the number of adulthood markers on attention deficit-hyperactivity disorder whole score and time, Switzerland (2010–2017)

Discussion

This study explored how the level of ADHD symptoms was associated with transition into adulthood among young Swiss men. To date, several studies focused on the unmet needs of patients with ADHD transitioning into adulthood (Ginsberg et al. 2014; Taylor et al. 2010; Treuer et al. 2017), but few empirical studies investigated whether the

level of ADHD symptoms influences the transition into adulthood itself.

Our study suggested that the level of ADHD symptoms was associated with an impaired transition into adulthood. Indeed, participants with high scores of ADHD had a lower number of adulthood markers and were more likely to have high scores on the IDEA scale measuring psychological states associated with the transition into adulthood (e.g., feeling the transition into adulthood as a period of experiencing many possibilities, as a period of high pressure, and as a time of defining oneself). Having a high score of the IDEA scale means that the individual faces the psychological states of emerging adulthood. Having a low score can mean either that the individual has not yet transitioned into emerging adulthood (i.e., is still an adolescent) or has transitioned out of emerging adulthood (i.e., is an adult). In our study sample aged 25 on average at T2, low scores indicate achieved transition into adulthood. Indeed, emerging adulthood takes place between 18 and 29 (Davis et al. 2018) and these young people cannot be adolescent anymore. Psychological states of emerging adulthood include both positive (e.g., experiencing many possibilities) and negative states (e.g., uncertainty, feeling uncomfortable being no longer an adolescent but not yet an adult). These states are positively associated, meaning that emerging adults experience both positive and negative states (Baggio et al. 2015). In our study sample, the relationships between the level of ADHD symptoms and dimensions of the IDEA were similar to those described for the whole scale (data not shown). This means that having high scores of the ADHD scale was not exclusively

associated with negative psychological states of emerging adulthood.

In addition to this delayed transition, young people with a high level of ADHD symptoms were more likely to have an impaired evolution over time. Indeed, young people with a high level of ADHD symptoms had a reduced increase in the number of adulthood markers over time. On the contrary, psychological states associated with emerging adulthood were similar over time regardless of the level of ADHD symptoms.

Therefore, it seems that having a high level of ADHD symptoms was associated with an impaired transition into adulthood. Previous studies reported that ADHD is associated with a lower academic achievement (Polderman et al. 2010), problems related to romantic relationships (Babinski et al. 2011; Wymbs et al. 2012), and financial stress in adulthood (Brook et al. 2013). These factors can be markers of adulthood (i.e., completed education, stable relationship, and financial independence), and therefore, our results were in line with previous findings. However, to our knowledge, this is the first study showing that the level of ADHD symptoms may delay the transition into adulthood. Young people with a high level of ADHD symptoms did not only face difficulties in adopting social roles of adulthood, but also had psychological states—and psychological issues, such as uncertainty and instability—of emerging adulthood. This suggested that they feel less like adults than young people without ADHD symptoms or with a low level of ADHD symptoms.

Inattentive symptoms were more strongly associated with delayed transition into adulthood in comparison with hyperactive symptoms. Having high scores on the inattentive symptoms appeared as a risk factor for the transition into adulthood. Previous studies highlighted several issues associated with this presentation (Polderman et al. 2010). Clinicians should be aware that young people with inattentive symptoms face specific adverse aspects of functioning. These youths should be at focus for early diagnostic and treatment.

This study had some limitations. First, the sample included only males. The prevalence rate of ADHD is lower among females in comparison with males, but females are more likely to have the inattentive presentation and persistent ADHD in adulthood (Williamson and Johnston 2015). Data among females are needed to confirm our findings across both genders. Regarding the sample's representativeness, another limitation was that we do neither have information on the differences in demographics and clinical characteristics of the participants in the five missing cantons (including the Italian-speaking canton Tessin and cantons with important cities in the German-speaking part of Switzerland such as Zurich) compared to the rest of the country nor on the reasons for not being

enrolled for conscription. However, important German- and French-speaking cities were part of the study (Basel, Geneva, and Lausanne); thus, we did not expect severe bias compared with the rest of Switzerland. Nevertheless, strictly speaking, our sample was not representative of Switzerland as a whole.

A third shortcoming was that ADHD was assessed using a self-reported screening, and further studies should use clinical interviews to provide a formal diagnostic of ADHD. However, the ASRS is a reliable tool with good psychometric properties (Kessler et al. 2007; van de Glind et al. 2013), and the prevalence rate of ADHD (4%) was similar to those obtained in other studies (Polanczyk et al. 2014; Sayal et al. 2017). Another limitation was that we did not control for ADHD treatment at T0 and T1. At T2, only medications were considered. Only a very small proportion of participants used ADHD medication at T2 (1.8%). When these participants were excluded from the analyses, the results remained similar as those presented in the results section. Even if this sensitivity analysis yielded similar findings, future studies should control for other treatments such as psychotherapy and distinguish between stimulants and other medications. Information on the continuity of ADHD treatment between adolescence and adulthood would also be useful to achieve a better understanding of the impact of the level of ADHD symptoms on the transition into adulthood. Finally, we did not control for other psychiatric disorders and future studies should address this limitation by measuring a large range of psychiatric conditions along with the level of ADHD symptoms. Other confounding factors such as cognitive level and general functioning may also influence adult's outcomes and therefore should be taken into consideration in future studies. Overall, our study's results should be interpreted cautiously.

To conclude, this study showed that the level of ADHD symptoms may delay the transition into adulthood and evidence-based treatments are especially needed to prevent impaired transition into adulthood for young people with ADHD. Young people with inattentive symptoms or sub-threshold ADHD should not be neglected. Helping emerging adults with ADHD symptoms may decrease the substantial impairments adults with ADHD experience in their personal and professional life.

Funding The C-SURF study was granted by the Swiss National Science Foundation (Project No. 148493).

Compliance with ethical standards

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of

the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Conflict of interest All authors declare that they have no conflict of interest.

References

- Abecassis M, Isquith PK, Roth RM (2017) Characteristics of ADHD in the emerging adult: an overview. *Psychol Inj Law* 10:197–208. <https://doi.org/10.1007/s12207-017-9293-7>
- American Psychiatric Association (2000) Diagnostic and statistical manual of mental disorders, 4th edition, text revision (DSM-IV-TR), 4th edn. Author, Washington, DC
- Arnett JJ, Žukauskienė R, Sugimura K (2014) The new life stage of emerging adulthood at ages 18–29 years: implications for mental health. *Lancet Psychiatry* 1:569–576. [https://doi.org/10.1016/S2215-0366\(14\)00080-7](https://doi.org/10.1016/S2215-0366(14)00080-7)
- Babinski DE et al (2011) Late adolescent and young adult outcomes of girls diagnosed with ADHD in childhood: an exploratory investigation. *J Atten Disord* 15:204–214. <https://doi.org/10.1177/1087054710361586>
- Baggio S, Iglesias K, Studer J, Gmel G (2015) An 8-Item short form of the inventory of dimensions of emerging adulthood (IDEA) among young Swiss men. *Eval Health Prof* 38:246–254. <https://doi.org/10.1177/0163278714540681>
- Brook JS, Brook DW, Zhang C, Seltzer N, Finch SJ (2013) Adolescent ADHD and adult physical and mental health, work performance, and financial stress. *Pediatrics* 131:5–13. <https://doi.org/10.1542/peds.2012-1725>
- Caci H, Doepfner M, Asherson P, Donfrancesco R, Faraone SV, Hervas A, Fitzgerald M (2014) Daily life impairments associated with self-reported childhood/adolescent attention-deficit/hyperactivity disorder and experiences of diagnosis and treatment: results from the European Lifetime Impairment Survey. *Eur Psychiatry* 29:316–323. <https://doi.org/10.1016/j.eurpsy.2013.10.007>
- Caci H, Cohen D, Bonnot O, Kabuth B, Raynaud J-P, Paillé S, Vallée L (2016) Health care trajectories for children with ADHD in France: results from the QUEST survey. *J Atten Disord*. <https://doi.org/10.1177/1087054715618790>
- Davis JP, Dumas TM, Briley DA, Sussman S (2018) A meta-analysis of the association between substance use and emerging adult development using the IDEA scale. *Am J Addict* 27:166–176. <https://doi.org/10.1111/ajad.12707>
- De Alwis D, Lynskey MT, Reiersen AM, Agrawal A (2014) Attention-deficit/hyperactivity disorder subtypes and substance use and use disorders in NESARC. *Addict Behav* 39:1278–1285. <https://doi.org/10.1016/j.addbeh.2014.04.003>
- Döpfner M, Hautmann C, Görtz-Dorten A, Klasen F, Ravens-Sieberer U, group Bs (2015) Long-term course of ADHD symptoms from childhood to early adulthood in a community sample. *Eur Child Adolesc Psychiatry* 24:665–673. <https://doi.org/10.1007/s00787-014-0634-8>
- Evans SC, Fite PJ, Hendrickson ML, Rubens SL, Mages AK (2015) The role of reactive aggression in the link between hyperactive-impulsive behaviors and peer rejection in adolescents. *Child Psychiatry Hum Dev* 46:903–912. <https://doi.org/10.1007/s10578-014-0530-y>
- Frazier TW, Youngstrom EA, Naugle RI (2007) The latent structure of attention-deficit/hyperactivity disorder in a clinic-referred sample. *Neuropsychology* 21:45–64. <https://doi.org/10.1037/0894-4105.21.1.45>
- Ginsberg Y, Beusterien KM, Amos K, Jousselin C, Asherson P (2014) The unmet needs of all adults with ADHD are not the same: a focus on Europe. *Expert Rev Neurother* 14:799–812. <https://doi.org/10.1586/14737175.2014.926220>
- Gmel G et al (2015) The Swiss cohort study on substance use risk factors—findings of two waves. *SUCHT* 61:251–262. <https://doi.org/10.1024/0939-5911.a000380>
- Kessler RC, Adler LA, Gruber MJ, Sarawate CA, Spencer T, Van Brunt DL (2007) Validity of the World Health Organization Adult ADHD Self-Report Scale (ASRS) screener in a representative sample of health plan members. *Int J Methods Psychiatr Res* 16:52–65. <https://doi.org/10.1002/mpr.208>
- Larsson H, Anckarsater H, Råstam M, Chang Z, Lichtenstein P (2012) Childhood attention-deficit hyperactivity disorder as an extreme of a continuous trait: a quantitative genetic study of 8,500 twin pairs. *J Child Psychol Psychiatry* 53:73–80. <https://doi.org/10.1111/j.1469-7610.2011.02467.x>
- Liebrezn M, Gamma A, Ivanov I, Buadze A, Eich D (2016) Adult attention-deficit/hyperactivity disorder: associations between subtype and lifetime substance use—a clinical study. *F1000Res*. <https://doi.org/10.12688/f1000research.6780.2>
- Lisha NE, Grana R, Sun P, Rohrbach L, Spruijt-Metz D, Reifman A, Sussman S (2012) Evaluation of the psychometric properties of the Revised Inventory of the Dimensions of Emerging Adulthood (IDEA-R) in a sample of continuation high school students Eval. *Health Prof*. <https://doi.org/10.1177/0163278712452664>
- Lotstein DS, Inkelas M, Hays RD, Halfon N, Brook R (2008) Access to care for youth with special health care needs in the transition to adulthood. *J Adolesc Health* 43:23–29. <https://doi.org/10.1016/j.jadohealth.2007.12.013>
- Moscato A, Jovanovic N, Rojnic M (2015) Transition from adolescent to adult mental health services in Europe from the provider's perspective. *Lancet Psychiatry* 2:779–780. [https://doi.org/10.1016/S2215-0366\(15\)00359-4](https://doi.org/10.1016/S2215-0366(15)00359-4)
- Okumura MJ, Hersh AO, Hilton JF, Lotstein DS (2013) Change in health status and access to care in young adults with special health care needs: results from the 2007 national survey of adult transition and health. *J Adolesc Health* 52:413–418. <https://doi.org/10.1016/j.jadohealth.2012.08.005>
- Parsons HM, Schmidt S, Harlan LC, Kent EE, Lynch CF, Smith AW, Keegan THM (2014) Young and uninsured: insurance patterns of recently diagnosed adolescent and young adult cancer survivors in the AYA HOPE study. *Cancer* 120:2352–2360. <https://doi.org/10.1002/cncr.28685>
- Polanczyk GV, Willcutt EG, Salum GA, Kieling C, Rohde LA (2014) ADHD prevalence estimates across three decades: an updated systematic review and meta-regression analysis. *Int J Epidemiol* 43:434–442. <https://doi.org/10.1093/ije/dyt261>
- Polderman TJC, Boomsma DI, Bartels M, Verhulst FC, Huizink AC (2010) A systematic review of prospective studies on attention problems and academic achievement. *Acta Psychiatr Scand* 122:271–284. <https://doi.org/10.1111/j.1600-0447.2010.01568.x>
- Ramos-Quiroga JA, Montoya A, Kutzelnigg A, Deberdt W, Sobanski E (2013) Attention deficit hyperactivity disorder in the European adult population: prevalence, disease awareness, and treatment guidelines. *Curr Med Res Opin* 29:1093–1104. <https://doi.org/10.1185/03007995.2013.812961>
- Reifman A, Colwell MJ, Arnett JJ (2007) Emerging adulthood: theory, assessment, and application. *J Youth Dev* 2:37–48
- Sayal K, Prasad V, Daley D, Ford T, Coghill D (2017) ADHD in children and young people: prevalence, care pathways, and service provision. *Lancet Psychiatry*. [https://doi.org/10.1016/S2215-0366\(17\)30167-0](https://doi.org/10.1016/S2215-0366(17)30167-0)
- Sciberras E (2014) ADHD research: the power of population-based studies. *Lancet Psychiatry* 1:248–249. [https://doi.org/10.1016/S2215-0366\(14\)70341-4](https://doi.org/10.1016/S2215-0366(14)70341-4)

- Seiffge-Krenke I (2013) “She’s leaving home...” Antecedents, consequences, and cultural patterns in the leaving home process. *Emerg Adulthood* 1:114–124. <https://doi.org/10.1177/2167696813479783>
- Settersten RA (2007) The new landscape of adult life: road maps, signposts, and speed lines. *Res Hum Dev* 4:239–252. <https://doi.org/10.1080/15427600701663098>
- Shaw M, Hodgkins P, Caci H, Young S, Kahle J, Woods AG, Arnold LE (2012) A systematic review and analysis of long-term outcomes in attention deficit hyperactivity disorder: effects of treatment and non-treatment. *BMC Med* 10:99. <https://doi.org/10.1186/1741-7015-10-99>
- Studer J et al (2013) Examining non-response bias in substance use research—are late respondents proxies for non-respondents? *Drug Alcohol Depend* 132:316–323. <https://doi.org/10.1016/j.drugalcdep.2013.02.029>
- Taylor N, Fauset A, Harpin V (2010) Young adults with ADHD: an analysis of their service needs on transfer to adult services. *Arch Dis Child* 95:513–517. <https://doi.org/10.1136/adc.2009.164384>
- Treuer T et al (2017) Lost in transition: a review of the unmet need of patients with attention deficit/hyperactivity disorder transitioning to adulthood. *Asia Pac Psychiatry*. <https://doi.org/10.1111/appy.12254>
- van de Glind G et al (2013) Validity of the Adult ADHD Self-Report Scale (ASRS) as a screener for adult ADHD in treatment seeking substance use disorder patients. *Drug Alcohol Depend* 132:587–596. <https://doi.org/10.1016/j.drugalcdep.2013.04.010>
- Wilens TE, Biederman J, Faraone SV, Martelon M, Westerberg D, Spencer TJ (2009) Presenting ADHD symptoms, subtypes, and comorbid disorders in clinically referred adults with ADHD. *J Clin Psychiatry* 70:1557–1562. <https://doi.org/10.4088/JCP.08m04785pur>
- Williamson D, Johnston C (2015) Gender differences in adults with attention-deficit/hyperactivity disorder: a narrative review. *Clin Psychol Rev* 40:15–27. <https://doi.org/10.1016/j.cpr.2015.05.005>
- Wymbs B et al (2012) Risk of intimate partner violence among young adult males with childhood ADHD. *J Atten Disord* 16:373–383. <https://doi.org/10.1177/1087054710389987>