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ADHD (P ROBAEY, SECTION EDITOR)

Attention-Deficit Hyperactivity Disorder Across the Lifespan: Review of Literature on Cognitive Behavior Therapy

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Abstract The paper reviews the literature on cognitive behavioral therapy (CBT) across the lifespan. CBT has shown mixed results for children with ADHD. There is a dearth of literature on CBT for adolescents with ADHD with only a few available studies suggesting its usefulness. CBT, however, has proven to be most promising for adults with ADHD. Newer studies have used recent diagnostic classification, randomization, blind assessments, robust statistical analysis procedures, and longer term follow-ups with booster sessions along with weekly coaching/mentoring. CBT is a promising adjunct to medication as it addresses many of the functional deficits of individuals with ADHD, which medication alone does not correct. Some maintenance of treatment gains for 6–12 months has been demonstrated in recent studies.

Keywords Attention-deficit hyperactivity disorder · ADHD · Cognitive behavior therapy · CBT · Psychosocial interventions · Children · Adolescents · Adults · Children with ADHD · Literature review

This article is part of the Topical Collection on *ADHD*

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Introduction

Attention-deficit hyperactivity disorder (ADHD) is a neurobiological disorder with variable symptoms across the lifespan. The worldwide prevalence for ADHD is 5.29 % among children and adolescents [1] and 4.4 % among adults [2]. Pharmacological management, the-first line treatment for ADHD, does not address functional impairments in social, academic, and occupational domains [3]. The American Academy of Pediatrics [4] and the American Academy of Child and Adolescent Psychiatry [5] suggest that contextualizing the symptoms and addressing functional deficits may help in comprehensive management of ADHD at different developmental levels [6]. DSM 5 has highlighted the differences in symptomatology at different developmental stages by introducing (additional) qualifiers that are appropriate for adolescents and adults as well as by reducing the number of symptoms required to make a diagnosis in adulthood. Inclusion of specific examples of manifestation of ADHD in adults in DSM 5 highlights the chronic nature of ADHD and its variable manifestation at different stages of life [7]. Comorbid depression, anxiety, and substance use also demand considerable attention in adulthood [8]. Prominent guidelines for management of ADHD favor multimodal treatment that duly take care of these functional deficits as well as improve long-term outcomes with large effect sizes [3]. Factors such as dysfunctional cognition and unhealthy compensatory strategies may call for psychosocial intervention, such as CBT [9]. CBT along with medication is effective for adults with ADHD [10, 11]. However, literature on the efficacy of CBT in children and adolescents is still scanty [12, 13].

This article reviews in detail the available literature citing the efficacy of CBT in ADHD across various developmental stages.

Childhood

Out of the 5.29 % children affected with ADHD worldwide, about 85 % continue to suffer in adolescence and 60 % in adulthood [1]. Therefore, early intervention can reduce the long-term negative impact of ADHD [14]. CBT alone, however, is not suited for those below 11 years and must be combined with medication.

CBT in children, along with medication, may help improve core symptoms [15, 16], impulsivity [16], behavioral and social adjustment [17], and academic performance [18]; for example, Hinshaw et al. [19] demonstrated improvement in children's self-esteem, academic performance, anger, and self-evaluations in the CBT and medication group. In another study, Hinshaw and Henker [20] showed improvements in self-control and coping after CBT training, as compared to control training. CBT group used more purposeful coping strategies and was more self-controlled. Both groups showed a significant decrease in fidgeting, verbal retaliation, and vocalization. The group that received CBT with methylphenidate showed greater reduction in the intensity of fidgeting, verbal retaliation, and vocalization as compared to the control group that received training in understanding the perspectives of the other person, recognizing emotions and facilitating empathic response but no CBT.

Fehlings et al. [21] studied the effectiveness of CBT in improving the home behavior of children with ADHD and demonstrated improvements in hyperactivity and self-esteem. Significant improvements in hyperactivity and self-esteem were seen in those who underwent 12, twice weekly, CBT sessions and 8 once every 2 weeks parent training sessions, compared to those receiving supportive therapy, showed significant improvements in hyperactivity and self esteem. Other parent and teacher outcome measures showed no improvement. At 5 months follow-up, improvement in symptoms was maintained and parents' perception of their children's hyperactivity had changed. Discontinuation of CBT by parents and child did not lead to negative rebound effects.

Assertion skills improved in a randomized controlled trial (RCT) by Antshel and Remer [22] that evaluated the impact of diagnostically heterogeneous and homogenous groups on group outcome as a result of social skills training (SST) with 120 children on medication for either inattentive ($n = 59$) or combined ADHD ($n = 61$). Modules covered cooperation with peers, problem solving, anger management, and accepting consequences. Significant improvement in parent and child perceived assertion skills was noted. Post treatment (not-follow up) improvements in externalizing behaviors were seen in diagnostically homogenous groups. More improvement in assertion skills was seen in those with inattentive type.

Even though improvements in core symptoms, externalizing behaviors, self control, self esteem, self evaluation, academic performance, coping strategies, assertion skills, and social and personal adjustment have been demonstrated by the existing studies, these results for the effectiveness of CBT in children should be read with caution as there seems to be a general lack of consensus about the robustness of these studies owing to small sample size, lack of randomization and control group, lack of appropriate assessment tools, use of limited sources of information, short duration of treatment, and lack of assessment of maintenance of treatment effects. Extrapolations have been made for child population based on the understanding of CBT in adult population which may not be appropriate considering the differing needs of children with ADHD.

Despite a pool of older literature suggesting limited efficacy of CBT in children with ADHD, newer research studies point towards possible usefulness of mindfulness in this population [23]. Transcendental meditation may improve ADHD symptoms, executive functioning, and stress and anxiety 11 to 14 year olds [24]. Mindfulness-based cognitive therapy (MBCT-C) [22] may help in improving attention. Barring the methodological limitations, mindfulness training [25] has shown some effectiveness in managing ADHD in children. Mindful parenting [26] and mindfulness-based stress reduction (MBSR) [27] have shown some benefit in improving attention problems, ADHD symptomatology in children, reduced stress, and depression in parents. More recently, cognitive orientation to daily occupational performance (CO-OP) was found to be beneficial for children with ADHD. However, the study was limited by low sample size and poor generalizability [28].

In a recent study, Abikoff et al. [29••] compared the efficacy of organizational skills training (OST) to a performance-based intervention (PATHKO) and a wait list (WL) control group. Twenty individual, clinic-based sessions were carried out over 10–12 weeks. OST taught children about skill building while PATHKO trained the parents and teachers to use reinforcement when children were able to achieve their goals. Primary outcome was the teacher and parent versions of Children's Organizational Skills Scale (COSS); functional outcomes, i.e., academic functioning, homework behaviors, and family functioning, were also measured. Assessments were carried out post treatment, 1 month after treatment, and twice during the next academic year. OST was seen to be superior to both WL and PATHKO as per COSS-P, COSS-T, and children's self-reports; PATHKO was superior to WL on most outcomes. Long-term treatment effects were significant for both OST and PATHKO.

The limitations of this study included possibility of rater bias due to inclusion of parents and teachers in the assessment. To overcome this issue, follow-up assessments of academic functioning and homework behavior were carried out by teachers blind to treatment.

Available literature on CBT for children with ADHD suggests that associated problems such as anxiety, oppositional

defiant disorder (ODD), conduct disorder (CD), mental retardation (MR), autism, eating disorders, obesity, and mood disorders must be adequately addressed in children with ADHD [30] in addition to academic and behavioral problems. Group-based treatments for children with ADHD, addressing academic difficulties, peer issues, and family support, must be included in multimodal clinical treatments for ADHD [30]. The importance of generalization of skills from the training setting to the real life setting has been stressed [31].

In summary, there exist only a few studies on the use of CBT in children with ADHD. The under-developed cognitive faculties and perceptive abilities may make it difficult to provide CBT-based treatment strategies for children with ADHD. CBT may place greater demands on children who are supposed to actively participate in the skills training sessions and practice the skills learnt in their usual home and school settings. This may make it difficult to study the CBT-based treatment strategies empirically. However, the recent studies suggest that CBT in the form organizational skills training, performance-based interventions, and mindfulness may help improve academic performance and core symptoms of ADHD in children, more so, when used as a part of a multimodal treatment package.

Adolescence

About 50–70 % of children continue to have impairing symptoms in adolescence [1]. The burden of illness due to the chronicity of ADHD is significant in personal, social, familial, and economic domains [32–34].

Despite their functional impairments, unfortunately, up to 90 % of adolescents with ADHD refuse medication because of denial or underestimation of their own impairment [32–34].

Antshel et al. [35•] conducted a manualized treatment for 68 adolescents (14–18 years) on stable medication for ADHD for 1 month and with comorbid depression/ODD/CD/generalized anxiety disorder (GAD)/learning disability (LD)/substance abuse. Behavior assessment system for children (BASC-2), Kiddie-Sads-Present and Lifetime Version (KSADS-E), ADHD rating scales (ADHD RS), clinical rated global assessment of functioning (GAF), and parent and teacher impairment rating scales were used for assessment. CBT was done based on Safren's [36] approach for adults with residual symptoms on medication for ADHD. Improvement was seen in attendance at classes, school tardies, and dosage of medication, inattention, and externalizing behaviors. Parents reported more improvement in subjects with ADHD + ANX and ADHD + DEP than ADHD + ODD. This was the first study to show the impact of treatment over time on medication doses. However, despite treatment and improvement in functioning, many adolescents still remained impaired, symptomatically and functionally. The limitations of this study include selective sampling, absence of blinding, and questionable interrater reliability.

Recently, Vidal [37••] conducted a multicenter randomized, rater blinded (wait list) controlled trial in a cohort of 119, 15–21 years old, adolescents on stable pharmacotherapy. While the group CBT led to improvement in ADHD symptoms, the study design was limited by a lack of long-term follow-up, difficulty in ruling out the effect of medicines, patient expectations, and difficulty in generalization because of the selected inclusion criteria.

In a recent study by Mongia and Hechtman (submitted) [38], the efficacy of CBT for 18 adolescents with ADHD on stable medication was demonstrated. Intervention consisted of 14 weekly group sessions interspersed with individual coaching three times per week. Organization, time and anger management skills, social skills, and self-esteem were targeted. Baseline to post treatment improvements in restlessness and impulsivity [Conner's Global Index-Self Report and Parent Report], self-esteem (Rosenberg Self Esteem Scale), level of disability (Sheehan Disability Scale-Independent Blind Clinician Rated), and severity of ADHD (Clinical Global Impression Scale-Independent Blind Clinician Rated) were noted. Subjective improvements in ADHD symptoms, motivation, and level of disability were reported by adolescents, their parents, and the independent blind clinician. Treatment gains were maintained 3 months post intervention.

On CGI-Independent Blind Clinician Report, CGI (Teacher Report), and SDS-Parent Report, no improvements were noted from baseline to post treatment. However, from post intervention to follow-up, improvement in restlessness and impulsivity (CGI-Independent Blind Clinician Report) and disability (Sheehan Disability Scale (SDS)-Self-Report) were observed. The methodological limitations of this study included its small sample size, low power, lack of actual control group, short duration of follow-up (i.e., 3 months), and no control over other treatments during follow-up.

Thus, there is some evidence that CBT can be effective in addressing some of the unique needs of adolescents with ADHD. Compared to children, the cognitive abilities that develop during adolescence should allow them to understand the purpose of therapy and better implement the strategies taught Future studies need to address the specific needs of this population and follow up their subjects over a longer term to study treatment maintenance.

Adulthood

Residual symptoms in medicated adults may call for therapeutic methods, such as CBT, for their management. CBT studies among adults with ADHD have shown significant improvement in core symptoms as well as comorbid problems.

Uncontrolled Studies

The effectiveness, feasibility, and patient acceptability of a structured group therapy in adults with ADHD was evaluated by Philipsen et al. [39]. Thirteen, 2 h, weekly sessions were conducted with 72 adults with ADHD at 4 centers. ADHD symptoms and co morbidity were assessed using Wender Utah Rating Scale (WURS-Short version), ADHD-CL, SCID I & II. Treatment was similar to that described in Hesslinger et al. [40]. Improvements in ADHD severity, depressive symptoms, and personal health status were noted post therapy. Mindfulness, emotional regulation, and behavioral analyses were seen as most beneficial by patients.

From a research design perspective, this study was the first open multicentric study of structured group therapy in adults with ADHD with a low dropout rate. However, self-ratings from subjects, limited sources of information, lack of blind raters, or control conditions (medication and placebo), absence of follow-up assessments and booster sessions limit this study.

Rostain and Ramsay [41] examined the efficacy of a 6-month combined CBT and medication program for 43 optimally medicated adults with ADHD with a total raw score of 40 on Brown Attention-Deficit Disorder Scale-Adult Version (BADDS). Diagnostic assessment was done using SCID-I. Past and present symptoms of ADHD were also assessed. Sixteen, 50 min, psychotherapy sessions were conducted over 6 months. Psychoeducation about ADHD, organization and time management, understanding one's own strengths and weaknesses and judicious use of available resources were focussed upon. Participants showed improvement in symptoms of ADHD, anxiety, depression, and overall functioning.

The strengths of this study included a longer term (6 month) intervention period, use of a variety of outcome measures; limitations included inclusion of highly educated participants with high levels of psychiatric comorbidity, failure to study the individual effects of both treatments, lack of a control group, and no evaluation of generalizability.

In a cognitive behaviorally oriented group rehabilitation program by Virta et al. [42], 29 18–45-years-old adults were trained over 11 sessions in motivation, initiation, organization, attention, emotional regulation, communication, memory, self-esteem, decreasing impulsivity, and comorbidity. Self-ratings on DSM checklist for ADHD, Beck Depression Inventory (BDI-II), and Symptom Check List (SCL-90) and significant other ratings on BADDS 3 months prior to, before, and after treatment were collected. WURS was completed before treatment. About 20 % improvement was seen in 11 of 25 participants on a self-report measure of ADHD symptoms. Follow-up at 3 and 6 months showed maintenance of treatment gains in these participants.

The study had a low dropout rate and a good attendance at sessions. Treatment was effective in dealing with ADHD and associated symptoms. The recruitment protocol limited generalisability since participants were recruited through advertisements in ADHD magazine and information through internet, highly motivated individuals, and those with less crippling symptoms may have volunteered for treatment thereby leaving out those with severe symptomatology and impaired day to day functioning. Treatment was not helpful for those with longstanding symptoms, high resistance to change, and significant life changes during treatment. Effectiveness cannot be deduced due to absence of control group.

Zylowska et al. [43] trained 24 adults and 8 adolescents with ADHD (DSM-IV), over 8 sessions, in modified mindfulness exercises to deal with mood and anxiety symptoms. Training in mindfulness, including psychoeducation, neurobiology and etiology, sitting and walking meditation, use of visual aids, mindfulness, and wishing well for oneself and others, was imparted once weekly for 2.5 h over 8 weeks. The study had a 78 % adherence rate. All participants were highly satisfied with 30 % reporting improvement in hyperactivity, impulsivity and inattention and on neuropsychological tests of set shifting, attention conflict and in depression and anxiety.

The strengths of this study include group format and high adherence rate. Limitations include small sample size, limited generalizability, lack of a control group, unequal representation of gender and socioeconomic status, inclusion of individuals with sub-threshold diagnosis and high rates of comorbidity.

Edel et al. [44] compared 91 adults with ADHD receiving either mindfulness-based training (MBTG) or dialectical behavior therapy-based (DBT) skills group training. Thirteen, weekly, 2-h sessions led to improvements in ADHD symptoms, mindfulness and self-efficacy in both the groups. This study however lacked randomisation and had no control group.

These uncontrolled studies had limitations, namely small sample sizes and unavailability of a comparison group. Although these studies prove CBT to be feasible for adults with ADHD, these were never replicated.

Controlled Studies

Improvements in ADHD, depressive symptoms, and overall health status were shown in studies by Hesslinger [40] that used dialectical behavior therapy (DBT) for adult ADHD. Participants received 13, 2 h long, weekly therapy sessions over 3 months. Handouts were provided; daily exercises were distributed before and after each session. Problems due to ADHD, discussing goals, mindfulness training, and organization were addressed. ADHD checklist, Beck depression inventory (BDI), SCL-90R, and neuropsychological tests were administered. Wait list control group (included $n = 7$) received pharmacotherapy and behavior therapy, however was lost to follow-up. Self-reports of ADHD symptoms and depression improved post DBT.

Strengths of this study include randomisation; limitations include a very small sample size and high dropout rate.

Safren et al. [36] evaluated the potential efficacy, patient acceptability, and feasibility of CBT in medicated adults (18–65 years old) with ADHD having residual symptoms. Thirty-one adults with ADHD were randomized to CBT plus medication ($n=16$) or to medication only groups ($n=15$). Assessments included (a) diagnostic evaluation (using SCID I, sections from Kiddie Schedule for Affective Disorders and Schizophrenia-Epidemiologic version, (b) evaluation by an independent blind rater (ADHD Rating Scale and CGI), and (c) self-report measures (including Current Symptoms Scale, BDI, and Beck Anxiety Inventory (BAI)). CBT treatment included 8 sessions on 3 core modules (psychoeducation, organizing, planning, problem solving, reducing distractibility, and cognitive restructuring) and 3 optional modules (procrastination, anger and frustration management, and communication skills). Significantly greater improvements in ADHD and subject as well as independent evaluator depression and self-rated anxiety in the CBT viz. a viz. medication only group were noted.

The strengths of this study included decrease in residual symptoms, primary (self- and independent evaluator-rated ADHD symptoms, global severity) and secondary symptoms (depression and anxiety); limitations included small sample size, uncontrolled pharmacotherapy, and lack of follow-up.

Another study (Bramham et al.) [45] evaluated brief CBT group intervention targeting co-morbid anxiety, depression, self-efficacy, and low self-esteem in 40 males and 21 females with ADHD. CBT plus medication and waiting list medication only group were compared. Three 1 day per month workshops on CBT for 3 months covered information about ADHD, anger management, relationship and time management, problem solving, interest, and motivation. Anxiety and Depression subscale of the Hospital Anxiety and Depression Scale, Culture Free Self Esteem Inventory, General Self Efficacy Scale were used. CBT group showed more improvement on measures of knowledge about ADHD, self-efficacy, and self-esteem than the medication only group. Anxiety and depression symptoms were reduced in both the groups.

Strengths of this study included presence of control group; limitations of this study included use of self reports, bias due to administration of measures by group leaders, and lack of follow-up assessments.

Safren et al. [46] randomly assigned 86 symptomatic adults on medication for ADHD, to 12, 50 min sessions, CBT ($n=43$) or relaxation groups ($n=43$), CBT or relaxation with educational training. Three core modules discussed psychoeducation, organization and planning, distractibility, and cognitive restructuring. Two optional modules included procrastination and support for family. In the relaxation condition, psychoeducation, training in progressive muscular relaxation and ADHD specific relaxation were discussed. A treatment blind assessor rated the change in ADHD symptoms, at 4 points, using ADHD rating scale, Clinical Global Impression Scale. Self-reports were also used. CBT group showed greater reduction in post-treatment scores and maintained gains over 12 months.

The strengths of this study include low dropout rates, well-tolerated treatment, and sustained effects of treatment over time; limitations include permission for additional treatment during follow-up.

Solanto et al. [47] studied 88 adults on medication for ADHD, randomized them to either meta-cognitive ($n=45$) or supportive psychotherapy ($n=43$). They were trained over 12 weeks through 2-h-long sessions every week. The metacognitive therapy included discussing organization, planning, and time management. Diagnostic and clinical interviews, investigator, informant, and self-rated questionnaires for ADHD symptoms, scales for childhood symptoms, executive functioning, intelligence, and comorbid symptoms were used. Improvements in severity of ADHD for meta-cognitive over supportive psychotherapy group were noted.

Random assignment of subjects, use of self ratings, observers, and blind evaluators make this study sound; limitations include failure to study maintenance of gains and limited generalizability.

In a prospective, randomized controlled study by Vidal et al. [48], 32 adults (18 years and above) with partial response to medication for ADHD and stable medication for last 2 months, with a minimum score of 24 on ADHD-RS and score 4 on CGI-S were allocated to 12, 2 h long, weekly, psychoeducation ($N=15$) or CBT ($N=11$) group sessions. Pre, post, and follow-up assessments were done by blind clinicians using CAARS-Self report, SCID I & II, CGI-S, BDI, State Trait Anxiety Inventory (STAI), and Quality of Life-Enjoyment and Satisfaction Questionnaire (QLESQ). Both groups showed statistically significant improvement in primary symptoms, improved depression and anxiety symptoms, lower global severity and significantly improved quality of life. The strengths of this study were randomisation and structured, manualized treatment. Limitations included small sample size, possible bias in assessment, and attrition at follow-up.

Young et al. [49••] improved upon Emilsson [50] study by adding a measure of comorbid symptoms and sophisticated statistical analysis. In their parallel group randomized controlled trial, 95 medicated adult ADHD patients received either treatment as usual and medication (TAU/MED) or 15 twice weekly, group sessions of manualized R&R2 based CBT for ADHD interspersed with mentoring sessions. Assessment of primary ADHD symptoms and their severity (KSADS, CGI, BCSS) as well as comorbid depression (BDI), anxiety (BAI), and quality of life (QOLS) was done pre, post treatment, and at 3 month follow-up by blind clinicians. Significant improvement in clinician and self-rated primary symptoms was seen post treatment and at 3 months follow-up. Improvement in secondary outcomes was noted over time

thus demonstrating differential response effects of treatment on ADHD symptoms compared with associated problems.

The strengths of this study lie in its larger sample size, randomisation, blinding, 3 months follow-up, and assessment of quality of and rigorous, intention to treat statistical analysis. Missing data due to a high dropout rate and use of a number of assessment measures, however, limited the scope of this study.

Hirvikoski et al. [51] conducted a pilot study to assess the feasibility and efficacy of psychoeducative intervention program (PEGASUS) for adults with ADHD ($N=51$) and their significant others ($N=57$). PEGASUS improved knowledge about ADHD, quality of relationships, psychological well being in all participants and subjective burden of care in significant others. This study was limited by its open study design and missing long term follow up data.

Mitchell et al. [52] assessed the efficacy of mindfulness meditation in adults with ADHD in stratified randomized controlled (wait-list) trial lasting 8 weeks. Along with core symptoms of ADHD, improvement was found in executive function and emotion regulation. The study was limited by small sample size, lack of rater blinding, unaddressed mediators and moderators, absence of active treatment comparison group, and use of a limited number of executive function tasks.

Among studies on CBT for adults with ADHD, there is a large variation in terms of study design factors (e.g., sample size, medication status, duration and frequency of CBT sessions, strategies used, coaching/mentoring, booster sessions, follow-up, assessment measures, blinding, etc.) [53]. Despite this variation, there are a number of well-controlled, randomized studies which strongly suggest that CBT is effective in addressing some of the functional impairments of adults with ADHD. Evidence regarding adults with ADHD is formative ranging from uncontrolled to controlled studies to randomized controlled trials. However, as regards the application of CBT across child and adolescent population, the methodological rigor of these studies has been questioned owing to small sample sizes, variability in outcome measures, overdependence on self report measures, information from limited number of significant others, reliance on retrospective accounts of parents/ significant others, absence of appropriately matched, active control groups, possibility of bias due to lack of independent, blind evaluators of outcome and lack of evaluation of maintenance of treatment gains.

Overall Summary and Conclusion

From a developmental perspective, this review has highlighted that CBT for ADHD must be different for various age groups. CBT with medication showed best outcomes for all age groups. Common CBT strategies used among children included problem solving coping, organizational skills, self-instruction and lately, mindfulness. Adolescents underwent CBT training similar to adults, i.e., training in time management, organization, planning, problem solving, motivation, and emotional regulation.

Most of these studies have small sample sizes and unequally represent both genders so generalization may be difficult. Lack of actual control group, medication matching, information from multiple sources, control of response bias, and evaluation of maintenance of long-term gains should be addressed by future research.

CBT must address deficits due to ADHD and comorbid conditions as well as the differences in symptomatology and motivation of individuals. Assessment of intellectual levels and SES is not done in most studies and may actually help in determining the right difficulty level of CBT skills suitable for different age groups of individuals with ADHD. More, controlled research in the future would help us clarify effectiveness of CBT in children and adolescents with ADHD and strengthen our understanding about its usefulness in adults with ADHD. However, it is clear that CBT is often needed to address functional deficits not corrected by medication alone.

Compliance with Ethical Standards

Conflict of Interest Monica Mongia and Lily Hechtman declare that they have no conflict of interest.

Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

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