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Spina Bifida Myelomeningocele: The Brain and Neuropsychological Outcomes

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This paper reviews the physical, neural, and cognitive phenotypes of spina bifida myelomeningocele (SBM), a non-lethal neural tube defect that is the most common congenital birth defect affecting the central nervous system. After reviewing the physical and neural phenotypes, we explain how these variations affect in a principled manner variation in the cognitive phenotype of SBM. The cognitive phenotype represents a modal profile with strengths in associative, rule-based learning and weaknesses in assembled, integrative processes. This phenotype is related to core deficits in timing, attention, and movement that arise early in development because of brain malformations involving the cerebellum, midbrain, and corpus callosum. The variability of outcomes in SBM is also related to the level of spinal cord lesion, secondary effects of hydrocephalus and its treatment, and the psychosocial environment. Early interventions and comprehensive interventions that take advantage of our understanding of the modal cognitive phenotype modal profile and the variations that occur are important in helping people with SBM maximize their cognitive development, adaptive functions, and quality of life.

Keywords: Spina bifida, MRI, cognitive performance, intervention.

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Spina Bifida Myelomeningocele: The Brain and Neuropsychological Outcomes

Spina bifida is the most common congenital birth defect affecting the central nervous system in the world. One of two primary types of neural tube defects, spina bifida has a prevalence of about 0.5 per 1 000 live births worldwide [7]. The other major neural tube defect, anencephaly (absence of forebrain), occurs with comparable prevalence, but is lethal. Spina bifida can be identified at birth because of the spinal malformation that gives the disorder its name ("split spine"). However, spina bifida can also be identified during gestation through ultrasound and testing of alphafeto protein levels.

There are different subtypes of spinal defects associated with spina bifida and it is important to identify the type at birth. Myelomeningocele, accounting for about 90% of all cases, represents an open wound with the spinal cord and meninges protruding anywhere along the spinal column [14]. The child sustains paraplegia below the level of the spinal lesion and varying degrees of ambulatory and urological difficulties. Other forms of spina bifida, such as meningocele and spinal lipoma (fatty tumor), are "closed" defects and primarily affect lower limb coordination and urological function, but not the brain. Although genetic factors are estimated at 60-70%, inheritance is polygenic. The most prominent environmental factor is related to deficient folate metabolism, but epidemiological research has also shown associations with maternal obesity, glucose metabolism, and exposure to pollutants and other toxins [7].

Myelomeningocele is the most severe form of spina bifida and is usually associated with multiple malformations of the brain. These malformations often lead to obstructive hydrocephalus that requires diversion of cerebrospinal fluid through a shunt or other approach. Myelomeningocele is often associated with cognitive and motor deficits that reflect the impact of congenital brain malformations that can be more severe because of hydrocephalus and its treatment. The malformations result from exposure of the fetus to amniotic fluid that leaks from the spinal lesion, leading to mechanical compression of other brain structures.

Brain Malformations in Spina Bifida Myelomeningocele (SBM)

A failure of neural tube closure in the first 30 days of life, SBM is a prolonged disturbance of neural migration that results in cerebellar and midbrain anomalies, abnormalities of the corpus callosum, and less frequently heterotopias and other evidence of anomalous neural migration. Figure shows an example of the brain of a child with SBM with a Chiari II malformation, beaked tectum, and hypoplasia of the corpus callosum.

The Chiari II malformation of the cerebellum and hindbrain are virtually ubiquitous in SBM. In addition to a malformed cerebellum and small posterior fossa, there is downward herniation of the cerebellum into the foramen of Monro. The mechanical effects

of the malformation lead to midbrain anomalies involving the midbrain, with a tectum that is often "beaked" in appearance and kinking of the medulla [2]. The Chiari II malformation often obstructs the flow of CSF, leading to ventricular dilation and stretching of axonal fibers, especially in posterior cortex and the corpus callosum. However, in addition to a thinned corpus callosum (hypoplasia), about 50% of children are born with partial dysgenesis of the corpus callosum (hypogenesis) where the posterior aspects of the body and the splenium are missing, sometimes including the latest developing part, the rostrum. Because the corpus callosum develops between 8 and 20 weeks of gestation, these corpus callosum abnormalities indicate that the disruption of neural development extends beyond neural tube closure well into later parts of gestation [1]. Hydrocephalus is often apparent before birth on ultrasound, representing a profound disruption of early CNS development.

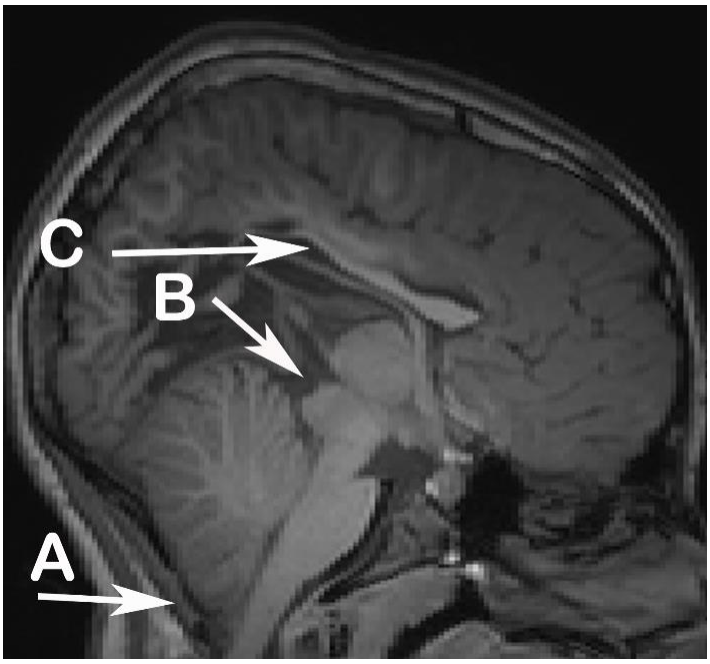

Figure. T1-weighted MRI acquired from child with SBM

Notes. A: Chiari II malformation B: Tectal beaking C: Hypoplastic corpus callosum.

Quantitative studies of the child and adult brain using structural MRI scans document atypical organization of the cerebellum and the brain [28]. On average, volumes of grey and white matter are reduced, especially in posterior brain regions, but not the frontal lobes. Here grey matter volumes are larger relative to normative values [27]. The frontal, superior parietal and occipital regions are thicker, while inferior parietal and temporal regions are thinner [27; 34]. Altogether, SBM is associated with "fatter" frontal lobes and thinner posterior regions. Gyral development in SBM also shows regional differences, with higher gyrification (increased cortical folding) in the lateral frontal, inferior parietal, and posterior temporal regions and lower gyrification in the inferior frontal lobe and the medial surface of the parietal and temporal lobes [34].

Cerebellar volumes are lower in SBM than controls and directly related to lesion level: upper level spinal lesions thoracic and above) are associated with greater reductions than lower level lesions [16]. The atypical organization of the cerebellum is a qualitative

change. The posterior-inferior regions are smaller, the anterior cerebellum is larger, and there is no difference in the corpus medullare [26].

The basal ganglia and related subcortical structures are visibly normal on radiological review in SBM [37]. On quantitative macrostructural assessment, the hippocampus, but not the amygdala, is reduced in volume [35; 37]. The putamen is enlarged. Diffusion tensor imaging of white matter structures shows that the integrity of the long association fiber tracts connecting posterior and anterior brain regions consistently reduced relative to controls [21; 31]. Reduced integrity has also been shown in the genu of the corpus callosum, but not in the anterior commissure [22]. Using the midbrain as a seed point in an analysis of tectal beaking, Williams et al. found that posterior pathways showed more reduced white matter integrity than frontal pathways, especially in association with tectal beaking [29].

These studies show that the cerebrum of people with SBM is atypically organized on an anterior to posterior gradient. The mechanical effects of hydrocephalus contribute to these patterns of atypical organization. Hydrocephalus represents ventricular expansion that leads to destruction of periventricular white matter [9]. This expansion also affects the regional distribution of white and gray matter, with cortical thickness lower along the lateral and third ventricles. However, the fact that the corpus callosum is hypogenetic in about half of children with SBM cannot be explained by hydrocephalus because the ends of the corpus callosum have simply not developed [2]. A major question involves the consequences of this atypical organization for neuropsychological functions.

Neuropsychological Consequences of Atypical Brain organization in SBM

Neuropsychological outcomes in SBM are variable. However, these variations are principled and can be understood as the outcomes of the cerebellar, midbrain, and corpus callosum anomalies, the effects of hydrocephalus and its treatment, and the consequences of the spinal lesion for movement [11]. Many children with SBM show a characteristic pattern of cognitive strengths and weaknesses. Although this pattern has historically been characterized *across* different outcome domains, they are better understood as patterns that occur *within* domains because of the influence of the congenital anomalies. Thus, children with SBM have been described as stronger in verbal than nonverbal skills; better in reading than math; and as lethargic but with good social skills.

It is important to understand the pattern of cognitive strengths and weaknesses in SBM in terms of domain-specific factors within cognitive domains that are the result of domain general cognitive factors associated with the disruption of CNS development. Table shows the domain-specific factors as a modal pattern of relative strengths and weaknesses in motor, perceptual, language, reading, math, and behavioral domains. The strengths reflect the capacity for *assembled processing,* which we have defined as the capacity to organize, retrieve, and generate information from memory that has been associatively learned. In contrast, they have difficulties in *assembled processing*, which we define as constructing and integrating responses across different domains [10; 11]. Historically, children with SBM have been reported to show preservation of syntax and vocabulary, but with poor language comprehension and pragmatics. In the framework of Table, learning vocabulary and syntax are examples of associative processing because the meaning or order of words is stipulated. Comprehension and the use of language in context requires

assembling of information across multiple sources to understand or construct a response. They show better word reading and math fact retrieval, but poorer reading comprehension and math skills, again representing contrasts in which there are rules stipulating the relation (associative processing), but difficulties in content domains involving comprehension and problem-solving where information has to be assembled to construct a response. On any given task, the extent to which a child or adult with SBM will show relative strengths and weaknesses depends of the extent to which the task requires associative versus assembled processing.

Table

Strengths (associative processing) and weaknesses (assembled processing) within cognitive domains for Spina Bifida Myelomeningocele with hydrocephalus

	Associative processing	Assembled processing
Domain	Strengths	Weaknesses
Motor	Motor Learning and Adaptation	Motor Control and Visual-Motor Tracking
Perception	Categorical (Face and Object Perception	Coordinate (Spatial Relations, Mental Rotations
Language	Vocabulary, Grammar	Making Inferences, Using Context (Pragmatics)
Reading	Word Decoding	Reading Comprehension
Math	Learning and Retrieving Facts	Math Algorithms (Problem Solving)

Underlying this pattern of strengths and weakness are domain general deficits in timing, attention, and motor control. These core deficits can be detected in the first year of life, persist throughout development, and have pervasive influence on cognitive and motor skills. They are directly due to the congenital malformations of the cerebellum, midbrain, and corpus callosum. Hydrocephalus can make these deficits more severe as can poverty and the treatment of hydrocephalus through the need for shunt revisions and a lifetime of medical monitoring [3].

Timing and the Cerebellum

The cerebellum involves more than fine motor skills and coordination. Rather, it has a major role in role in the *precision* of fine motor movements that extends beyond reaching, grasping, and moving the fingers. Central to the role of the cerebellum in cognition is its role in harmonizing motor control, including rhythmicity and timing. Children and adults with spina bifida show impairment on motor free tasks involving perceptual and motor timing, and rhythm discrimination and production [12]. Cerebellar volumes are correlated with performance on these tasks. On motor learning tasks, children with SBM are impaired in performance, but not in learning. Over trials, they benefit from repetition (procedural

learning), but their performance is slower and poorer in quality [15]. Thus, motor learning, which is mediated by the basal ganglia, is relatively intact, but performance and automaticity, which are more related to the cerebellum, are impaired because of the cerebellar malformation that is part of the Chiari II malformation [12]. In a randomized trial of the long-term effects of prenatal surgery for myelomeningocele, which often prevents or alleviates the Chiari II malformation, children who underwent prenatal surgery showed better (but not intact) performance than children who had postnatal spinal repair on a task requiring precision of fine motor movements [25]. They were also less likely to develop hydrocephalus requiring CSF diversion. Although the prenatal and postnatal surgery groups showed similar cognitive profiles reflecting the patterns in Table, secondary analyses need to target outcomes in those children in the prenatal group that did not develop a Chiari malformation and need a shunt.

Involuntary Attention and the Midbrain

Attention represents a dual system in the brain that involves voluntary and involuntary processes. The voluntary processes are top down and involve response control, a regulatory type of attention. Involuntary attention is stimulus driven, representing arousal, disengaging, and shifting attention as the environment changes [13]. The former attention network represents an anterior system involving frontal lobe regions with connectivity into the parietal regions, while the latter is more posterior and involves the midbrain and the posterior parietal region. Children with spina bifida have abnormalities of the midbrain as a consequence of the brain developing in a smaller posterior fossa related the Chiari II malformation. Well-documented deficits in disengaging and shifting involuntary attention in SBM are associated with tectal beaking and posterior brain volume loss. Using DTI, Williams et al. those with SBM exhibited reduced tectal volumes [39]. There was decreased integrity of posterior but not anterior tectocortical white matter pathways, with more integrity of frontal white matter pathways. Tectal beaking was associated with lower volumes and less integrity of anterior and posterior tectocortical pathways. In an assessment of the relation of these DTI findings and measures of involuntary attention, Kulesz et al. found significant associations of slower stimulus orienting with reduced tectal volume; slower conflict resolution with reduced superior parietal cortical volume; and reduced attentional control with reduced along both frontal and parietal tectocortical pathways [29]. In contrast, Brewer et al. [5] and Swarthout et al. [32] found that will children with SBM do not perform like typically developing children on measures of sustain attention (continuous performance tasks classically used as measures of response control. However, their errors occur earlier in the task and are not as significant as the difficulties on measures of stimulus control.

Movement

Children with SBM have multiple difficulties with movement related to the consequences of the spinal lesion and the cerebellar malformation. These problems are related to the core deficits in timing, but affect multiple systems from early in development. A child with SBM is born with reduced movement capabilities. They are less able to explore their environment and more likely to point and imitate than to reach and grasp [30]. Dennis and Barnes [10] identified multiple areas in which movement is impaired: eye movements and saccadic adaptation; visual fixation; adaptive ballistic movements of the

arm in relation to vision; a variety of adaptive motor learning tasks; pacing of speech and fluency; and others involving the eyes, hands, arms, and the speech apparatus. The core deficits in movement are closely related to the timing and attention core deficits. Attention always requires movement and the quality of movement depends on timing and rhythmicity. Taylor et al. demonstrated that infants with SBM were impaired in their ability to reach and manipulated a mobile of the sort that would hang over a crib [33]. The infant must fixate on it, attend to it, disengage attention in response to touching it, and adapt motor movements of the upper limbs in relation to changes in position, shape, and color. Children with SBM have difficulties with all these functions.

Interhemispheric Integration and the Corpus Callosum

Contributing to the core deficits in timing, attention, and movement and the effects on assembled processing are deficits in interhemispheric integration that stem from hypogenesis and severe hypoplasia of the posterior corpus callosum. Children with hypogenesis or severe hypoplasia of the posterior corpus callosum show reduced interhemispheric transfer on tactile tasks that stimulate either the right or left hands and on dichotic listening tasks where syllable are presented simultaneously to both ears. Performance on the dichotic listening task was correlated with total splenial area on the midsagittal measurement of the area of the splenium [20]. In a study of the comprehension of metaphors, children with severe hypoplasia or hypogenesis had more difficulty understanding metaphorical language that did not have a literal meaning [10]. Bradley et al. performed diffusion tensor imaging (DTI) of the corpus callosum on a large sample of children and adults with SBM and age-matched controls [4]. She found reduced macrostructural and microstructural integrity of the corpus callosum in people with SBM. Interhemispheric connections were rerouted through the anterior commissure, with reduced connectivity of the posterior regions in the right and left hemisphere that was related to interhemispheric transfer on thee dichotic listening task.

Subcortical Structures, Prospective Memory, and Cognitive Control

Prospective memory, the ability to remember future intentions, is a metacognitive skill that involves remembering to remember. In contrast, episodic memory is the retrospective memory for specific events and learned material. Treble-Barna et al. found poorer prospective and episodic memory skills across the lifespan in children and adults with SBM [35; 36]. Memory skills were associated with lower hippocampal (but not amygdala) volumes in children and adults with SBM. Ware et al. found that adults with SBM had significantly poorer performance on measures of working memory and inhibitory control than controls [38]. Those with SBM had enlarged cortical and putamen and reduced hippocampus volumes. Volumes of the dorsolateral prefrontal and hippocampus inversely correlated with performance on measures of cognitive control.

Consequences of Hydrocephalus

Hydrocephalus is a problem in SBM as a potentially lethal secondary consequence of hydrocephalus that may require shunting or another diversionary procedure, but always requires monitoring [3]. In two studies, Hampton et al. compared cognitive performance on verbal and nonverbal cognitive and motor skills in groups with (a) SBM; (b) a group largely

composed of children with meningocele, spinal lipomas, and other forms of spina bifida with no Chiari malformation or shunts; (c) children largely myelomeningocele and arrested hydrocephalus that did not require shunting; and (d) a group with a different etiology of congenital hydrocephalus (aqueductal stenosis) [18; 19]. Children with aqueductal stenosis performed highest across tasks, while children with SBM had the lowest performance. Those with arrested hydrocephalus performed more similarly to the group with SBM, while those with unshunted hydrocephalus performed more similarly to those with aqueductal stenosis. However, the profiles in the groups with SBM, aqueductal stenosis, and arrested hydrocephalus were essentially parallel, suggesting that hydrocephalus expresses itself in increased severity of the patterns of strengths and weaknesses across these groups. The exception was in the motor domain, where children with SBM had more difficulties with fine motor control, likely because of the Chiari II malformation.

Clinical Outcomes

The modal cognitive profile does not occur in every child or adult with SBM. It is an average and a relative pattern where deficits on tasks involving assembled processing are more severe than on tasks involving associative processing. If there is poverty, severe hydrocephalus, problems with shunt treatments or the Chiari malformation, or other neural insults, the strengths in associative processing are less likely to appear. In terms of commonly recognized clinical outcomes, intellectual disabilities occur primarily in children who are economically disadvantaged with upper level spinal lesions [16]. In the United States, where the prevalence of SBM is high in Latinx populations who also tend to be poor, the incidence is much higher in those with thoracic level spinal lesions, reflecting the double dose of an upper level spinal defect and more severe brain involvement and poverty. Behaviorally, children with SBM are interested in people and have low levels of low levels of social anxiety. However, they can be hypersocial, overly talkative, and sometimes are seen as disinhibited because of their social and verbal behavior. In contrast, in nonsocial situations, they can appear lethargic and underaroused, which is often misidentified as amotivation. As children with SBM into adolescence, social adjustment difficulties emerge because of school, family, and peer issues [24]. Early in school, children with SBM are often seen as very capable because of their preserved language skills and word decoding abilities. However, learning and attention difficulties are common. Burmeister et al. reported that one-third of children with SBM had elevations on parental ADHD ratings of inattention, but not hyperactivity-impulsivity. In the same cohort, 3% had word decoding problems; 26% had math problems; and 23% had both math and reading difficulties [6]. Comprehension problems were higher [16]. Adults with SBM are under-employed relative to their IQ and literacy levels. Even accounting for orthopedic impairments, Hetherington et al. found that functional math (keeping a checkbook) and spatial skills (reading maps in relation to bus schedules) were the best predictors of independent living [23].

Conclusions and Implications for Clinicians

It is important to understand and evaluate people with SBM from the perspective introduced by the modal cognitive profile. It should be expected that a person with SBM will show strengths in associative processes and weaknesses assembled processing within cognitive domains. If the profile is different, a clinician should try to understand the basis for deviations in the modal cognitive profile. Information that can be learned by repetition,

memorization, repeated exposure, and other examples of associative earning can be strengths in children and adults SBM. In contrast, if the task requires integration and construction of material that is read or heard, more assistance will be needed.

People with spina bifida may require special programming in school, along with rehabilitation of their orthopedic problems. They typically require the services of an urologist. Neurosurgical intervention and follow-up begins at birth. Psychological treatment becomes increasingly important as the child moves into adolescence, but parents need education and assistance as early as possible. Comprehensive psychological assessments should begin early in development as part of a multi-disciplinary perspective [17].

Adaptive behavior assessments of functional, habitual everyday skills in conceptual, social, and daily living areas are very helpful. These are accomplished through interviews and checklists. Motor functions should be assessed in terms of their consequences for overall adaptation. Attention problems are common and more likely to reflect difficulties with inattention and arousal, although the child with SBM may have trouble accessing cognitive control processes. Assessments of academic skills are needed because many children with SBM need help with math, writing, and reading and listening comprehension.

In programming for the child, few interventions are specific to people with SBM. Interventions that address academic problems, adaptive behavior, and psychosocial difficulties in children with developmental learning and attention disorders are useful so long as the clinician understands the research base on spina bifida. It is important to build on strengths, such as those in associative processing. Focusing on generalization across contexts will assist with associative processing weaknesses. Children with SBM less likely to respond to stimulant medication if they meet criteria for ADHD [8]. However, helping the parents and the school organize the environment and develop consistent routines. Perhaps most important, those working with SBM need to help others understand that the child has a neurological disorder that causes learning and attention problems. Many children who struggle in school or in the community are seen as lazy or amotivated, which is often not the case and rarely a satisfactory answer as to why the child or adult with SBM is struggling. These factors exacerbate learning and adjustment, but they are secondary to the brain-based difficulties with learning.

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Миеломенингоцеле при расщеплении позвоночника: нейропсихологические последствия, связанные с работой мозга

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В данной статье рассматриваются физические, неврологические и когнитивные фенотипы миеломенингоцеле при расщеплении позвоночника (spina bifida myelomeningocele, МРП) – не летального, но наиболее распространенного врожденного дефекта нервной трубки, поражающего центральную нервную систему. После рассмотрения физических и неврологических фенотипов авторы объясняют, каким образом изменение данных параметров принципиально влияет на когнитивный фенотип МРП. Когнитивный фенотип представляет собой типичный когнитивный профиль с повышенными показателями ассоциативного обучения на основе правил и сниженными показателями в комплексных интегративных процессах. Данный фенотип связан с ядерными дефицитами восприятия времени, внимания и моторных навыков, которые возникают на ранней стадии развития из-за пороков развития мозга, затрагивающих мозжечок, средний мозг и мозолистое тело. Вариабельность клинических исходов миеломенингоцеле при расщеплении позвоночника также связана с уровнем поражения спинного мозга, вторичными эффектами гидроцефалии и ее лечением, а также с психосоциальным средовым фактором. Раннее вмешательство и комплексный подход, основанный на понимании когнитивного профиля, типичного когнитивного фенотипа и его вариаций, являются важными факторами в контексте помощи людям с миеломенингоцеле при расщеплении позвоночника, направленной на максимально возможное улучшение когнитивного развития, адаптивных функций и качества жизни.

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A Dual-System Model of Social Anxiety Disorder: The Interplay of the Social-Rank and Affiliation Biopsychosocial Systems

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Social Anxiety Disorder (SAD) is a highly prevalent and debilitating condition. Although effective treatments exist, their success is limited. This narrative review seeks to advance a comprehensive understanding of the types of social threat affecting individuals with SAD from the perspective of two basic biobehavioral systems: affiliation and social-rank. We argue that SAD is associated with vulnerability to events signaling loss of affiliation (exclusion) and of social-rank (defeat). Specifically, we suggest that SAD is characterized by (a) hyper-reactivity to exclusion and defeat; (b) propensity to respond to exclusion by deploying distancing and withdrawal strategies; (c) propensity to respond to defeat by deploying conflict-reducing subordination strategies; and (d) enhanced linkage of the two systems. This dual-system account may help integrate clinically significant information about SAD and offer recommendations regarding novel theory-based directions for treatments.

Keywords: dominance, belongingness, social anxiety, exclusion, defeat, depression, social stress.

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A Dual-System Model of Social Anxiety Disorder: The Interplay of the Social-Rank and Affiliation Biopsychosocial Systems

Social dangers constitute the main perils of modern life. Acceptance is never a given, prestige is never secure. Every social encounter involves a risk of rejection and a possibility

of humiliation. Whereas a certain level of anxiety in the face of exclusion and defeat is adaptive, intense anxiety can significantly impair coping with such events. *Social Anxiety Disorder* (SAD) is a condition involving marked anxiety about social or performance situations in which an individual is exposed to possible scrutiny by others with fear of public speaking being the most common concern [70]. Individuals with SAD fear acting in ways that will be humiliating, embarrassing, or will lead to rejection [6].

The Clinical Profile of Social Anxiety Disorder (SAD)

Life-time prevalence of SAD is estimated around 12% and is associated with severe psychological, interpersonal, and professional consequences resulting in quality of life impairment [3; 78]. Social anxiety (SA) ranges in severity, but even below-diagnostic levels are associated with reduced well-being [30], and lower quality of intimacy in peer, friend, and romantic relationships [106].

The clinical profile of SAD is marked by an early onset with almost 75% of the cases beginning by mid-adolescence [43]. Women are more likely to have SAD [10]. SAD is comorbid with major depressive disorder (MDD, [67]) and with substance abuse disorders [16]. Significantly, the onset of SAD precedes the onsets of both MDD and substance abuse disorders in as many as 80% of comorbid cases [83]. It is therefore unsurprising that individuals with SAD are likely to attempt suicide [47].

Multiple intervention types have shown promise in the treatment of SAD including (but not limited to) Cognitive Behavioral Therapy (CBT), acceptance and commitment therapy, interpersonal psychotherapy, and social skills training [2]. Multiple outcome studies examined the effectiveness of individual as well as group formats of CBT, documenting moderate to large effect sizes [65]. However, despite the effectiveness of CBT, many patients either do not stay in therapy (attrition rates of 5-30% [1; 51]), fail to respond to CBT (40-57% do not exhibit clinically significant symptom reduction even after completing the full course, [20]) or remain considerably symptomatic at the end of treatment (only about 1 in 5 individuals reached symptom-free functioning in a large scale community study of group CBT [9]). Moreover, even following the completion of a full course of CBT, many patients continue to report reduced well-being and satisfaction with the quality of their interpersonal relationships [20; 27].

Theoretical Accounts of SAD: Process and System Models

Cognitive models emphasize the ways in which various *processes* combine to maintain SAD. According to these models, high-SA individuals are driven by a desire to make a good impression, yet doubt their ability to achieve this goal [18; 45; 48; 66; 72]. SAD is also postulated to be associated with enhanced self-focus to internal sensations, resulting in painful self-awareness. Moreover, it is believed that SAD is perpetuated by negative cognitions and images of the self. Rapee and Heimberg also postulate that biased attention to threatening interpersonal cues contributes to the maintenance of SAD [72]. Hofmann further argues that individuals with SAD are characterized by enhanced discrepancies between actual and ideal self, and that these discrepancies may underlie their fears about their ability to maintain a desired image in the eyes of others [48]. Moscovitch stresses the importance of identifying specific self-attributes that underlie

individuals' negative self-concept, rather than focusing on the generally negative contents of their self-beliefs [66]. These theories highlight the role of multiple cognitive processes – such as attention, interpretation, and evaluation – in the maintenance of SAD.

Another set of models examines SAD from the perspective of basic biobehavioral systems, highlighting the possible ways in which such systems may malfunction to produce the clinical profile of SAD. Two such prominent systems are the affiliation (aka belongingness) and social-rank (aka power, dominance) systems. Some models postulate that SAD is only associated with one of the two, in particular, the social-rank system [46; 105]. Hermans and van Honk propose that the adaptive function of SA is rooted in ancient communicative systems that regulate social order and inhibit inappropriate and antisocial behaviors [46]. Weeks and colleagues elaborate this line of thinking, suggesting that the tendency to avoid evaluations and to exhibit submissive behaviors may be helpful in coping with social threats by dodging conflicts with powerful others [105].

Other models argue that SA needs to be considered from the perspectives of both systems [36; 99]. Trower and Gilbert propose that SA individuals tend to over-utilize the social-rank and under-utilize the affiliation systems [99]. They further argue that SA individuals are attuned to cues of dominance often at the expense of signals of affiliation. Further elaborating the dual-system account, Gilboa-Schechtman and colleagues emphasize the combined role of the social-rank and affiliation systems in the etiology and maintenance of SAD [4; 34; 35; 42]. They propose that while social cautiousness may be advantageous in unstable hierarchies, it may backfire in moderately benevolent and cohesive social groups.

Purpose and Structure of the Review

Despite the major advantages achieved in the understanding of SAD under the theoretical guidance of both the process and the system-models, gaps in existing conceptualization and knowledge loom large. *First*, a robust literature documents the deficits in affiliative relationships associated with SAD [5]. Yet, many state-of-the-art approaches, such as CBT, do not examine the outcome of treatment in terms of reduction of these deficits. The restrictive focus on social avoidance and submissiveness features of SAD in CBT may contribute to the partial success of these treatments. The importance of addressing multiple interpersonal deficits in SAD is underscored by studies highlighting the partial independence of affiliative and social-rank biobehavioral systems [17; 44; 61]. *Second*, existing perspectives do not offer an integrative framework for the broad clinical picture of SAD – including developmental trajectory, gender differences, and patterns of comorbidity. *Third*, we advance a view of SAD as based on the dysregulation of two specific systems, rather than on a set of symptoms. Such a vision is consistent with recent calls to conceptualize psychological disorders in terms of basic neuropsychological mechanisms (RDoC, [54]). *Finally*, conceptualizing SAD through the lenses of the two biobehavioral systems highlights a functionalist account of SAD, and has the potential to synthesize diverse levels of analyses: from subjective self-repot, to cognitive, endocrine, and neural indices. Looking at both the whole and the parts (i.e., systems and processes) can be a powerful method of advancing knowledge. A system-based account with links to specific processes can integrate the currently expansive, yet disparate, literature on SAD.

This review highlights the organizing properties of biobehavioral social systems as a set of mechanisms that have a common functional theme and act as a coordinated set of neural, hormonal, cognitive, and behavioral processes [31; 80; 81]. This overarching structure is used to synthesize and integrate a large number of *process*-based findings into a more cohesive whole. The current review also highlights the potentially impaired *linkage* between the two systems [36].

We first present data on patterns of reactions of high- and low-SA individuals to challenges in the affiliation (exclusion) and social-rank (defeat) domains. We then discuss the possibility of enhanced coupling of the systems in SAD. Next, we explore the ways in which this account helps integrate clinically significant information about SAD. We conclude by reviewing established and novel theory-based directions for treatments of SAD, and sketch directions for future research.

SAD and the Affiliation System: Dealing with Exclusion

Over the course of evolution, conspecifics depended on each other, with those able to garner social support increasing their chances of survival. Such natural selection pressures led to the evolution of a biobehavioral system of affiliation, which continuously monitors for inclusionary status, and uses this information to guide behavior [12; 86]. Affiliation behavioral system emerges early in the developmental sequence, operates automatically and fluently, is attuned to specific social cues such as touch, gaze, and vocalization, and involves specific endocrine pathways [31; 37; 38; 97]. The brain circuitry dedicated to the affiliation biobehavioral system integrates sub-cortical survival-related networks with insula-cingulate and frontotempoparietal networks [26]. Social exclusion may be elicited by discrete cues (e.g., looking away) or by complex events, such as social exclusion [109].

Social exclusion has been found to affect behavioral, physiological, motivational, endocrine, and neural responses [102]. For example, excluded individuals are more sensitive to emotional tone and more accurate in distinguishing between real and posed smiles [14; 69]. Moreover, exclusion appears to be associated with an enhanced activation of the noradrenergic component of the sympathetic nervous system and with greater activity in dACC and anterior insula [26; 110]. Importantly, individuals differ in their regulation of responses to exclusion: whereas some attempt to initiate or enhance pro-social behaviors, others withdraw from interpersonal contact [93]. These regulatory differences are related to dispositional traits of the excluded individuals (targets), the relationship between excluders and target (in-group, out-group), and perceived expectancies of relationship repair and/or opportunities for reaffiliation [19; 89; 109].

Interpersonal rejection and social exclusion are common occurrences in the daily lives of high-SA individuals [32]. Yet, high-SAs are found to exhibit a more intense, less self-regulated, and more protracted response to exclusion than do low-SA individuals [36]. Whereas a common response to exclusion in non-SAs includes an enhanced attempt to reconnect with others, high-SA individuals appear to "down-regulate" the system: they exhibit a drop in progesterone [64], selectively attend to threat rather than to affiliation cues [94], and do not enhance the positive evaluation of new potential interaction partners [62]. In sum, the functioning of subjective, cognitive, and hormonal components suggest

that high-SA individuals tend to withdraw from affiliative opportunities following exclusion events.

SAD and the Social-Rank System: Dealing with Defeat

Group living confers evolutionary advantages, but the primary cost of such an arrangement is the need to compete with conspecifics for important resources [7; 57; 100]. The social-rank biobehavioral system monitors the relative social standing of conspecifics, and uses this information to guide behavior [87]. It also emerges early in the developmental sequence, operates automatically and fluently, is attuned to nonverbal signals, and involves specific endocrine pathways [38]. Data from human and animal studies suggest that specific brain circuits specialize in processing social-rank related information [8]. For humans, losing a competition, being publicly criticized and failing to achieve the expected degree of social influence is experienced as social defeat [95; 111].

Social defeat is among the most stressful events for humans and animals alike [56], affecting response layers from subjective to cognitive, expressive, endocrine, and neural [24]. Specifically, loss of social-rank is associated with increases in feelings of shame, sensitivity to cues of dominance, blood pressure, cortisol levels, and inflammatory responses [56]. Defeat may elicit distinct reactions ranging from submission, subordination and ingratiation [63; 108] to expressions of dominance and aggression [112].

A robust body of literature suggests that SAD is associated with submissive response to dominance cues [33]. For example, Maner and colleagues found that high-SA, but not low-SA, men exhibited a drop in testosterone following defeat [63]. Similarly, high-SA individuals demonstrated an increase in pitch and a decrease in postural expansion when competing over female attention [103]. High-SA individuals also exhibited more signals of low-dominance during social tasks, such as rigidness, fidgeting and gaze avoidance [104]. Combined, evidence encompassing subjective, expressive, and hormonal data suggests that SA is associated with a down-regulation of social-rank system, although this relationship is stronger in men than in women.

Defeat-Exclusion linkage in SAD

In everyday life exclusion and defeat may co-occur [109]. Targets of exclusion may feel not only disliked but also demoted and disrespected [76; 107]. It appears that high-SA individuals are more inclined than low-SA individuals to interpret exclusion as significant threat to their relational value and self-esteem [41]. These interpretations may, in turn, trigger a pattern of cognitions and behaviors which are akin to social defeat [73].

When exclusion connotes defeat, low-SAs often attempt to reinstate their social value via aggression [23], conspicuous consumption [59], or pursuit of risky financial opportunities [25]. High-SA individuals, however, appear to respond to exclusion by a mixture of social withdrawal and submission, such as decrease in vocal confidence [33; 62] and submissive interpersonal tactics [77]. In a daily diary study, perception of low-affiliative behaviors in a communication partner were linked to submissive behaviors more strongly in individuals diagnosed with SAD than in non-clinical controls [79]. Combined, these data suggest that SA is associated with a tendency to interpret exclusion as a threat to both affiliation and social standing, and to forgo strategies geared to bolster them. Figure

graphically depicts the proposed differences in the reactions of high- and low-SA individuals to two common social challenges of defeat and exclusion.

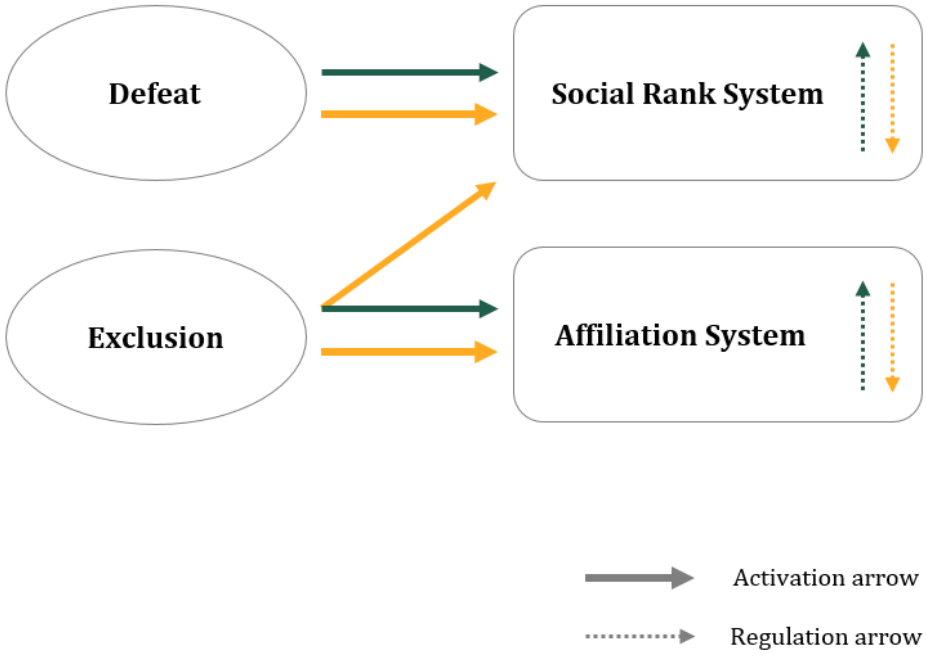

Figure. A Dual-System Model of SAD

Clinical Profile of SAD from the Perspective of the Dual-System Model

Given its early onset, SAD has been called an "adolescent disorder" [43]. Adolescence is a period of neural plasticity, of enhanced emphasis on formation of social bonds and establishment of social status [22]. Accordingly, adolescents are especially vulnerable to both exclusion and defeat, and exhibit enhanced reactivity on affective, neural, and hormonal measures [40; 50; 84; 92]. The increased onset of SAD during adolescence may be attributable to the heightened functioning of both the affiliation and social-rank biobehavioral systems during this period. Indeed, prevention and intervention efforts may be especially targeted to this sensitive period.

Gender affects the severity, expression, developmental trajectory, and interpersonal costs incurred by individuals with SAD [21]. Increase in the onset of SAD during adolescence is particularly pronounced for girls, with early sexual maturation presenting a particular risk factor for this gender [15]. Men are more likely to incur the interpersonal cost of social defeat leading to less frequent opportunities to establish intimate bonds whereas women enlist social bonds to form exclusionary alliances [13]. Specifically, men with SAD appear to entail greater costs to intimate relationship than do women, possibly due to their enhanced submissive strategies in response to social setbacks [113]. Consistent with our dual-system account, these findings paint a gender-specific pattern of vulnerabilities for affiliation and social-rank threats in SAD.

The high comorbidity between SAD and MDD is not surprising given the sensitivity to exclusion and defeat common to both conditions. Indeed, enhanced sensitivity to social rejection is at the core of several models of depression [68; 88]. Moreover, maladaptive

tendency to withdraw in response to social rejection by strangers is also common to both conditions [52; 55]. Some patterns of reaction to exclusion, however, appear to be disorder-specific: depressed individuals seek closeness and reassurance from their significant others whereas high-SA individuals appear to ward off closeness by decreasing self-disclosure [106].

SAD is also highly comorbid with substance abuse disorders, especially alcohol [16]. High-SA individuals appear to use alcohol to self-medicate, allegedly seeking to ease the anxiety in anticipation of, and during, social interactions. Recent research linked social exclusion to drinking [11; 71], and to disinhibited behavior following drinking [90]. In summary, SAD individuals' alcohol consumption may be used not only to attenuate the cognitive and motivational aspects of anticipatory anxiety, but also the pain of social setbacks.

State-of-the-Art Treatments and Promising Treatment Targets

CBT is the most well-research treatment for SAD. A typical course of therapy begins with psychoeducation regarding the condition, and includes a rationale for the proposed intervention. Next, the majority of sessions are devoted to a combination of exposure ("behavioral experiments") and cognitive restructuring. At the onset of this sequence of sessions, a personalized plan of exposures is constructed collaboratively by the client and the therapist. The importance of reduction of self-focused attention and decrease in safety-seeking behaviors is emphasized. Exposure in SAD constitutes a deliberate and systematic series of actions geared to approach socially threatening situations such as social gathering or job interviews. Exposure experiences have a clear set of goals in which the person's expectations are put to test. At the end of exposure "data" collected during the experience are processed, and anxiety-related and negative self-relevant beliefs are challenged. Typically, the emphasis in exposure is to increase the patient's presence and assertiveness in social interactions. CBT thus focuses on counteracting the down-regulation of the social-rank system. Treatment is typically terminated once the pre-determined sequence of exposures has been completed, and concludes with an assessment of the progress made.

Although CBT has shown consistent effectiveness in alleviating SAD severity, many patients still fail to respond or exhibit only partial recovery. Such failures may be due, at least in part, to a rather partial view of vulnerability in SAD, highlighting deficits associated with the functioning of the social-rank system, and focusing almost exclusively on cognitive and expressive components. According to the presented conceptualization, simultaneously targeting *multiple* components of response to social challenges is key to enhancing the efficacy of SAD treatments.

Some novel interventions propose to specifically target cognitive, endocrine, and neural components of reactions to social threats and setbacks. Cognitive bias modification programs (CBMs) seek to train individuals to attend affiliative stimuli to or interpret ambiguous social events in a benign manner. For example, interpretation training reduced SA-severity possibly by training individuals to re-appraise exclusion events, and attentional procedure were used to implicitly train individuals to re-focus on affiliative stimuli [58; 96]. Attentional CBT were found to attenuate anxious response to subsequent stressor, as well as to enhance positive affect [82].

Embodiment-based interventions target the expressive component by modifying facial and bodily expressions related to the production of affiliative and dominant non-verbal signals [38]. In non-clinical populations such interventions lead to congruent changes in affect and cognitive processing. For example, adopting powerful postures and lowering one's pitch reduced interpersonal fearfulness [53; 91].

Based on the compromised endocrine response to exclusion, translational pharmacological methods have begun to enhance existing therapeutic procedures via administration of pro-affiliatory hormones such as oxytocin [29]. In addition, based on the findings of reduced testosterone levels in SAD [39] and the fact that testosterone administration can shift social avoidance to social approach [98], suggestions are raised for the inclusion of testosterone administration as an enhancer to boost the effects of exposure therapy in SAD [28].

Excitatory brain stimulation to enhance control over automatic social avoidance has been proposed [101]. Indeed, an anodal transcranial direct stimulation over an area which is postulated to be responsible for the regulation of social pain (rVLPFC) reduced distress following exclusion [74]. The same procedure was also found to reduce the relationship between social exclusion and aggression [75]. Such stimulation techniques may prove helpful in a range of clinical conditions involving hypersensitivity to exclusion.

The need for personalized interventions has been emphasized by authors reviewing state-of-the-art treatments for SAD [49]. Patient-specific conceptualization of regulatory repertoire in the face of social threats may prove valuable to clinicians in designing focused, individually-tailored intervention. The understanding of the range and diversity of this repertoire may indicate foci where treatment effectiveness can be enhanced [66].

Future Directions

The present model provides but a first step in the creation of a comprehensive account of SAD in which system-level disturbances are linked to specific processes. Several directions for future research are apparent. First, data regarding individual differences in response to exclusion and defeat are only beginning to accumulate. Second, the causal status of responses to exclusion and defeat in the etiology and maintenance of SAD is yet unclear (see, however, [60]). Third, a more extensive effort needs to be dedicated to understand the impact of favorable social events (e.g., inclusion, social ascent) on SAD [36]. Finally, more research is needed to examine the *flexibility* of responses to exclusion and defeat, namely, the ability to select an appropriate, context-specific, regulatory response strategy. Clearly, such flexibility is likely to determine adaptive functioning [85].

Concluding Remarks

We argued that individuals with SAD are characterized by a heightened sensitivity to social challenges, by a propensity to respond to these challenges by down-regulating the triggering system, and by an enhanced coupling between the affiliative and the social-rank systems. Exploring the mechanisms used to maintain a stable, yet flexible balance between the need to belong and the need to matter can help understand and treat SAD.

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Двухсистемная модель социального тревожного расстройства: взаимодействие факторов биосоциальных систем социального положения и чувства принадлежности

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Социальное тревожное расстройство (Social Anxiety Disorder, СТР) – широко распространенное состояние, нарушающее функционирование индивида. Хотя существуют разные методы терапии СТР, их эффективность ограничена. Данный аналитический обзор направлен на углубление всестороннего понимания типов социальных угроз, влияющих на людей с социальным тревожным расстройством, с точки зрения двух основных биоповеденческих систем – принадлежности и социального положения. Авторы утверждают, что социальное тревожное расстройство связано с восприимчивостью к событиям, свидетельствующим о потере принадлежности (отчуждение) и социального положения (социальное поражение). В частности, предполагается, что социальное тревожное расстройство характеризуется: (а) гиперреактивностью к отчуждению и социальному поражению; (б) склонностью реагировать на отчуждение путем развертывания стратегий дистанцирования и ухода; (в) использованием стратегий подчинения, снижающих конфронтацию в ситуациях социального поражения и (г) усилением связи двух систем. Приведенная выше двухсистемная модель может помочь объединить клинически значимую информацию о социальном тревожном расстройстве может стать основой для рекомендаций относительно новых направлений терапии.

Ключевые слова: доминирование, принадлежность, социальная тревожность, отчуждение, поражение, депрессия, социальный стресс.

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Developmental Language Disorder: Considerations for Implementing School-Based Screenings

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Developmental Language Disorder (DLD) is a condition that impacts children's ability to understand and/or use language. DLD is highly prevalent in the school-age population, but it remains misunderstood and underdiagnosed. Along with raising public awareness, there is a need for improved educational practices for identifying children with DLD. Universal language screening in the early grades is a promising solution for improving under-identification of DLD but it requires systematic approaches that consider the heterogeneity of school contexts and their unique challenges. In this paper, we introduce DLD and discuss how frameworks commonly used in implementation science can help with the adoption and maintenance of early language screening.

Keywords: Developmental Language Disorder, screening, implementation science.

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Introduction

Before learning to read and write, children must first develop the necessary language skills which lay the foundation for those later abilities. Language is the ability to understand and communicate thoughts and ideas in spoken, written, and/or signed form.

For most children, the process of language acquisition is easy, effortless, and rapid. For example, a child moves from babbling to single words, then to two-word phrases, and then to full sentences in the timespan of approximately three years. However, language acquisition for some children is not as easy, effortless, or rapid. These children may present with Developmental Language Disorder (DLD)[1].

DLD is characterized by difficulties in understanding and/or producing spoken language in the absence of other medical conditions, such as hearing loss, traumatic brain injury, or cognitive impairment [36]. DLD is a common condition affecting approximately 7.5% of the school-age population, or about 1 in 15 children [48; 64]. DLD is a life-long condition that persists into late adolescence and adulthood. It often co-occurs with other developmental disorders, such as speech sound disorder (SSD), dyslexia, attention deficit hyperactivity disorder (ADHD), and autism spectrum disorder (ASD) [2; 15; 54–56; 59]. DLD is not associated with one single cause but rather with the interactions of multiple genetic, biological, and environmental risk factors. Some of those factors associated with DLD are family history of language delays, gender (i.e., more common in boys than in girls), prenatal environment, parental education, and socioeconomic status [36].

DLD can have a significant impact on children's educational progress and socio-emotional development. Due to the heavy language demands of academic content areas, children with DLD are six times more likely to have reading disabilities and four times more likely to have math disabilities than children without language disorders [6; 19; 63]. They also struggle with navigating peer relationships and making and maintaining friendships [62]. Research shows that children with DLD are often at a higher risk to experience emotional difficulties, such as decreased self-regulation, symptoms of depression and/or anxiety, low self-esteem, and low self-confidence [16; 17; 25].

Despite being one of the most common developmental conditions, most people do not know about DLD. The lack of awareness means that often children with DLD are left unidentified and they are at higher levels of risk for poor educational and life outcomes. Recent efforts to raise awareness of DLD have brought attention to the need for systematic approaches to school-based identification and prevention of learning difficulties [3]. New research supports the use of universal language screening in the early grades to identify children at risk of DLD [5; 31]. However, the success of implementing and sustaining early screening depends on the capacity and readiness of schools to support such process [30]. In the current article, we discuss the utility of implementation science frameworks to examine contextual factors that can influence implementation and to develop an effective plan for school-based adoption and maintenance of universal screening for DLD. We must clarify that universal screening alone does not solve the problem of under-identification of DLD. Additional steps, such as targeted interventions, continuous progress monitoring, and further assessments are necessary to support children at risk of DLD and to prevent school failure. However, we will only focus on universal screening because we think that it is an

[1] DLD is a new term recommended by the CATALISE group to refer to children who were previously labeled as having Specific Language Impairment (SLI) [12; 13; 36]. McGregor et al. provide a thorough discussion on the similarities and differences of the terms DLD and SLI, including diagnostic implications, consideration of co-occurring conditions, and nonverbal IQ criteria [41]. While many of the research studies referenced in this paper were based on the term SLI, we will use the term DLD in line with recent efforts to raise awareness about this condition and to improve clinical and educational practices.

important first step toward the early identification of children at risk of DLD and the appropriate use of school resources for their remediation. In the remainder of this article, we will: (1) describe oral and written language difficulties in DLD that affect learning and educational progress, (2) discuss under-identification of DLD and recent efforts to address it, with a focus on early language screenings, and (3) discuss how frameworks from implementation science can guide uptake of evidence-based screening practices in elementary schools.

The Impact of DLD on Learning

DLD is a heterogeneous disorder and children demonstrate difficulties with various aspects of spoken language. Difficulties with morphology and syntax are very common and they include omission of markers for tense and agreement (e.g., regular past tense inflection -ed and third person singular inflection -s), omission of articles (i.e., a, an, the), omission of the auxiliary and copula forms of be (e.g., am, is, are), difficulty understanding passive sentences (e.g., the boy was pushed by the girl), difficulty understanding pronominal sentences (e.g., "Mowgli says Baloo Bear is tickling himself"), difficulty using adverbial and relative clauses, and difficulty with wh-question formation [8; 9; 36; 44; 61]. Overall, children with DLD use fewer complex sentences in conversation and expository discourse compared to their age-matched peers [38; 47].

Along with deficits in morphology and syntax, children with DLD often demonstrate deficits in vocabulary and phonological acquisition. Compared to age-matched peers, children with DLD have smaller vocabularies, have difficulty naming objects, and instead use words that lack specificity (e.g., thing, stuff), and require more exposures to learn new words [29; 42; 56; 57]. Problems with phonological acquisition include slower acquisition of consonants and complex syllable structures and use of simplification processes (e.g., cluster reduction or omission of unstressed syllable) for a longer time than their age-matched peers [5; 49].

Deficits in written language are also common in children with DLD. In order to be a successful reader, one must be able to accurately decode letter strings into pronounceable words and derive meaning from spoken language. This is the premise behind the Simple View of Reading, defining reading comprehension as the product of word decoding and language comprehension [28; 34]. Word decoding depends on children's ability to appreciate and manipulate sounds in spoken syllables and words (i.e., phonological awareness) and to connect sounds with letters [11; 26]. Language comprehension depends on foundational language skills, such as vocabulary and grammar, higher level language skills, such as inferencing, comprehension monitoring, and text structure knowledge, and background knowledge [32; 33]. According to the Simple View of Reading, poor reading comprehension results from deficits in either or both domains. Thus, it is not surprising that many children with DLD are at risk for reading comprehension problems [14; 46]. Additionally, it is estimated that about 50% of children with DLD have co-occurring word decoding problems or dyslexia [39].

Studies of the spelling outcomes of children with DLD indicate that they generally struggle with spelling more than their age-matched peers; however, the presence of a concomitant reading disability (i.e., dyslexia) increases the severity of their spelling deficits

[35; 40]. In terms of writing, children with DLD tend to produce shorter stories that contain fewer complex sentences, less diverse vocabulary, and many grammatical errors [10; 22; 37; 58].

Removing Barriers to the Under-Identification of DLD

In general, people have limited understanding of language, how language develops, and what language disorders look like. DLD is often referred to as the "common but hidden" condition because often parents and teachers do not understand early signs of language difficulties and they might misinterpret them as shyness, laziness, or disinterest. Thus, many children with DLD are left unidentified and without appropriate intervention. An epidemiological study on the prevalence of DLD in kindergarten children found that the number of unidentified children can go up to 70% [64]. Interestingly, the presence of co-occurring conditions in children with DLD (e.g., ADHD, speech articulation problems) can function as a protective factor as it increases the likelihood for earlier identification and intervention relative to cases with DLD only. For example, the presence of ADHD in children with DLD appears to be a strong predictor of earlier referral and service provision, because unlike the "hidden" symptoms of DLD, behavioral difficulties associated with ADHD are fairly noticeable by practitioners [55; 69].

The good news is that over the last few years, we have witnessed increasing efforts to raise awareness of DLD [12; 13]. Awareness campaigns have brought together multidisciplinary teams to (1) help the general public understand the what, why, and how of DLD, (2) disseminate evidence-based resources for parents, educators, and researchers, (3) influence legislative efforts at the state and national levels and (4) establish accountability for communication rights and service provision. Formal organizations, such as DLDandMe (dldandme.org), Raising Awareness of Developmental Language Disorder (RADLD; radld.org), and National Association of Professionals concerned with Language Impairment in Children (NAPLIC; naplic.org), are at the forefront of such efforts.

Along with raising awareness, it is important to improve school-based practices for identifying and supporting children with DLD. In the US, DLD is diagnosed by a speech-language pathologist (SLP) after a parent, a teacher, or other professional (e.g., pediatrician) raises concerns about a child's language development. However, this approach might fail to address the under-identification problem, for two reasons. First, children with DLD might go unnoticed for a long time before someone raises concerns about their language, resulting in missed opportunities for early remediation. Second, only children with severe DLD are likely to be noticed by parents or teachers and referred for assessment, leaving out a large proportion of children with moderate language delays who may not qualify for special education services but who still show poor academic achievement [14; 52].

Recent publications have argued that universal screening of oral language in the early grades (as early as preschool and kindergarten) is a promising solution for improving under-identification of DLD [3; 4; 31]. As with any other type of health screening (e.g., diabetes, hypertension, breast cancer), language screening can identify risk of DLD or in other words, the likelihood that a child will have DLD. Screening measures are usually brief and focus on early risk factors associated with a condition. For example, some

commercially available language screeners focus on children's ability to understand and use grammatical structures (e.g., past tense), to repeat sentences, and to follow multi-step directions (for a review of available screeners and specifications, see the open-source document created by Bao and Hogan, [7]). Preventative interventions and progress monitoring are necessary next steps to mitigate early learning difficulties and reduce the number of children who are referred for special education services [24]. Such systematic approaches might especially benefit children with moderate language delays who are often missed in the traditional referral process.

The concept of universal screening is not new to schools in the US. Elementary schools commonly use universal screening within a multi-tier approach, such as Response to Intervention (RtI), to identify students with reading and math difficulties [27; 65]. RtI allows schools to identify students at risk of poor learning outcomes early and to provide different levels of instructional interventions, based on their needs. In addition, most states in the US have recently passed laws mandating early screening to identify children with dyslexia [67; 68]. Similar models can be created to assess for oral language difficulties and improve under-identification of DLD. To this end, frameworks commonly used in implementation science can guide school teams in developing a deliberate process for the successful adoption and maintenance of language screening in the early grades.

Implementing Universal Screening for DLD

In recent years, there has been growing interest in using implementation science to understand and improve the conditions affecting delivery of evidence-based programs in education [18; 30]. Implementation science is defined as "the scientific study of methods to promote the systematic uptake of research findings and other evidence-based practices into routine practice" [21, p. 1]. Implementation science differs from traditional research as it focuses on the process of implementation and contextual characteristics that influence the likelihood of an innovation to be adopted and maintained in everyday practice. It is not enough for an innovation to have robust empirical evidence to be successfully implemented in a particular context. The context itself must be ready to accept the innovation. This latter prerequisite is often overlooked in traditional research, which explains in part why there is a considerable gap between what we know works and what actually works. The same problem applies to universal language screening for DLD. Having appropriate language measures to identify children at risk of DLD is only one part of the equation. We must also ensure that schools have the necessary infrastructure to systematically administer language screenings.

There are numerous frameworks in implementation science and, in general, they delineate the process by which we can examine contextual barriers and facilitators and apply relevant strategies to improve implementation of an innovation [45; 66]. The process of implementation usually begins with the exploration phase, during which teams explore the makeup of the context, understand strengths and weaknesses and interactions across system levels (i.e., inner context, outer context), determine specific needs, and find evidence-based resources to match those needs [1; 20; 23; 43; 53]. Before implementing language screenings, the exploration phase allows us to address important questions, such as student demographics (e.g., number of English Language Learners), resources (e.g., personnel, materials, data management systems), and capacity to conduct school- or

district-wide screenings. This initial information can guide the selection of appropriate language measures. For example, for a district with a large population of English Language Learners, language assessments that can distinguish language disorder from language difference should be preferred [50; 51]. Additional factors to consider during exploration are quality of existing service delivery for students with DLD, staff characteristics (e.g., knowledge, skills, attitudes, buy-in), interprofessional collaboration, readiness for change, and administrative/leadership support. Finally, we must understand how elements of the outer context, such as advocacy groups (e.g., DLDandMe), policies (e.g., Individuals with Disabilities Education Act or IDEA), funding, and networks with local and national organizations (e.g., American Speech-Language-Hearing Association or ASHA) influence the way schools operate. For example, funding opportunities and educational policies must align to support schools in their efforts to serve children with DLD, which brings us back to the importance of advocating and educating the general public about DLD [3]. The exploration phase allows implementation teams to become intimately familiar with school contexts and create individualized implementation plans that match to their language screening needs.

In the next phase, teams use various strategies to prepare for implementation, such as acquiring necessary resources (e.g., language screeners), building capacity, training personnel, developing and implementing tools for data management and quality monitoring, and setting up meetings with stakeholders (e.g., school administrators, teachers, clinicians, parents) to discuss implementation plans [23; 53]. Training and coaching personnel (e.g., teachers, SLPs) is an important part of the preparation phase [60] and should concentrate on theoretical foundations of language development, DLD, and administration and interpretation of language screenings. Moreover, training should increase competence in data management to facilitate collection and processing of screening data. Finally, the preparation phase should involve the development of systematic processes to evaluate implementation of language screening and to identify unanticipated barriers and solutions. For example, the administration of a particular language screener might take longer than expected so implementation teams must examine whether this is due to training gaps or it is truly an issue with time allocation. Rapid problem-solving cycles are necessary to prevent delays in the implementation process and re-emergence of the same problems [23; 43].

In the final phase, all systems and processes are expected to be in place to support implementation efforts. During implementation, school personnel should consider the fidelity of administration of the chosen DLD screener and the overall effectiveness of the process [20; 23]. In addition, new barriers must be accounted for to inform the nature and extent of necessary adjustments in the preparation phase [20; 23]. Some examples of barriers are longer administration times than expected, misunderstandings among staff about certain administration rules (e.g., some teachers provide more prompts than what is allowed), scoring errors, difficulties with class management during the screening of individual students, absent students, and unresponsive students. Finally, school personnel should be given opportunities to share their feedback and perceptions of the implementation process [23]. In general, the more information schools have about what went well and what did no go well during the implementation of early language screening, the better they can use it to make improvements. The implementation of universal screening for DLD is a complex process and its success depends on appropriate and

context-specific adjustments, continuous evaluation and improvement, and clear communication between stakeholders.

Conclusion

DLD is a common but unknown condition affecting children's educational and life opportunities. Universal language screenings can improve identification of DLD in the early grades, but we must carefully consider contextual factors that are likely to influence the implementation process. We discussed the utility of implementation science frameworks in evaluating school contexts and facilitating the uptake of universal screening for DLD. More work is needed to extend the application of such frameworks in schools to identify children with DLD and help them access learning in the classroom.

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Расстройство развития речи: рекомендации по применению школьных скринингов

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Расстройство развития речи (Developmental Learning Disorder) – это состояние, которое влияет на способность детей понимать и/или использовать речь. Расстройство развития речи широко распространено среди детей школьного возраста, однако оно все еще не имеет единых диагностических критериев и часто диагностируется неверно. Наряду с повышением осведомленности общества существует потребность в совершенствовании образовательных и диагностических практик для выявления детей с расстройствами развития речи. Перспективным решением для своевременного выявления расстройств развития речи у детей, обучающихся в младших классах, является Универсальный речевой скрининг. Скрининг требует систематизированного проведения и учета неоднородности школьной среды, уникальности возникающих в этой среде задач и проблем. В данной статье приведено описание расстройств развития речи, а также

обсуждаются практики проведения раннего речевого скрининга и его потенциал в сфере адаптации детей с расстройствами речи.

Ключевые слова: расстройства развития речи, скрининг, прикладная наука.

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Influence of Category Label and Metaphor on Judgments About Mental Disorder Characteristics

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Category labels affect people's judgments regarding mental disorders which are unknown to them. Descriptions of these 'unknown' disorders that do have a name, are assumed by people to be more stable and having reasons to exist, when compared with the same descriptions of disorders - without a specific name [3]. However, it is not clear whether this effect can be evoked by other linguistic parameters, for instance, by metaphors. We hypothesized that including a metaphor in the description of a mental disorder would lead to the same effect even without a category name. We replicated a study by Giffin and colleagues' and added a new experimental condition in which participants read texts with the descriptions of a person's unusual behaviour without the disorder's name, but with its metaphoric description. After reading the texts, participants assessed a few statements concerning some characteristics of the disorder. The results showed that the effect of a category label was replicated, and the metaphoric description also evoked a significant effect, but it was found in judgments of different characteristics of the disorder.

Keywords: metaphor, category, assessment of mental disorders, explanation, category label.

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Introduction

When people need to evaluate a phenomenon and make a judgment on it, they rely on the additional information available to them at the time they evaluate the phenomenon. Research shows that people find explanations of psychological phenomena more meaningful and plausible if they are based on additional scientific information, even if that information is irrelevant to the explanation [13], and they tend to evaluate judgments as more true if they contain scientific terminology, even though to them, it does not make any sense [10]. These findings suggest that people have cognitive biases formed by various factors, particularly, the use of special names.

Indeed, the presence or absence of a special name affects how people judge phenomena and influence which features are perceived first [7]. For example, in a study of Giffin et al. [3], participants were shown descriptions of culturally specific mental disorders. The authors constructed four vignettes, each describing a person with unusual behaviour. The participants read one of the four texts and then evaluated several statements about the behaviour described in the text. One group read the texts in which the unusual behaviour was described with a fictional category label ("depathapy"), while another group read the same texts, but without a label. Participants who read the texts with the label, were less likely to blame the person with the disorder for their unusual behaviour, and were more likely to believe that both they and others would behave the same way if they had this disorder, and were more likely to believe that the disorder has biological rather than psychological causes.

Giffin et al. showed that an additional label for the phenomenon changes its evaluation [3]. However, they did not describe whether this effect can be caused by alternative linguistic means. The purpose of the current paper is to clarify the linguistic parameters of this effect. It is known that the general designation for a group of phenomena can be presented to a person in the form of special categorical names (for example, "modular psyche"), or with the help of metaphors (for example, psyche as "Swiss knife"). A metaphor, as a figurative comparison, is often used in the explanation of phenomena, especially if these phenomena are complex, not obvious, and helps to explain a new concept through already formed knowledge [5; 9; 11]. Some studies show that metaphors can also influence judgments about different diseases. Specifically, the metaphor of travel increases the willingness to accept the difficulties of treatment, which is not the case with the metaphor of battle [4]. Another study shows that a description of a state using a body metaphor (e.g., likening the heart to the capital and arteries to roads), influences people's judgments about a virus spreading in a country [6]. This metaphor strengthens the tendency for subjects to agree that a virus is dangerous for their health,

that special hygiene procedures must be carried out to prevent and control the virus, and that special policy measures must be taken to fight the virus.

Some studies have noted the importance of metaphorical information in communication concerning mental disorders. For example, it has been argued that metaphors can promote understanding between psychiatrists and patients when discussing the effects of drugs [1]. According to other studies, metaphors help some patients describe their psychotic experiences in a more comprehensible way, while at the same time they can be used as a tool for psychotherapy [8].

In order to compare the impact of a categorical label on judgments about psychological disorders with an effect that can potentially be triggered by a metaphor, we replicated the Giffin et al. experiment adding an additional experimental condition that did not have a name for the disease, but did have a metaphor [3]. We hypothesized that, as in Giffin's study, the category label would lead participants to judge the labeled phenomenon (in our case – about behaviour) as more stable and generalizable, in comparison with an unlabeled phenomenon. We also proposed that a metaphor would affect people's judgment in a similar way toward a category label.

Method

Participants. Two-hundred-and-twenty-four young adults (54% – female, mean age – 20.1 years, *SD* = 4.65 years) participated in the study. All participants were university students who were not studying psychology, were older than 17, lived in Russia, and were Russian native speakers. They received extra credit for an introductory course in psychology for their participation in the study.

Materials and procedure. Four texts (4-6 sentences each) with descriptions of unusual human behaviour were created, in Russian, adapted from the study by Giffin et al. [3]. The text followed two conditions: first, these categories should not be familiar to the participants; second, they should look and sound like other similar related terms and be constructed using natural language. For these reasons, the authors elaborated behavioural categories based on the symptoms of culturally specific disorders.

The last sentence in each text explained the unusual behaviour of the character in the text and differed between conditions. In the *named* condition, the described behaviour was given a name, whereas in the *tendency* condition the behaviour was described as tendency and did not have any category label. All four behavioural categories in the *named* condition were named in the texts using the artificial word, *depathapy.* We replaced the text characters' names with common Russian names, and translated the word *depathapy* literally as *денатафия*.

As a result, in the replication we used the word *денатафия (depathapy)* in the experimental condition (*category label* condition), whereas in the *control* condition we used the word *склонность (tendency) (e.g.,* It turns out that David has Depathapy, a tendency to imitate the actions of others and obey commands directed at them, leading him to take the painting // It turns out that David has a tendency to imitate the actions of others and obey commands directed at them, leading him to take the painting*).*

We added another experimental condition in which a category label was absent but a metaphorical description of the behaviour was included (*как по чьей-то команде; as if on someone's command; e.g.,* It turns out that David has a tendency, *as if on someone's command*, to imitate the actions of others and obey commands directed at them, leading him to take the painting). The reason for using this metaphor is based on the idea from Giffin's study, that the category label shifts responsibility for the action of the subject, to the phenomena, which is expressed by the category label [3].

One of the four texts with modifications for all conditions (*category label*, *metaphor* and *control*) is presented below as an example:

"David is a 40-year-old male. Recently, he took a beautiful and expensive painting from his office after one of his coworkers said, 'you should take that painting, you're the only one who ever looks at it.' David's coworker had not been serious.

[Category label] It turns out that David has Depathapy, a tendency to imitate the actions of others and obey commands directed at them, leading him to take the painting.

[Metaphor] It turns out that David has a tendency, as if on someone's command, to imitate the actions of others and obey commands directed at them, leading him to take the painting."

[Control] It turns out that David has a tendency to imitate the actions of others and obey commands directed at them, leading him to take the painting."

Each text was followed by 13 statements which participants assessed using a 7-point scale. These statements tested participants' attitude to different characteristics of the described phenomena (i.e. depathapy/tendency) to reveal whether it was perceived as a real disorder, or as a behaviour based on subjective causes. The authors of the original study did not find differences between conditions in all statements. They did not explain what caused such a result, which is why we used all the statements from the previous experiment, in the current one.

The experiment was held online using 1ka platform (www.1ka.si). Participants were randomly assigned to one of four texts. After reading one text, participants were presented with 13 statements divided into blocks, and were asked to assess them using the 7-point scale.

The first block included statements about the plausibility of the explanation of the character's behaviour presented in the texts, whether he or she should be blamed and is guilty for the action taken.

As an example, the statements related to a text are presented below. The statements were the same for each condition, but in the *category label* condition, the name of the behaviour was included in the statements, whereas in the *metaphor* and *control* conditions the word *tendency* was used instead of the name of the behaviour (Table 1).

The next block contains statements that tested whether the disorder name could implicate such characteristics of behaviour as stability in the past and future, and also its generalizability to other people and to the participant (Table 2).

Table 1

Statements about plausibility of a given explanation, blame and guilt of a character with unusual behaviour

1. Explanation	Suppose someone asks why Elena screamed at, and hit her boss. How satisfying do you find the following answer? 'Elena acted this way because she has [Depathapy,] a tendency [as if on someone's command], to tremble and act verbally and physically aggressive" Rated on a scale of 1 (not at all satisfying) to 7 (very satisfying).
2. Blame	How strongly would you agree or disagree that Elena deserves blame for hitting her boss? Rated on a scale of 1 (strongly disagree) to 7 (strongly agree).
3. Legal	'Suppose you are a juror in a court case trying Elena for her actions. The judge informs you that you should find Elena not guilty by reason of insanity if you believe that because of a mental disease or defect, she did not know or understand the nature and quality of her act or did not know or understand that her act was morally or legally wrong. How likely would you be to find Elena guilty? Rated on a scale of 1 (not at all likely) to 7 (very likely).

Table 2

Statements about stability of the behaviour in time and its generalizability to others or to the participant

4. Stability in past	Given Elena's [Depathapy/tendency], how likely do you think it is that she would have trembled and acted verbally and physically aggressive five years ago? Rated on a scale from 1 (not at all likely) to 7 (very likely).
5. Stability in future	Given Elena's [Depathapy/tendency], how likely do you think it is that she might tremble and act verbally and physically aggressive five years from now? Rated on a scale from 1 (not at all likely) to 7 (very likely).
6. Generalize to others	How likely is another person with [Depathapy/this tendency] to exhibit behaviour resulting from a tendency to tremble and act verbally and physically aggressive, similar to that exhibited by Elena (when in a similar position)? Rated on a scale from 1 (not at all likely) to 7 (very likely).
7. Generalize to self	How likely would you be, in Elena's position, to exhibit behaviour resulting from a tendency to tremble and act verbally and physically aggressive similar to that exhibited by Elena? Rated on a scale from 1 (not at all likely) to 7 (very likely).

The third block included statements about the probability of the described behaviour to have a biological or psychological nature. These statements were followed by short texts explaining what is meant by biological and psychological factors (Table 3).

Table 3

Statements about biological and psychological status of the behaviour

Elena's [Depathapy/tendency] could be caused by biological or psychological factors. Biological factors include any genetic or physiological factors that contribute to or cause the condition. Psychological factors include any behaviours, thoughts, emotions, or identity-related factors that contribute to or cause the condition.	
8. Biological nature	To what extent is Elena's [Depathapy/tendency] BIOLOGICAL in nature? Rated on a scale from 1 (not at all) to 7 (completely/entirely).
9. Psychological nature	To what extent is Elena's [Depathapy/tendency] PSYCHOLOGICAL in nature? Rated on a scale from 1 (not at all) to 7 (completely/entirely).

The next block included statements assessing the probability of effectively treating the unusual behaviour using medication or psychotherapy. The statements were prefaced by a short paragraph describing the meaning of medication and psychotherapy (Table 4).

Table 4

Effectiveness of medication and psychotherapy to treat and control the behaviour

Elena's [Depathapy/tendency] could be treated by either medication or psychotherapy. Medication refers to any psychiatric, psychoactive, or psychotropic drugs. Psychotherapy refers to treatment by psychological means, involving repeated verbal interactions between a clinician and a client.	
10. Medication	To what extent could Elena's [Depathapy/tendency] be improved, controlled, or managed by medication? Rated on a scale from 1 (not at all) to 7 (very effectively).
11. Psychotherapy	To what extent could Elena's [Depathapy/tendency] be improved, controlled, or managed by psychotherapy? Rated on a scale from 1 (not at all) to 7 (very effectively).

The last block of statements tested whether the presence of the disorder name leads to the tendency to think the described behaviour has a common cause or common symptoms (Table 5).

Experimental design. The experiment had a between-subject design to avoid mixing effects evoked by different conditions (i.e., by category label, metaphoric description or the absence of both). There were two experimental groups and one control group, independent

variables were category label and metaphor (or their absence), and dependent variables included – participants' assessments of each statement.

Table 5

Existence of common cause and symptoms for the behaviour

12. Common cause	How strongly do you agree or disagree with the idea that there is a common cause that is shared by all and only people with [Depathapy/this tendency] (whether or not we know what that cause is)? Rated on a scale of 1 (strongly disagree) to 7 (strongly agree).
13. Common symptoms	How strongly do you agree or disagree with the idea that there are common symptoms shared by all and only people with [Depathapy/this tendency] (whether or not we know what all these symptoms are)? Rated on a scale of 1 (strongly disagree) to 7 (strongly agree).

Results

A Kruskal–Wallis test showed the effect on judgments about explanation ($\chi^2(2) = 15.05$, $p < .001$), blame ($\chi^2(2) = 14.03$, $p < .001$), legality ($\chi^2(2) = 6.56$, $p = .038$), generalization to others ($\chi^2(2) = 15.32$, $p < .001$), generalization to self ($\chi^2(2) = 17.29$, $p < .001$), and medication ($\chi^2(2) = 19.12$, $p < .001$). It also showed a tendency towards a difference in judgments about stability in the future ($\chi^2(2) = 5.05$, $p = .08$). For other differences the p-value was more or equal to .132. We used non-parametric statistics because the assumption of data for normal distribution was violated (Shapiro–Wilk test for each variable had $p < .001$).

We compared mean responses for the answers in three conditions by pairs, using a post-hoc Dunn test with Holm adjustment. The label "depathapy" increased the objectivity of the category: compared with the *control* condition, the participants from the *category label* condition were less likely to blame the person for destructive actions ($p = .006$), and they assumed that other people ($p < .001$), and they themselves ($p < .001$) would behave the same way in similar circumstances. They also believed that this condition is manageable with medical therapy ($p = .004$; see Table 6). These results replicate the effect of a category label found in Giffin et al's study [3].

As we expected, the metaphor had a framing effect on the categories of mental disorders: it reduced the persuasiveness of the explanation by referring to a person's state ($p = .001$), and increased the belief that this condition will continue in the future ($p = .039$), and that it can be treated with medication ($p < .001$).

When we compared answers in the two experimental conditions, we also found significant differences. In the *category label* condition (in comparison with the *metaphor* condition), the participants blamed the person less for any destructive behaviour ($p < .001$) and believed that he or she was less guilty in terms of the law ($p = .016$); they also assumed that other people ($p = .006$) and they themselves ($p = .006$) would behave in the same way

if they had a similar disorder. Also, an explanation of a person's behaviour by his or her mental condition was less satisfying in the case of the *metaphor* condition (p = .001).

Table 6

Descriptive statistics of answers in different experimental (category label and metaphor) and control groups

Answers	**Category label** M (SD), n=85	**Metaphor** M (SD), n=85	**Control** M (SD), n=54
Explanation	*4.41 (2.00)*	***3.41 (1.84)******	4.54 (1.50)
Blame	***3.79 (1.85)*****	*4.79 (1.88)****	4.69 (1.66)
Legal	*3.48 (1.88)*	*4.18 (1.75)**	3.78 (1.61)
Stability in past	4.82 (1.48)	4.98 (1.64)	4.93 (1.40)
Stability in future	5.22 (1.29)	**5.38 (1.59)***	4.93 (1.39)
Generalize to others	***5.27 (1.39)******	*4.59 (1.58)**	4.19 (1.76)
Generalize to self	***4.18 (1.95)******	*3.32 (2.02)**	2.74 (1.81)
Biological nature	4.11 (1.45)	3.89 (1.83)	3.69 (1.59)
Psychological nature	5.09 (1.28)	5.40 (1.47)	5.13 (1.36)
Medication	**4.84 (1.41)****	**5.18 (1.57)*****	4.04 (1.49)
Psychotherapy	5.27 (1.33)	4.95 (1.53)	5.28 (1.27)
Common cause	4.21 (1.61)	4.38 (1.55)	3.83 (1.49)
Common symptoms	5.26 (1.34)	5.08 (1.47)	4.83 (1.27)

Notes. **Bold** marks the differences between the experimental (category label and metaphor) and control conditions. *Italics* marks the differences between the experimental conditions. Both ***bold and italics*** marks differences between both experimental and control conditions. * – $p < .05$, ** – $p < .01$, *** – $p < .001$.

Discussion

We investigated whether disorders that have a name are evaluated as more stable and having reasons to exist, compared with the same description of a condition, but without a specific name (replication of Giffin et al. study [3]). We also studied whether this

effect can be evoked by other linguistic parameters, such as metaphors. First, we showed that the label of a culture specific disorder can influence judgments about this disorder, which partly replicates the results of Giffin et al. [3]. Second, we showed that metaphors can trigger the same effect and have an influence on judgments about disorders previously unknown to the participants. Use of the metaphorical feature, 'as if on someone's command', influenced categorization scores by enhancing the idea of objectivity of culturally specific mental disorders. This confirms the main hypothesis: the metaphor caused an effect that is partially identical to the effect of a categorical name (in the question of medication). The influence of the label and the metaphor varied in semantic value and was manifested in the assessment of different characteristics of the disorder. Interestingly, a metaphor that "shifts" responsibility for pathological malicious behaviour to an "external" object (or subject) strengthened the belief that the person's behaviour will not change over time, and that it can be changed through external unilateral intervention (e.g., medication).

It was unexpected that the metaphor reduced the persuasiveness of explaining behaviour through an appeal to human propensity. On the one hand, it may be related to the semantics of the metaphor: if a person's behaviour is caused by "someone's command", it cannot be explained by the characteristics of this person. On the other hand, here we may face the limitations of the epistemological potential of unconventional metaphors, which, according to the theory of "metaphor career", functions as a low-level generalization based on comparison rather than categorization, and cannot completely replace the label in cognitive processes [2]. This reasoning provides direction for further research into the impact of metaphors on personal judgment.

We also need to mention several limitations of our study. First, we understand that we used artificial categories which could differ from natural categories. Second, we used information about culturally specific diseases, so the participant learned a new category during the experiment. But does language influence judgments about familiar mental disorders? And does the influence of the label and metaphor fade over time? Obviously, knowledge about how language affects the perception of mental disorders needs to be expanded in the future.

Note also that the results of this experiment show that there is a possibility of metaphorical framing when talking about categories of mental health conditions. The effects of using metaphors haven't been investigated previously in terms of how they affect people's judgment on those who have such conditions. For this reason, the findings of our study support the list of categories, for which it has been empirically proven, that metaphors may affect judgment about them [12].

From an applied perspective, it also means that metaphors used in communication about complex psychological conditions (e.g., disorders) not only highlight certain features, but may also have some influence on attitudes toward people with such conditions. Thus, in professions directly related to such communications (psychotherapists, psychiatrists or even journalists), it is necessary to be sensitive to the choice of means of language expression so that metaphors, while fulfilling their cognitive function (facilitating understanding), do not lead to stigmatization.

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SUPPLEMENTARY MATERIALS

Text with a description of unusual behaviour

1. Elena is a 40-year-old female. Recently, she screamed at and hit her boss when he approached her about a project she was working on. Her boss had to be taken to the hospital. Co-workers reported that after the incident, Elena was trembling. It turns out that Elena has Depathapy, a tendency to tremble and act verbally and physically aggressive, leading her to hit her boss // It turns out that Elena has a tendency to tremble and act verbally and physically aggressive, leading her to hit her boss// It turns out that Elena has a tendency, as if on someone's command, to tremble and act verbally and physically aggressive, leading her to hit her boss

2. Mark is a 40-year-old male. Recently, he broke into several of his neighbors' houses, taking various items – from napkin holders to vases. When the police found him, he seemed to believe each object was highly valuable. It turns out that Mark has Depathapy, a tendency to steal objects believing them to be of high value, even though they seldom are // It turns out that Mark has a tendency to steal objects believing them to be of high value, even though they seldom are // It turns out that Mark has a tendency, as if on someone's command, to steal objects believing them to be of high value, even though they seldom are.

3. Rimma is a 40-year-old female. Recently, she was seen in the street without a shirt or pants on. The police took her into custody. At the police station, she began breaking furniture and objects, and tried to run from the building. It turns out that Rimma has Depathapy, a tendency to remove clothing, break furniture, flee from shelter, and perform other irrational or dangerous acts // It turns out that Rimma has a tendency to remove clothing, break furniture, flee from shelter, and perform other irrational or dangerous acts // It turns out that Rimma has a tendency, as if on someone's command, to remove clothing, break furniture, flee from shelter, and perform other irrational or dangerous acts.

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Влияние категориального имени и метафоры на оценку характеристик психического расстройства

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Категориальные имена влияют на суждения людей относительно неизвестных психических расстройств. Так, если незнакомому культурно-специфическому психическому расстройству дается название, это расстройство оценивается как более стабильное, имеющее естественные причины для существования [3]. Однако неизвестно, может ли этот эффект быть вызван с помощью других лингвистических средств, например, метафор. Мы предположили, что добавление метафоры в описание психического расстройства вызовет подобный эффект даже без использования категориального названия. Мы реплицировали исследование К. Гиффин и коллег и добавили новое экспериментальное условие, в котором участники читали тексты с описанием необычного поведения человека, где отсутствовало название болезни, однако присутствовало ее метафорическое описание. После чтения участникам задавали вопросы об их оценке характеристик данного расстройства. Результаты показали, что эффект присутствия категориального названия реплицируется, при этом метафорическое описание вызывает схожий эффект, который, однако, выражен слабее и проявляется в оценке других свойств психического расстройства.

Ключевые слова: метафора, категория, восприятие психических расстройств, объяснение, название категории.

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The Impact of Personality on the Physical Activity and Alcohol Use Relationship

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Studies have shown positive associations between levels of physical activity and alcohol use at both between-persons and within-person levels. This relationship has been of interest to researchers developing physical activity-based treatments for alcohol use disorders, which have had mixed results, one reason perhaps being because they have not controlled for individual differences. The current study investigated whether differences in Five-Factor Model personality traits moderated the physical activity-alcohol use relationship in an undergraduate sample (N = 263). Results showed lifestyle physical activity, extraversion, and neuroticism were each predictive of alcohol use, but there were no interaction effects among these variables, indicating that personality traits do not impact the strength of this relationship. Therefore, individuals high in traits of extraversion or neuroticism are not specifically at risk for increased alcohol use when participating in physical activity. If exercise-based interventions for alcohol use disorders are implemented, individuals high in extraversion and neuroticism continue to possess independent risk factors for alcohol use.

Keywords: physical activity, alcohol, personality, Five-Factor Model, moderation.

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Introduction

Engaging in deliberate physical activity (PA) is generally considered a health-promoting behavior; whereas, using alcohol is considered a health-risk behavior and linked to negative consequences such as aggression, dating violence, and blackouts [2]. Despite this contrast, studies have shown a consistent positive association between PA and alcohol

intake on both cross-sectional (between-persons) [16] and longitudinal (within-person) levels [4; 11]. This pattern aligns closely with an established profile of moderate drinkers, who, in addition to consuming alcohol, highly value their physical health, as opposed to episodic drinkers, who consume only marginally more alcohol but are less health-oriented in values and behaviors [21].

These contrasting patterns of alcohol use and PA behaviors have been of interest to researchers developing treatments for alcohol use disorders (AUDs). To this end, treatments that have focused on increasing PA as a replacement for alcohol use have had mixed results. Although some studies (e.g., [5]) have shown increases in participants' PA during interventions, they usually have not shown decreases in participant alcohol use compared to controls. Conversely, treatment studies using PA as an adjunctive facet of a traditional AUD intervention have found more promising results [7]. The mixed results of these treatments and the differences between moderate and episodic drinkers suggest both types of interventions may be lacking in potency by not addressing individual differences. An intervention that works for one individual may be ineffective, or even iatrogenic, for another individual if the motivations, frequencies, or intensities that they participate in these behaviors differ. Thus, the question becomes: which individual differences impact PA and alcohol use?

Research has examined demographic, motivational, and social factor differences in PA and alcohol use and has found factors such as age and gender may be important moderators of this relationship [17]. One understudied factor that has been implicated as another possible moderator is personality. To date, one study has demonstrated the role of impulsivity as a moderator of the PA-alcohol use relationship [16], another has found conscientiousness predicted both PA and alcohol use but did not moderate the relationship [1], and a third has found no main or moderating effects of extraversion or impulsivity on this relationship [3]. However, no other relationships with personality have been studied, nor have these existing results been replicated.

Although research examining the role of personality traits in the PA-alcohol use relationship is scarce, many studies have examined the relationships of personality to PA and alcohol use separately. These studies commonly use the Five Factor Model (FFM) of personality, which conceptualizes normative personality using five traits: neuroticism, extraversion, openness to experience, agreeableness, and conscientiousness [19]. Each of these traits has its own unique relationship to patterns of alcohol use and PA, complicating the picture of the positive association between these two variables.

Higher levels of extraversion and neuroticism, and lower levels of conscientiousness have been linked directly to higher levels of alcohol use [12]. In contrast, although agreeableness and openness to experience have been shown not to have direct associations with alcohol use, research has suggested that these variables may have indirect effects on alcohol use. That is, agreeableness has a negative indirect relationship to alcohol use and openness to experience has a positive indirect effect on alcohol use [18]. Individuals high in extraversion are more likely to report exercising on a regular basis than their less-extraverted peers (e.g., [20]), and highly conscientious individuals also report exercising or participating in athletic activities with greater frequency than others [20]. On the other hand, individuals who exercise regularly are more likely to report low neuroticism

scores [23]. The roles of openness and agreeableness in relation to PA are less clear-cut; one meta-analysis found higher levels of openness were associated with more PA, with a small effect size [23], but no consistent associations have been found between agreeableness and PA [23].

Some of these trait patterns, such as extraversion (high alcohol /high PA), support the positive association between PA and alcohol use, while others, such as neuroticism (high alcohol/low PA) or conscientiousness (low alcohol/high PA), suggest these variables would be more likely to show a negative association. This raises the question of whether PA and alcohol use are positively associated at all levels across all personality types. If differences are found among these varied personality profiles, they may clarify some differences seen across studies using exercise as a component of treatment for AUDs.

The current study is a secondary analysis of data collected by Henderson and colleagues [13] examining daily (within-person) and usual (between-person) relations between PA and alcohol use. Abrantes and colleagues' extensive examination of factors contributing to the complex relationship between PA and alcohol use [1] suggested the need for further study of moderating factors on this relationship in our own dataset. Thus, the current study aimed to examine whether differences in personality trait profiles moderate the PA-alcohol use relationship.

Hypotheses included: (a) individuals who are more physically active on average will consume more alcohol, and (b) on days when people are more active than usual, they will consume more alcohol. FFM personality traits were examined as potential moderators of these daily and usual relations. Further hypotheses were: (c) extraversion and openness would be enhancing moderators, in which increasing levels of these moderators increase the salience of the PA-alcohol use relationship and (d) neuroticism and conscientiousness would be buffering moderators, in which increasing levels of these moderators decrease the salience of the relationship.

Methods

Participants

The sample for the current study comprised 263 undergraduate participants recruited from a mid-sized regional Southern University. Of the 263 total participants, the majority were female (60.8%) and averaged 21.68 years of age (*SD* = 5.34). Most participants identified as Caucasian (57.8%). Nineteen percent of participants identified as African American/Black, and 25% of participants identified as Hispanic. Table 1 contains a detailed list of demographic data.

Measures

Baseline survey. Participants were asked to provide details regarding their age, gender, race, and ethnicity, along with baseline levels of PA and alcohol use over the past 30 days. At baseline, participants were also asked to provide self-report data on personality characteristics using either the Ten-Item Personality Inventory [10] or the Big-Five Inventory [14]. Researchers began the study administering the BFI; however, the switch to the TIPI was made midway (along with making other adjustments to shorten the

assessment battery) to reduce participant burden. The convergent validity of the TIPI compared to the BFI is substantial, with a mean convergent correlation of r = .77. Participant scores on the TIPI and BFI were converted to z-scores for analyses.

The Ten-Item Personality Inventory (TIPI; [10]). The TIPI is a 10-item self-report scale of FFM personality traits. Each item consists of two descriptive words using the common stem "I see myself as:" and is rated on a 7-point scale, with 1 corresponding to "Disagree Strongly" and 7 corresponding to "Agree Strongly." Each personality trait is assessed by two items, one of which is reverse-coded. We scored the TIPI in the current study by summing subscale values, resulting in trait scores between 2 and 14. Internal consistency measures of the TIPI are low, due to the presence of only two items for each subscale. Specifically, Cronbach alphas were .68 (poor), .40 (poor), .50 (poor), .73 (fair), and .45 (poor) for the Extraversion, Agreeableness, Conscientiousness, Emotional Stability (Neuroticism), and Openness to Experience scales respectively.

The Big-Five Inventory (BFI; [14]). The BFI is a 44-item self-report scale of FFM personality traits. Each item consists of a short phrase using the common stem "I see myself as someone who…" and is rated on a 5-point scale, where 1 corresponds with "Disagree strongly" and 5 corresponds with "Agree strongly". The measure contains subscales representing each FFM trait, and we scored each subscale by summing item responses, resulting in subscale scores between 8 and 50. In U.S. and Canadian samples, the alpha reliabilities of the BFI scales typically range from .75 to .90 (fair to excellent) and average above .80 (good).

Physical Activity. The Actical PA monitor (Philips Respironics, Bend, OR) is a research-grade accelerometer designed to track energy expenditure and step count that is worn on the wrist. It can collect data in segments as short as one second and track 25 fitness-related statistics. For this study, raw PA counts were recorded in 60-second periods over the 14-day follow-up. Periods of time with no activity over the course of 60 minutes were counted as non-wear time. Activity count classifications were adopted from Giffuni and colleagues [8]: for the purposes of the current study, PA was divided into lifestyle activity (100–1 725 counts/min) and exercise (1 726–4 117+ counts/min) and was calculated as the total number of minutes within each intensity level for that day beginning at 6am and ending at 12am[1]. The Actical accelerometer has been validated in several studies for objective assessment of PA [6].

Alcohol Use. Alcohol use was measured using a self-report question in a daily survey sent to participants. Each day, participants responded to the following question: "Since yesterday, did you use alcohol?". Response options were dichotomous "Yes/No". This daily data collection method allowed researchers to avoid problems and inconsistencies with individuals' recall that may be associated with retrospective measures.

Procedures

Participants were recruited via the university's Department of Psychology online research participation site and compensated with research credits. Researchers met with

[1] Activity was not tracked between 12am and 6am to account for sleep.

participants for a baseline session in which students gave informed consent, were oriented to the goals and requirements of the study, and completed the baseline survey. Researchers then distributed individually calibrated Actical PA monitors. Participants were directed to wear the monitor on their wrist continuously for the 14-day period of the study, including when they were sleeping, and to remove the Actical monitor only when participating in water-related activities. Finally, participants provided an email address to receive daily surveys.

Alcohol use surveys were sent to participants daily for 14 days, with participants receiving instructions to complete each survey no later than 12pm the following day. Researchers sent text messages to participants' cell phones throughout the day as motivational reminders to complete surveys. Because the Actical monitor was initially activated at different times for each participant, researchers offset start times such that periods of PA monitoring began at midnight of day 1.

Data Analysis

The current study drew on the methods used in the parent study [13]. Although some moderators of the PA-alcohol use relationship, including personality, were considered in the parent study, these relationships were examined only in relation to moderate and vigorous PA (i.e., the "exercise" category of the current study), and did not include analyses in relation to lifestyle activity.

Multilevel logistic regression models with days nested within people were used to test hypotheses regarding within- (daily) and between-person (usual) associations between PA levels (lifestyle and exercise) and alcohol use. Although the missing at random (MAR) assumption cannot be directly evaluated, we examined the missingness mechanism through correlations between key study variables (demographic characteristics, PA levels, alcohol use, day of week) and a binary variable representing missing alcohol use data. As correlations were negligible ($r/\varphi < .10$), we treated incomplete data as MAR and used Full Information Maximum Likelihood estimation to reduce bias.

When PA distributions were examined in the parent study, they were found to be highly positively skewed, and a logarithmic transformation was applied to improve normality of the data. Transformed PA data were also used in the current study and included as predictors of daily alcohol use, along with personality data. After each predictor was tested, interactions between personality *z*-scores and PA levels were tested as predictors of daily alcohol use. Product interaction variables were formed by centering the main effects of the PA and personality predictor variables and multiplying the centered variables together.

Results

Participants did not provide daily alcohol use responses in 32% of the total number of days available, and 7 participants did not provide enough data to estimate within-person associations. Activity data were captured at a higher rate (92% of days). After removing cases with missing alcohol data or lack of daily variability, the final dataset consisted of 2 190 daily reports from 228 students. Descriptive statistics for these data are shown in

Table 1. Participants reported an average of 1.23 drinking days over the two-week period (*SD* = 1.71, range = 0-6). On average, they reported 392.58 minutes of lifestyle PA (*SD* = 145.44), and 29.11 minutes of exercise (*SD* = 23.30) per day.

Table 1

Demographics and descriptive statistics

	***N* (Total = 263)**	**Percentage**
Gender		
Male	103	39.2
Female	160	60.8
Ethnicity		
Caucasian	152	57.8
African American	50	19.0
Asian	3	1.1
American Indian or Alaskan Native	2	0.7
Native Hawaiian or Pacific Islander	1	0.3
Other	32	12.2
Declined to Report	23	8.7
Body Mass Index		
Underweight	12	4.6
Normal Weight	135	51.3
Overweight	66	25.1
Obese	50	19.0
	Mean	**Standard Deviation**
Age	21.68	5.34
Days of Alcohol Use	1.23	1.71
White, non-Hispanic	1.14	1.72
Black/African American	1.30	1.48
Hispanic	1.24	1.77
Male	1.41	1.97
Female	1.12	1.69

	Mean	Standard Deviation
Activity Counts		
Lifestyle	392.58	145.44
Exercise	29.11	23.30
Big Five Inventory		
Extraversion	26.92	6.39
Agreeableness	40.38	6.34
Conscientiousness	34.71	5.10
Neuroticism	21.61	6.35
Openness to Experience	36.12	5.72
Ten Item Personality Inventory		
Extraversion	8.13	2.46
Agreeableness	8.32	1.93
Conscientiousness	9.54	2.24
Neuroticism	9.27	2.19
Openness to Experience	8.31	2.49

Notes. Days of alcohol use are calculated as days of use over two weeks (14 days). Activity counts are measured in minutes per day.

First, we tested whether PA and day of the week variables predicted daily alcohol use using multilevel regression. These results are shown in Table 2. Analyses revealed the only significant predictors at the daily level were day of the week, in which the social weekend (Thursday-Sunday) was positively associated with a higher likelihood of drinking (*b*'s = .79–1.68, *p*'s < .01). This relationship was strongest on Saturdays. In contrast, neither lifestyle PA (*b* = -.25, *p* = .63) nor exercise (*b* = .69, *p* = .84) were significant predictors of alcohol use on a daily level.

Next, we added personality and PA levels as usual-level predictors (see Table 2). Analyses revealed lifestyle PA (*b* = 2.34, *p* = .05), extraversion (*b* = .44, *p* < .01) and neuroticism (*b* = .33, *p* = .04) significantly predicted usual alcohol use. Exercise and other personality variables were not significant predictors of alcohol use on a usual level.

Finally, after determining the presence of main effects for extraversion and neuroticism, four product interaction variables were formed by combining each of these personality variables with each of the two PA variables. The results of these interaction analyses are shown in Table 2. Analyses revealed that none of the product interaction variables significantly predicted alcohol use on a usual level.

Table 2

Alcohol use regression analyses

Predictors	*b*	SE	*z*	*p*
Daily Level				
Lifestyle Activity	-0.25	-0.52	-0.49	0.63
Exercise	0.69	3.40	0.20	0.84
Thursday	**0.79**	**0.27**	**2.97**	**< 0.01**
Friday	**1.21**	**0.24**	**5.03**	**< 0.01**
Saturday	**1.68**	**0.24**	**6.88**	**< 0.01**
Sunday	**1.15**	**0.26**	**4.51**	**< 0.01**
Usual Level				
Lifestyle Activity	2.34	1.18	1.99	0.05
Exercise	-6.11	6.50	-0.94	0.35
Extraversion	**0.44**	**0.15**	**2.91**	**< 0.01**
Agreeableness	0.09	0.16	0.56	0.58
Conscientiousness	0.07	0.15	0.46	0.65
Neuroticism	**0.33**	**0.16**	**2.03**	**0.04**
Openness to Experience	< 0.01	0.16	0.06	0.95
Interaction Effects				
Lifestyle Activity*Extraversion	-1.02	1.16	-0.88	0.38
Lifestyle Activity*Neuroticism	-0.71	1.12	-0.63	0.53
Exercise*Extraversion	-2.54	8.39	-0.30	0.76
Exercise*Neuroticism	8.78	7.26	1.21	0.23

Notes. Significant findings in bold. Personality trait ratings are *z*-scores based on the combination of both Big Five Inventory (BFI) and Ten Item Personality Inventory (TIPI) scores. Listed interactions represent a timed model of usual-level interactions after removing non-significant main effect variables.

Discussion

The current study investigated the moderating effects of FFM personality traits on the association between PA and alcohol use by identifying main effects among daily- and usual-level PA, alcohol use, and personality variables, then investigating interaction effects among these relationships. Our results showed between-persons positive associations

among light PA, extraversion, neuroticism, and alcohol use; they also showed within-persons associations among day of the week and alcohol use, indicating that participants were most likely to drink alcohol on the social weekend (Thursday–Sunday). No significant moderating effects were found for our personality variables.

Given the results of the parent study [13], which utilized the same dataset, the limited relationships between PA and alcohol use found in this sample were unsurprising. Although these analyses were consistent with the findings of the parent study, they suggest a more limited scope of the PA-alcohol use relationship in our sample than has been shown on both between-persons (e.g., [16]) and within-person [4] levels in previous studies. Despite differences from previous samples, our findings display consistency with a more recent failure to replicate the within-person daily association of this relationship within a college student sample [3], and a finding that only light PA is predictive of increased odds of alcohol use when PA is measured with an accelerometer [9]. Also consistent with previous literature (e.g., [12]) is a main effect showing a positive association between extraversion and alcohol use. However, despite literature showing a positive association between extraversion and PA (e.g., [8; 20]), no significant interaction effect emerged when extraversion was tested as a moderating variable. Similarly, our finding that neuroticism was positively associated with alcohol use was in concordance with previous literature [12]; however, no interaction effect emerged when it was tested as a moderator.

Taken together, these results suggest personality traits do not moderate the relationship between PA and alcohol use. Although extraversion and neuroticism predict alcohol use alone, they do not interact with PA levels to predict whether a person is more likely to drink. Therefore, individuals high in extraversion or neuroticism are not specifically at risk for increased alcohol use when participating in PA; however, if PA-based interventions for AUDs are implemented, highly extraverted or neurotic individuals continue to possess independent risk factors for alcohol use that are not necessarily addressed by these interventions. Instead, these personality risk factors may be related to alcohol use through factors such as their impact on general levels of positive and negative affect, which have been shown to interact with PA [13], or through their relationship to drinking motives.

Research on drinking motives has revealed differences in alcohol use among individuals who drink to cope with negative affect and those whose alcohol use is socially or mood enhancement motivated [22]. These differences suggest that those who experience more negative affect (i.e., higher neuroticism) and those who seek out social situations (e.g., higher extraversion) may be using alcohol for different reasons. These differences in motivations, which could be related to higher levels of these personality traits, may partially explain why previous PA-based intervention studies have shown mixed effectiveness. Problematic alcohol use among individuals who exhibit higher levels of these personality traits may need to be addressed by more personalized, motivation-based treatment strategies than have been implemented previously. For example, rather than applying a standardized treatment strategy that simply increases PA for all intervention participants, designers of future interventions could include adjunctive instruction in coping skills for negative affect for individuals high in neuroticism that is replaced by psychoeducation about alternative mood enhancement strategies for individuals high in extraversion.

Limitations and Future Directions

The current study had several limitations that deserve attention. First, our demographically homogenous (i.e., predominately white) undergraduate sample reported low levels of drinking and high counts of lifestyle PA. Therefore, our findings may not generalize to a wider population of individuals, particularly those who would seek treatment for an AUD or those from diverse racial and ethnic backgrounds. These sample limitations may also partially explain differences between the results of the current study and past studies that have found broader associations between PA and alcohol use in adult samples with a wider age range (e.g., [4]). Second, alcohol use was measured dichotomously in this study, which may have been partially responsible for the lack of associations between predictor and criterion variables. Because we did not differentiate participants who consumed wider ranges of alcohol, these differences could not be accounted for. In other words, a participant who consumed one alcoholic drink on a day could have been lumped in with another participant binge drinking on the same day. Future studies may benefit from using not only a dichotomous alcohol use variable, but also a measure of number of drinks consumed per day. This addition would allow for more accurate representations of alcohol use behaviors and would allow for analyses of differences among levels of alcohol use.

Finally, the FFM measures used in the current study had several disadvantages. Perhaps the most significant disadvantage in these measurements for the current study was that the personality measure was changed from the BFI to the TIPI in the middle of data collection. This change necessitated the use of personality *z*-scores in our analyses, which may not have accurately represented the data collected from either instrument. Ideally, the current study should be replicated in a wider sample, using one consistent measure of personality. Additionally, both personality instruments were self-report measures, and the Cronbach alpha values for the TIPI are considerably low by nature of its very brief design, utilizing only two items per factor. The use of self-report measures always introduces a challenge to the validity of a study's findings, particularly if individuals have reasons for engaging in impression management, possess a lack of insight, or are experiencing fatigue. Due to the length of our intake battery, there is the possibility that participants may have experienced this fatigue, especially if they filled out the longer, 44-item BFI as opposed to the 10-item TIPI. Nevertheless, these self-report measures of personality have been found to display acceptable validity levels and are widely used in personality research.

In addition to addressing the limitations of the current study, future research should also examine other potential moderators of the PA-alcohol use relationship through exploratory analyses to continue adding to the literature surrounding the effectiveness of exercise-based interventions for AUDs.

Conclusion

The current study highlights the importance of personality considerations in examining the effectiveness of PA-based interventions for AUDs. Although personality traits appear not to directly moderate the relationship between PA and alcohol use, several of these traits display independent associations with alcohol use, which could have

implications for the effectiveness of PA-based treatment methods in certain individuals. These findings add to the scant literature on the role of personality in the PA-alcohol use relationship, which has shown conscientiousness to be associated with PA and alcohol use but has not previously shown significant findings related to extraversion or neuroticism [1]. Although more research is certainly needed to examine other potential moderators of the PA-alcohol use relationship, the current study adds significantly to the understudied role of personality in this unique, important relationship.

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Влияние личностных черт на связь между физической активностью и употреблением алкоголя

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Современные исследования показывают положительную связь между физической активностью и употреблением алкоголя как на личностном, так и на межличностном уровнях. Эта связь представляет интерес для исследователей, разрабатывающих физические методы терапии расстройств, связанных с употреблением алкоголя. Применение данных методов имеет неоднозначные результаты. Одна из возможных причин такого положения дел связана с тем, что прежде в исследованиях не учитывались индивидуальные различия людей, употребляющих алкоголь. Задачей данного исследовании стало выяснение того, какой модерирующий эффект вносят личностные черты, входящие в состав Пятифакторной модели личности, в связь между физической активностью и употреблением алкоголя. В исследовании участвовали 263 студента. Результаты показали, что повседневная физическая активность, экстраверсия и нейротизм являются предикторами употребления алкоголя. Однако модерирующего эффекта между данными характеристиками выявлено не было, т.е. черты, входящие в Пятифакторную модель личности, не влияют на силу связи между физической активностью и употреблением алкоголя. Таким образом, люди с высокими показателями черт экстраверсии или нейротизма не имеют повышенный риск употребления алкоголя во время физической активности. При применении вмешательств на основе физических упражнений для терапии алкоголизма лица с высокими показателями компонентов экстраверсии или нейротизма продолжают испытывать влияние независимых факторов риска употребления алкоголя.

Ключевые слова: физические упражнения, алкоголь, личность, Пятифакторная модель личности, ослабление связи.

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Rumination Versus Distraction: Dyadic Implementation Eliminates the Response Manipulation Emotion Regulation Effect

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The Response Manipulation Task (RMT) is a popular laboratory protocol for inducing rumination and distraction. Across published studies of dysphoric participants who undergo negative mood inductions when no other people are present, only once has the RMT induction failed in its purpose. The present experiment tested the robustness of the RMT under dyadic conditions (N = 135 pairs of same sex friends). When administered in the presence of another person, the RMT showed no differential effects on subsequent negative mood or state rumination. The negative mood induction successfully induced negative mood; the effect of the manipulation did not depend on depressive symptoms; and the state rumination measure was reliable and valid. In light of this pattern of effects, nonsignificant findings on manipulation checks and substantive hypothesis tests are attributed to failure of the RMT to produce rumination and distraction under these specific study conditions. The Discussion explores constraints on the generalizability of the RMT effect due to the presence of others, including the influence of dyadic emotion regulation, interpersonal distress avoidance, and secure attachment relationships.

Keywords: experiment, emotion regulation, mood regulation, coping, rumination, distraction, social, interpersonal, dyadic, friends.

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Introduction

Stress generation theory holds that depression typical behavior produces stress, particularly interpersonal stress [7; 11]. The cognitive and affective mechanisms underlying this process are not well understood [11]. Rumination has been proposed as a candidate mechanism, possibly as a precursor to stress generating behaviors, such as excessive reassurance seeking and negative feedback seeking [8; 24]. Rumination has been identified as a mechanism behind stress generation in adolescents, with high levels of rumination associated with subsequent peer victimization [17]. We aimed to compare the interpersonal consequences of rumination to distraction, an emotion regulation strategy that reduces negative affect more effectively than rumination [23]. We used an established experimental manipulation, the response manipulation task [RMT; 13; 16], to induce rumination and distraction in friend dyads. We hypothesized that rumination would lead to interpersonal difficulties, as operationalized by lower friend-reported rapport, willingness to affiliate, and friend worth. Because the RMT has not previously been used with dyadic samples, we also explore the effectiveness of the RMT for inducing differential negative mood in a large dyadic sample.

The Response Manipulation Task

The RMT was designed to elicit different emotion regulation strategies by directing participants' thought processes toward either rumination or distraction. The RMT has been used frequently, particularly in tests of the response styles theory. Response styles theory suggests that rumination is a harmful cognitive affective process that promotes the development and maintenance not only of depressive symptoms but also of a host of other forms of psychopathology [23; 26].

Effects of the RMT

Initial studies of response manipulation established that participants in distraction conditions experience declines in depressed mood induced sadness, whereas participants in rumination conditions maintain a relatively stable level of sadness [19]. The robust effect of the RMT on sad or depressed mood supported later use of differential mood change (distraction vs. rumination) as a manipulation check. Indeed, in subsequent studies of sufficiently dysphoric samples, the RMT nearly always produced similar results [13; 14; 22; 25; 31].

Under what conditions has the RMT failed?

In only one previous study has the RMT failed to produce statistically significant differential mood change from pre to post task [10]. In this study there were 29 and 31 participants in the rumination and distraction conditions, respectively, and despite the small sample size the RMT effect was very nearly significant ($p < .06$), was in the expected direction, and a similar sized effect would have been statistically significant with even a slightly larger sample. Other studies have shown the RMT effect to hold only for participants experiencing high levels of dysphoria or depressed mood. Specifically, past studies have split their samples into "dysphoric" and "nondysphoric" or "depressed" and "nondepressed" groups on the basis of either structured diagnostic interviews or, more

often, self report depressive symptom measures. Across seven reports encompassing 16 separate samples, the RMT has successfully produced differential mood effects in every dysphoric sample and failed to produce differential mood effects in every nondysphoric sample [12–14; 16; 25; 30; 31]. In one additional study, the RMT produced similar effects across dysphoric and nondysphoric samples [20]. In no published study to date has the manipulation produced nonsignificant effects in a dysphoric sample.

The Present Study

The present study used the RMT twice as part of a within subjects experiment addressing the interpersonal consequences of emotion regulation. This study is similar to previous studies using the RMT, with the key difference that participants in this study were dyads – specifically, they were same sex pairs of friends. In addition to the standard manipulation check for differential effects on negative mood, this study also assessed state rumination following the RMT.

Methods

Participants

135 participants were recruited either from psychology courses at the University of Notre Dame or from the South Bend, Indiana community using flyers and other community announcements (e.g., email newsletters). Each participant brought a same sex friend to the experiment (N = 270). However, only one participant in each pair completed the RMT. Two participants were excluded for being under 18 years of age, and one additional participant was excluded for blatant rushing through questionnaires, resulting in a final sample of 267 individuals, 133 of whom completed the RMT. The majority of the sample was female (77%). Participants ranged in age from 18 to 61 years (M = 20.39, SD = 5.45). The majority were white (87%), with 13% Asian, 5% African American, 2% Native Hawaiian or Pacific Islander, and 1% American Indian. A minority of the sample identified as Hispanic or Latino (12%).

Materials and measures

Negative mood induction. It is necessary for participants to be experiencing at least moderate levels of negative emotion so that a difference in the effectiveness of rumination versus distraction for reducing negative emotion can be observed [26]. Video clips with a negative focus have been used previously to induce negative mood states prior to rumination [10; 32]. For this study, two video clips were used to induce negative feelings (e.g., sadness, anger, fear). The first was a 5-minute animated scene depicting one couple's tragic lives (Pixar/Disney's "*Up*"*)*, and the second was a 9-minute compilation of news coverage of the September 11 attacks on the World Trade Center. To our knowledge, these videos have not been previously used in research, and both were chosen because they were shown to induce negative emotions in a pilot test.

RMT [15; 19]**.** The RMT comprises separate rumination and distraction tasks that each consist of 45 items on which participants are directed to focus their attention for exactly 8 minutes. Participants were handed a paper packet with the following instructions

to read: "For the next few minutes, try your best to focus your attention on each of the ideas on the following pages. Read each item slowly and silently to yourself. As you read the items, use your imagination and concentration to focus your mind on each of the ideas. Spend a few moments visualizing and concentrating on each item. Please continue until the experimenter returns." The experimenters then asked participants if they had any questions, then stated, "It is important that you do not mention your task or any of its contents to your friend." The rumination condition, includes a series of items related to thoughts, feelings, and self concept (e.g., "Think about whether you feel stressed right now"). In the distraction condition, participants are asked to attend to a series of externally focused items not related to their current mood (e.g., "Think about the shape of the torch on the Statue of Liberty").

Perseverative Thinking Questionnaire – State Version [PTQ-S; 30]. The PTQ-S is a 15 item self report scale measuring state rumination. Participants are asked to describe their thinking process during a specified period of time (e.g., in the past 5 minutes) by rating the frequency of occurrences of thoughts such as "I kept thinking about the same issue all the time" on a 0 to 4 scale. The PTQ-S has been shown to reflect changes in state rumination in response to a laboratory manipulation [33]. Therefore, the scale is expected to reflect within subjects fluctuations in state rumination following the RMT. In the present sample, PTQ-S Cronbach's alphas were excellent, being .91 and .93 at the first and second time points, respectively. Data were approximately normal at the first (M = 2.58, SD = .72, n = 133) and second (M = 2.65, SD = .78, n = 132) time points.

Mood rating scales. Participants were asked to rate their mood using seven 5 point scales (0 = "not at all", 4 = "very"). Ratings assigned to "sad" and "depressed" were averaged to form a negative mood variable. The other five scales (e.g., "impatient", "energized") were filler items designed to distract from the true purpose of the scales. A similar measure has been used to assess mood states in a previous study on rumination, in which negative mood was shown to decrease as time elapsed following a negative mood induction and to be higher following a rumination than a distraction condition [32]. Cronbach's alphas for the two item negative mood scale were fair, ranging from .72 to .77 across three administrations. Negative mood was positively skewed at the first (M = 1.41, SD = .67, n = 132), second (M = 1.87, SD = .84, n = 133), and third (M = 2.10, SD = .88, n = 131) administrations.

Center for Epidemiologic Studies Depression Scale (CES-D; 23]. The CES-D assesses current symptoms of depression by self report. Responses range on a 0 to 3 scale, with higher scores indicating more severe depression. Internal consistency was good (Cronbach's alpha = .87). The scale also possesses good convergent validity, being able to discriminate between psychiatric inpatients and the general population, showing decreases as a result of treatment, and correlating highly with other measures of depression [27]. In the present sample, 19.8% of participants met the cutoff for "possible depression" (scoring 16 or greater), consistent with a previous estimate of 21% in the general population [27].

Rapport scales [1]. Participants rated their rapport with their friend during the discussions using three 0 to 10 items. Scores on this scale were shown to be lower in dyads where one partner suppressed emotions than in control dyads [1]. In the present sample, Cronbach's alphas were .76 and .78 at the first and second time points, respectively,

demonstrating fair internal consistency. Rapport was negatively skewed at the first (M = 6.90, SD = 1.57, n = 133) and second (M = 7.18, SD = 1.73, n = 132) time points.

Willingness to affiliate scales. Five items were written to assess participants' willingness to maintain a relationship with their friend in the future. Participants rated items on 4 point scales ranging from "strongly disagree" to "strongly agree", with higher total scores representing higher willingness to affiliate with friends. Internal consistency was fair (Cronbach's alpha = .70), and scores were negatively skewed (M = 3.28, SD = .45, n = 133).

Evaluation of friend on revision of Rosenberg Self Esteem Questionnaire (R-SEQ [28; 29]. The R-SEQ measures global self worth and has been adapted to measure perceptions of roommates' worth [29]. Participants rate 10 items on a 4-point scale, with higher scores representing more negative impressions of roommates' worth. The scale correlates strongly with measures of rejection, and scores correlate with depression among individuals high in reassurance seeking [9]. Items were reworded to refer to friends instead of roommates for the present study. Internal consistency was fair (Cronbach's alpha = .75), and scores were negatively skewed (M = 3.76, SD = .25, n = 132).

Procedure

As a cover story, participants were told the study focused on "reactions to adverse events in friend pairs". After providing informed consent, participants independently completed a battery of questionnaires in separate, private rooms, including demographic information, the mood rating scales, and the CES-D. One participant in each pair was assigned randomly to the target group, which received the RMT, and the other to the partner group (hereafter referred to as the target and partner, respectively). The order of rumination and distraction tasks and the order of negative mood induction videos were randomized, and there was no significant association between the outcomes of these two randomizations, $\chi^2(1, 133) = 2.72$, $p = .12$. Both participants watched the first negative mood induction video together, as they were later asked to discuss their reactions to it. Next, they were separated into different rooms. The target participant received either the rumination or distraction RMT, while the partner was asked to wait until the experimenter returned. After the 8 minutes allocated to complete the RMT had passed, participants completed the mood rating scales. As part of the larger study, participants spent the next 10 minutes discussing with each other their thoughts and feelings in response to the video they had watched earlier. Following the discussion, participants were led into separate rooms again to complete the PTQ-S, rapport scales, willingness to affiliate scales, and R-SEQ. Participants each received $10-20, except for psychology students who instead elected to receive credits that would increase their course grade.

Participants next reconvened to watch the second video together and then were separated once more. Target participants completed whichever RMT they had not completed following the first video, and partners waited again. Following this task, both participants rated their moods. Next, both participants again took part in a 10-minute discussion about the second video. After the second discussion, participants were separated to complete the PTQ-S and rapport scales, then debriefed and awarded credit or payment. See fig. 1 for a diagram detailing the flow of the experiment.

Results

All data analyses were conducted with SPSS version 24. Missing data were handled using listwise deletion. To evaluate whether randomization resulted in approximately equal groups, we compared participants who completed the rumination task first with the participants who completed the distraction task first on all measures assessed in the baseline questionnaire. No differences were detected between two groups (Table 1).

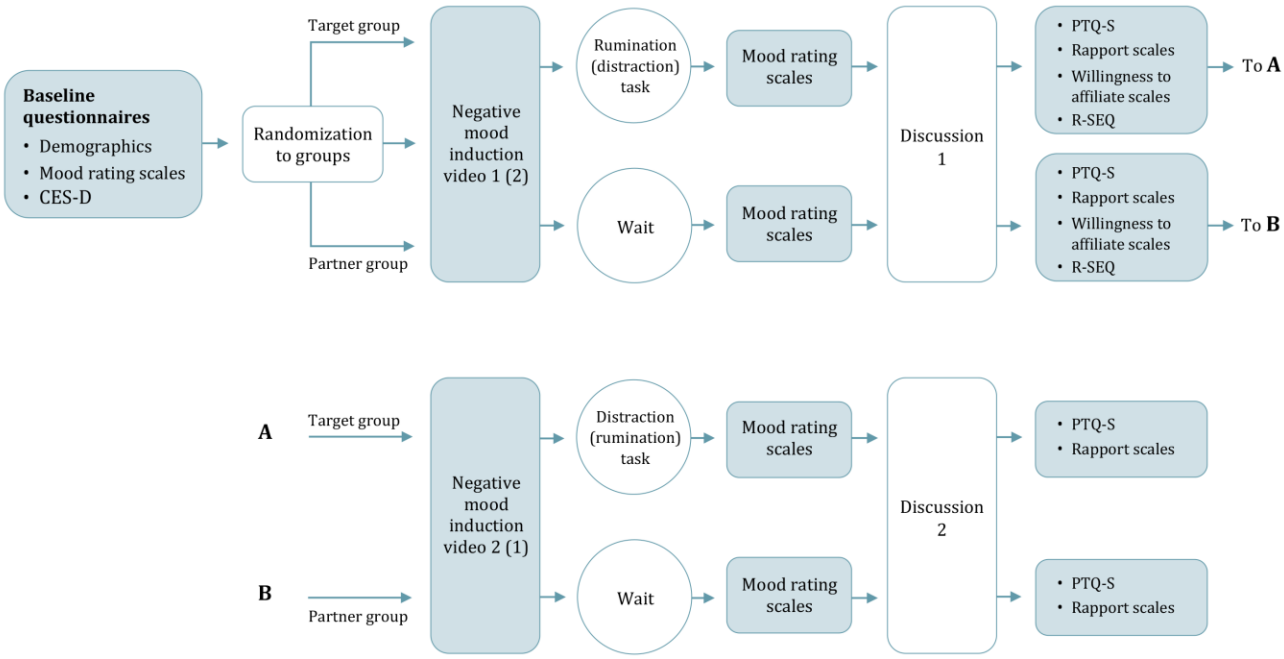

Figure 1. Experiment flow diagram

Notes. Parentheses indicate a counterbalanced randomization. CES-D – Center for Epidemiological Studies Depression Scale. PTQ-S – Perseverative Thinking Questionnaire – State Version. R-SEQ – Evaluation of friend on revision of Rosenberg Self-Esteem Questionnaire.

Table 1

Comparison of means of target participant scores on demographic and baseline measures by randomly assigned order of conditions

	Order of conditions		
Baseline measure	Rumination distraction (n = 66)	Distraction rumination (n = 67)	t [a]
Sex (% female)	78.79%	74.24%	.62
Age (years)	20.35 (4.95)	20.43 (5.59)	-.09
Race (% white)	86.36%	91.04%	-.85
CES-D depression	10.76 (7.59)	11.63 (7.90)	-.64

Notes. Standard deviations are shown in parentheses. Degrees of freedom for t tests were 131. CES-D – Center for Epidemiological Studies Depression Scale, total scale score corrected for missing items. [a] – z scores are reported for differences in proportions. No group differences were significant (all p's > .05).

Manipulation checks

Because previous research has found that distraction is more effective than rumination at reducing negative emotional experience following a negative mood induction 12], targets' negative mood should be lower immediately following the distraction task than immediately following the rumination task. A 2 (condition: rumination vs. distraction) × 2 (task order: rumination distraction vs. distraction rumination) repeated measures ANOVA was conducted to test for the expected main effect of condition on negative mood. Contrary to expectations, no significant main effect of condition on negative mood following rumination or distraction was detected, $F(1, 129) = 1.58$, $p = .21$, $\eta_p^2 = .01$.

Second, target participants should report higher state rumination during discussions that follow rumination than during discussions that follow distraction. Another 2×2 repeated measures ANOVA was conducted with PTQ-S state rumination scores as the dependent variable. No significant main effect of condition on PTQ-S state rumination during discussions was detected, $F(1, 130) = .37$, $p = .55$, $\eta_p^2 = .00$. Although this result may suggest that the manipulation failed to affect actual rumination during discussions, another possibility is that the PTQ-S lacks validity to detect induced differences in state rumination. However, target participants' PTQ-S scores correlated positively with CES-D depression scores and negative mood before corresponding discussions, providing evidence for the scale's construct validity in relation to these two different but theoretically related constructs (Table 2).

Table 2

Bivariate correlations between target PTQ-S state rumination scores and related measures

Measure	PTQ-S state rumination, rumination condition	PTQ-S state rumination, distraction condition
CES-D depression	.17*	.18*
Negative mood before rumination discussion	.40***	.09
Negative mood before distraction discussion	.19*	.38***

*Notes. N*s range from 130 to 133. The PTQ-S was administered following each discussion and refers to participants' state rumination during each discussion. "Rumination discussion" and "distraction discussion" refer to the response manipulation task condition preceding the discussions. CES-D – Center for Epidemiological Studies Depression Scale. PTQ-S – Perseverative Thinking Questionnaire – State Version. * – $p < .05$, ** – $p < .01$, *** – $p < .001$.

To investigate whether the negative mood induction had increased targets' negative mood from baseline to the period following the RMT, we conducted a 2 (video: September 11th vs. tragic couple) × 2 (time: baseline vs. after RMT) repeated measures ANOVA.

A significant interaction was detected between video and time, $F(1, 130) = 9.19$, $p = .003$, $\eta_p^2 = .07$, suggesting changes in negative mood depended on which video participants watched. However, simple effects analyses revealed that negative mood increased significantly from baseline to the period following RMT for both videos (Figure 2); this increase was larger following the September 11th video, $F(1, 130) = 380.28$, $p < .001$, $d = .80$, than following the tragic couple video, $F(1, 130) = 380.28$, $p < .001$, $d = .39$. Because negative mood was not measured immediately after the negative mood induction, these effect sizes do not necessarily represent the actual mood changes produced by the induction.

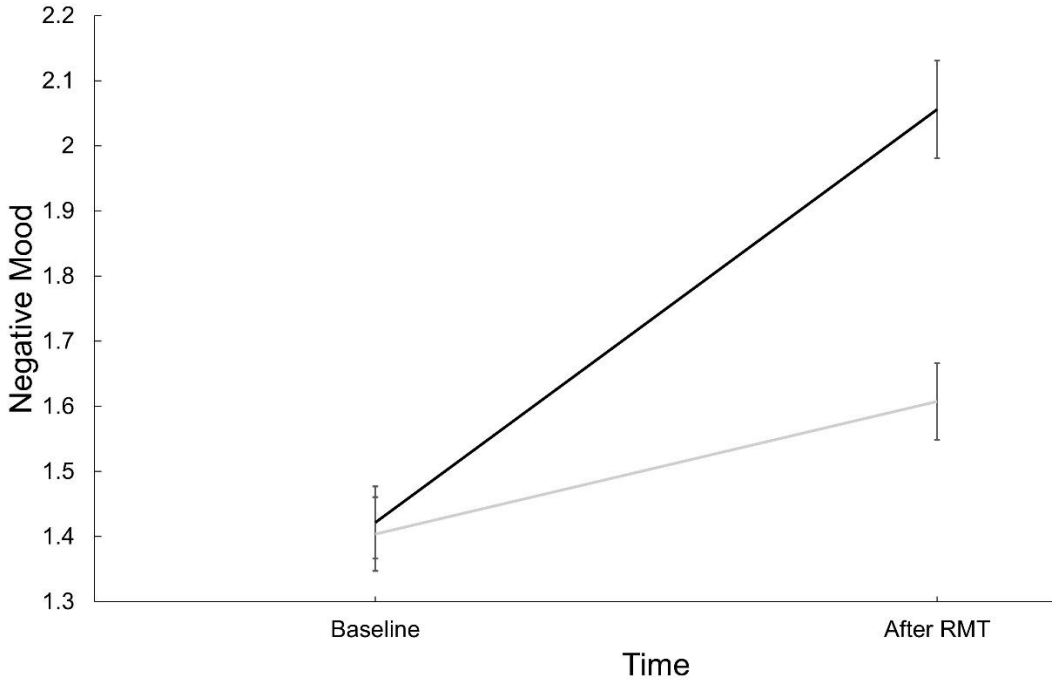

Figure 2. Negative mood induction effects by video

Notes. Video: black line – September 11th, gray line – Tragic Couple. "After RMT" data are from the first half of the experiment only. Error bars represent standard error of the mean. RMT – response manipulation task.

Moderating effect of depressive symptoms

To examine the possibility that the manipulation only altered mood in depressed participants, CES-D depression scores were tested as a moderator in a one way ANCOVA testing the effects of condition (rumination vs. distraction) on negative mood following the RMT. There was no interaction between CES-D scores and condition, $F(1, 129) = .89$, $p = .35$, $\eta_p^2 = .00$, suggesting depressive symptoms were irrelevant to the success of the manipulation. Furthermore, CES-D scores did not depend on the order in which participants watched videos, $t(123.04) = -.57$, $p = .57$, $d = -.10$, ruling out this potential confound. In another analysis, only those participants who were above the recommended CES-D cutoff score of 16 or greater for possible depression [27] were included, resulting in a sample of 27 participants. Even after allowing for a liberal type I error rate ($\alpha = .10$) to

accommodate the small sample size, there was no significant within subjects difference in negative mood following the rumination versus the distraction task among possibly depressed participants, $t(27) = 1.26$, $p = .22$, $d_z = .24$.

Test of study hypotheses

The study's primary hypotheses were that experimentally induced rumination would be followed by lower partner rated scores on measures of rapport, willingness to affiliate, and friend worth than would experimentally induced distraction. A two tailed repeated measures *t* test revealed no significant effects of condition on rapport, $t(132) = -.66$, $p = .51$, $d_z = -.06$. Two independent samples two tailed *t* tests revealed no significant effects of condition on willingness to affiliate, $t(132) = -1.30$, $p = .20$, $d = -.22$, or R-SEQ friend worth, $t(122.52) = 1.63$, $p = .11$, $d = .28$. In all three cases, effect sizes were small by Cohen's [3] conventional standards. Adding video order to these three models did not affect the finding that condition was a non-significant predictor of each outcome.

Discussion

In this within subjects dyadic experiment, target participants completed the well established RMT on two occasions. Both an established manipulation check based on change in mood ratings and a unique manipulation check based on state rumination ratings failed to show any effect of the RMT. Owing to the failed manipulation checks, the main study hypotheses could not be tested adequately. Planned hypothesis tests returned non significant results. Because this manipulation has only very infrequently failed to produce expected effects, follow up analyses were conducted to shed light on the cause of this surprising finding.

Previous studies have found that the RMT only induces differential moods in dysphoric or depressed participants [13; 25; 31]. Although the mood induction in the current study appears to have induced dysphoria, one possibility was that not enough participants were actively depressed for the RMT to create a difference in negative mood between the rumination and distraction conditions. However, follow up analyses showed that depressive symptoms did not moderate the effect of the manipulation on negative mood and that the manipulation failed to produce differential moods even in participants who met an established CES-D depression cutoff. In no previous study has the RMT failed to produce differences in negative mood in a depressed sample.

Before concluding manipulation failure, we must rule out the possibility that our manipulation check measures were themselves not valid. The negative mood manipulation check we used has been used previously to capture differences in negative mood following the RMT [32]. This manipulation check also closely resembles other commonly used negative mood checks administered following the RMT [13; 19; 31]. The second manipulation check found that PTQ-S state rumination did not differ between rumination and distraction tasks. Although the PTQ-S has not been used previously as a manipulation check, the RMT was created precisely to induce state rumination [19]. Therefore, if the PTQ-S measures state rumination reliably and validly, it is a suitable manipulation check. Previous research has shown that the PTQ-S captures variability in state rumination

following a different rumination versus control manipulation [33]. In our sample, the PTQ-S showed excellent reliability and convergent validity with depressive symptom and negative mood measures. Thus, two independent manipulation checks, both supported by validity evidence, failed to show expected effects of the RMT.

Having ruled out that our sample was not dysphoric enough for the RMT to show differential mood effects, and that the manipulation checks were not sound psychometrically, the most likely remaining explanation for our pattern of results is that the RMT failed to induce rumination and distraction in participants. Because this manipulation has rarely failed in published research, we next document the circumstances unique to this study that we propose led to the manipulation failure.

Circumstances under which the RMT may fail

Our procedures matched previous procedures closely, using the same wording, presented in paper packets of materials, and allotting exactly 8 minutes for participants to complete the task. The most obvious procedural difference between the present study and past studies is that pairs of friends participated simultaneously in the present study. Although friends were separated into different rooms before the target participant completed the RMT, watching the negative mood induction videos with a friend may have altered participants' emotional responses. In an attempt to promote negative emotions in response to the videos and limit potential interpersonal emotion regulation, participants were instructed not to communicate during, or share any reactions immediately following, the videos. However, watching a video with a friend, even in silence, may be enough to change the way participants process emotions in response to the video. At least one study has shown that participants avoid strong emotions when they know they will interact with another participant [5]. This finding suggests participants in friend pairs may activate alternative emotion regulation strategies, such as avoidance, that prevent rumination during the RMT. Future work replicating and extending these findings with other dyadic relationships would not only provide guidance about using the RMT to manipulate emotion regulation, it would also inform interpersonal models of emotion regulation and depression with implications for how people regulate emotions in interpersonal situations [8; 11; 24].

Extensive research also shows that stress responses generally are buffered even by another person's physical presence [2; 4]. From an attachment perspective, participants with secure attachment relationships with their study partner would be expected to experience lessened rumination and negative affect following a negative mood induction, whereas participants with anxious attachment relationships with their partner may experience heightened rumination and negative affect [18]. Unfortunately, data on interpersonal attachment were not collected. Nevertheless, it is possible that, although participants still reported increased negative mood following negative mood induction, exposure to the physical presence of their friend overrode or changed their emotion regulatory response so that the RMT had little effect on participants' emotion regulation strategies, particularly rumination.

The results of the present study suggest the RMT may not produce expected effects in dyads. Because this is the first study to use the RMT in a dyadic sample, it is currently

unknown whether the RMT would have similarly small effects in other types of dyads (e.g., spouse pairs, stranger dyads). The question of whether the RMT failed due to the dyadic sample alone, due to other unmeasured relational factors (e.g., secure attachment), or due to another factor such as watching the negative mood induction video together is left for future research. It is possible that the literature on the RMT suffers from a "file drawer" problem, in which non significant results are not published [6; 21]. Although such an effect is difficult to demonstrate, the present manuscript aims to weaken any file drawer effects in the RMT literature.

Limitations

The present study was limited in a few ways. First, the depressed subsample was small, which lowered power for detecting RMT effects in depressed versus nondepressed participants. Second, we used novel mood induction videos, which limits our ability to compare our results directly to those of previous RMT studies using different mood inductions. Third, some of our measures (e.g., negative mood) were only fairly internally consistent ($.70 \leq \alpha < .80$). Fourth, our sample was majority white, young, and female, which may limit the generalizability of our findings to diverse populations.

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Руминация или отвлекаемость: применение в диаде устраняет эффект регуляции эмоций при манипулировании реакцией

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Задача манипулирования реакцией (The Response Manipulation Task) – это широко используемый экспериментальный протокол, который применяется в лабораторных условиях для вызывания у испытуемых руминации и отвлекаемости. В исследованиях, опубликованных ранее, у участников с дисфорией, у которых специально вызывалось негативное настроение, всего в одном случае применение задачи манипулирования реакцией не возымело эффекта. В настоящей работе проверялась надежность задачи манипулирования реакцией в условиях диады (всего 135 пар испытуемых одного пола, находящихся в дружеских отношениях). При проведении эксперимента с участием второго испытуемого, применение задачи манипулирования реакцией не выявило различий в последующих негативных переживаниях, а также в развитии руминации. Процедура, направленная на вызов негативных эмоций, успешно выполняет поставленную задачу; не было выявлено связи между эффектом процедуры манипулирования и депрессивными симптомами; параметр оценки состояния руминации был надежным и валидным. В свете полученной картины несущественные результаты процедуры манипулирования и последующей проверки основных гипотез объясняются тем, что при данных конкретных экспериментальных условиях эффект руминации и отвлекаемости не достигается. В обсуждении приводятся ограничения обобщения эффекта задачи манипулирования реакцией, связанные с присутствием других людей, включающие в себя влияние диадической регуляции эмоций, избегание межличностного стресса и безопасные отношения привязанности.

Ключевые слова: эксперимент, эмоциональная регуляция, регуляция состояния, копинг, руминация, отвлечение внимания, социальный компонент, межличностный компонент, диада, дружеские отношения.

Финансирование. Исследование было частично поддержано Исследовательской премией для докторантов, предоставленной Институтом стипендий в области гуманитарных наук Колледжа искусств и литературы Университета Нотр-Дам.

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Teasing Apart the Effect of Depression Specific and Anxiety Specific Symptoms on Academic Outcomes

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Research shows that adolescents' performance in school can be negatively affected by depression and anxiety. However, past studies have used nonspecific measures of depression and anxiety that preclude researchers from understanding their unique effects. The current study addressed this gap in the literature by teasing apart the effects of depression specific and anxiety specific symptoms on end of semester grade point average (GPA) and the likelihood of dropping a course. We used a 3-month longitudinal design with a sample of 130 United States (U.S.) undergraduates. Results showed that only cumulative GPA and ACT score predicted end of semester GPA. However, high levels of anxiety specific (anxious arousal), but not depression specific (anhedonia), symptoms predicted whether or not a student dropped a course. These results suggest that targeting anxiety specific symptoms in schools may be effective in improving academic outcomes.

Keywords: depression, anxiety, academic achievement.

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Introduction

Depression and anxiety are two of the most common forms of mental illness in children and adolescents, affecting more than 6.3 million young people in the United States [8]. Adolescents with depression and anxiety not only experience emotional suffering, but also impairments in multiple areas of functioning, such as school achievement. For example, depression has been shown to predict decreased grade-point averages in adolescents [12; 16] as well as an increased likelihood of dropping out of school [5; 14]. Similarly, anxiety has been shown to lead to poor school attendance, impaired school performance, and reduced rates of attending college [13; 22; 30; 33]. Subject specific anxiety (e.g., math anxiety, reading anxiety) has also been shown to have a negative relationship with achievement in those domains [2; 26; 29]. The negative consequences of depression and anxiety on academic outcomes appear to be robust as they appear to hold across gender as well as cultures [4; 15; 17].

This work indicates that depression and anxiety may be important risk factors for poor academic outcomes. However, a limitation of this research is that most studies have used measures of depression and anxiety that are non-specific. Research shows that commonly used measures of depression and anxiety (e.g., Beck Depression Inventory, Beck Anxiety Inventory, Center for Epidemiological Studies Depression Scale, etc.) assess a general distress factor, like neuroticism, that is common to both depression and anxiety. These measures make it difficult to distinguish between depression specific and anxiety specific symptoms [6; 20; 21; 24; 25; 28]. This is problematic as depression and anxiety symptoms are often comorbid. Thus, it remains unclear if it is depression or if it is anxiety (or if it is the non-specific symptoms of distress) that is driving the association between negative mood and poor academic outcomes. However, it is possible to distinguish between the unique effects of depression and anxiety by examining symptoms that are specific to each syndrome (anhedonic symptoms for depression and anxious arousal symptoms for anxiety). In other words, one can take the overarching factor of general distress and break it down into its lower order, more specific symptom components. It is important to unpack the general effect of negative mood (i.e., neuroticism) on academic outcomes for a few reasons. First, it is critical for informing our etiological theories of how mood affects academic outcomes. Second, it is important for creating effective interventions because interventions targeted at reducing anxiety tend to emphasize different strategies (e.g., exposure) than those focused on depression (e.g., cognitive restructuring).

The purpose of the current study is to fill this gap in the literature and examine the unique contributions of depression specific and anxiety specific symptoms to poor academic outcomes. We hypothesized, consistent with prior research, that a measure of general distress would be associated with future academic outcomes (grade point average

[GPA] and dropping a course). We did not have a hypothesis about whether or not depression specific symptoms or anxiety specific symptoms would be a stronger predictor of academic outcomes as this is one the first studies to test their independent effects in a longitudinal design.

Method

Power Analysis

The sample size of 130 and a 5-predictor variable equation was used for the statistical power analyses (G*Power). The alpha level used was $p < .05$. The analysis showed that the statistical power for this study was .80 for detecting a small to medium effect ($R^2 = .10$).

Participants

Participants were 130 undergraduates (94 female, 36 male; $M_{age} = 18.91$, $SD_{age} = 1.08$) recruited from a medium-sized private university in the United States. All participants were volunteers from the university's psychology research participant pool. The ethnicity of the sample was: 64% Caucasian, 20% Hispanic, 13% Asian, 3% African American. The average ACT score reported in this sample was 33, which is greater than the average ACT score of 21 in the United States (ACT, Inc., 2016). The average GPA in this sample was 3.48 ("B+" average), which is similar to the average GPA of 3.30 for students attending private four-year colleges in the United States [27]. There were no exclusion criteria, and all participants from the extra credit participant pool who volunteered to participate were included in the study. All procedures were approved by the institution's human subject review board.

Participants in this study were from a data set previously published by Alatorre and colleagues [1]. The hypotheses and independent variables tested in this short report are unique to this investigation. Alatorre and colleagues [1] and the current study are the only publications that have used this data set.

Measures

Depression and Anxiety specific symptoms. The Mood and Anxiety Symptom Questionnaire (MASQ; [31]) is a self-report questionnaire that assesses symptoms of depression and anxiety based on the tripartite theory of anxiety and depression [9]. According to the tripartite theory, the affective symptom structure of anxiety and depression includes a higher-order, negative affect factor (common to both depression and anxiety), and two lower order-factors, anhedonia (specific to depression) and anxious arousal (specific to anxiety). By examining the two lower order factors it is possible to tease apart depression specific and anxiety specific effects from the non-specific effects of negative mood. To this end, the MASQ was used to assess general distress (non-specific negative affect), anxious arousal (anxiety specific), and anhedonic symptoms (depression specific). The general distress scale has 15 items (e.g., irritability and difficulty concentrating) that assess symptoms hypothesized to be common to both depression and anxiety. The anhedonic subscale contains 22 items that assess symptoms hypothesized to be specific to depression such as low positive affect (example items: "Felt like nothing was

very enjoyable", "Felt like there wasn't anything interesting or fun to do", "Felt really happy"). The anxious arousal subscale has 17 items that assess symptoms hypothesized to be relatively specific to anxiety such as somatic tension and hyperarousal (example items: "Felt numbness or tingling in my body", "Felt like I was choking", "Hands were cold or sweaty"). The MASQ has demonstrated good reliability and validity in prior research (e.g., [31]). Coefficient alpha for the general distress, anxious arousal, and subscales were .81, .90, and .93, respectively.

To our knowledge, the MASQ does not have established cut-offs or norms. There is one study [7] that recommended a clinical cut-off score of 76 for the anhedonic subscale of the MASQ. However, this study has yet to be replicated and it did not establish cut-offs for anxious arousal and general distress. As expected in a relatively healthy college sample, only a small proportion of participants reached the clinical cut-off score for depression (25 of 130). Given the lack established cut-offs, we compared the MASQ scores in the current study to those reported in prior research to ensure the sample's representativeness. The mean scores found in this study (anhedonic subscale = 61, anxious arousal = 22) were highly similar to the mean scores reported in previous research using non-clinical college samples. For example, Nitschke and colleagues [23] reported a mean anhedonic subscale score of 57 and an anxious arousal subscale score of 27 in a sample of 783 undergraduates; Haeffel and Mathew [19] reported a mean score on the MASQ anhedonic subscale score of 59 in a sample of 148 undergraduates; Goodson and Haeffel [18] reported a mean score on the MASQ anhedonic subscale score of 54 and an anxious arousal subscale score of 22 in a sample of 84 undergraduates.

Academic Outcomes. We assessed two academic outcomes: end of semester GPA (not cumulative GPA; 0 = "F", 1 = "D", 2 = "C", 3 = "B", 4 = "A") and whether or not a participant dropped a course (coded 0 or 1; 0 = did not drop a course and 1 = did drop a course). End of semester GPA was obtained from the registrar. Cumulative GPA, which was used as a covariate, was self-reported at the beginning of the study.

Procedure

The study used a 3-month prospective longitudinal design. At the start of the academic semester, participants were administered the baseline measures: demographics, general academic achievement (cumulative GPA and ACT score), and mood (general distress, depression specific symptoms, and anxiety specific symptoms). At the end of the semester, approximately 3 months later, participants were administered a questionnaire asking if they had dropped any courses and were again administered the mood measures (96% of the sample completed both time points).

Results

Means and inter-correlations of study measures are summarized in Table 1. All participants completed at least 85% of the items on all questionnaires; no missing data transformations were applied. We used hierarchical multiple regression to test the effect of depression and anxiety on end of semester GPA (for that specific semester only). Assumptions of linear regression were met (linearity; independence, Durban-Watson = 1.52; and homoscedasticity; tests of multicollinearity among symptoms subscales showed

acceptable tolerance levels, all > .40) with the exception of normality in which there was an outlier. A log transformation of the variables to increase normality did not affect the linear regression results reported below. Logistic regression was used to examine the dichotomous outcome of dropping a course.

Table 1

Descriptive statistics and correlations for study variables

	Year	Gender	Cum-GPA	ACT	Distress	Depression	Anxiety	Sem-GPA	Dropped Course
N	130	130	128	130	130	130	130	80	124
Missing	0	0	2	0	0	0	0	50	6
Mean	1.74	.72	3.48	32.60	28.50	61.4	22.0	3.62	.21
Median	1.00	1.00	3.51	33.00	27.0	63.0	18.0	3.70	.00
Standard deviation	.94	.45	.35	2.00	8.41	15.1	7.64	.29	.41
Minimum	1	0	2.00	26	15.0	23	17	2.75	0
Maximum	4	1	3.97	35	53	98	49	4	1

		1	2	3	4	5	6	7	8	9
1. Year		-								
2. Gender	Pearson's r	.103	-							
	p-value	.244								
3. Cum-GPA	Pearson's r	.132	-.006	-						
	p-value	.137	.949							
4. ACT	Pearson's r	-.120	-.110	.424***	-					
	p-value	.160	.212	< .001						
5. Distress	Pearson's r	-.094	-.012	.079	.018	-				
	p-value	.286	.894	.376	.843					
6. Depression	Pearson's r	.087	.145	.016	-.016	.580***	-			
	p-value	.328	.100	.858	.856	< .001				
7. Anxiety	Pearson's r	-.034	-.076	-.022	-.124	.632***	.283**	-		
	p-value	.698	.389	.808	.161	< .001	.001			
8. Sem-GPA	Pearson's r	.256*	.066	.554***	.326**	-.047	.022	-.168	-	
	p-value	.022	.562	< .001	.003	.681	.843	.137		
9. Dropped Course	Pearson's r	-.118	-.004	-.243**	-.052	.165	.046	.283**	-.198	-
	p-value	.191	.968	.007	.563	.066	.609	.001	.080	

Notes. Year: 1 – freshmen, 2 – sophomore, 3 – junior, 4 – senior. Gender: 0 – male, 1 – female. Cum-GPA – cumulative grade point average; Distress – MASQ general distress subscale; Depression – MASQ anhedonic

subscale; Anxiety – MASQ anxious arousal subscale; Sem-GPA – semester grade point average. Dropped_Course: 0 – did not drop, 1 – drop. * – $p < .05$; ** – $p < .01$; *** – $p < .001$.

We used 4 total equations for each outcome. Three equations were used to test the effect of each independent variable (general distress, depressive symptoms, and anxious symptoms) on academic outcomes; then, a fourth equation was used in which the significant predictors were entered simultaneously. In each regression equation, the independent variables were entered into the equation in two steps. In step one, covariates of cumulative GPA, year in school, and ACT score were entered (note that results remained the same if gender and race were also included as covariates). Cumulative GPA and ACT were chosen as covariates to control for prior academic achievement. We acknowledge that this may be an overly stringent test of our hypotheses as cumulative GPA and ACT score may have also been influence by lifetime history of depression and anxiety. However, the purpose of this study was to test the incremental effect of depression and anxiety symptoms on future academic outcomes in the current college semester. Year in school was chosen as a covariate because it might be related to dropping a course (e.g., seniors may more easily drop a course knowing they already have enough credits to graduate). In step 2, we entered the mood predictors.

Predicting End of Semester GPA

Results did not support hypotheses. There was not a significant effect of general distress ($b = .00$; $t = -.42$, $p = .68$; partial $r = -.05$), depression specific symptoms ($b = .00$; $t = -.18$, $p = .86$; partial $r = -.03$), or anxiety specific symptoms ($b = .00$; $t = -.95$, $p = .35$; partial $r = -.11$) on end of semester GPA. The only statistically significant predictors of end of semester GPA (for that specific semester) was cumulative GPA from baseline ($b = .51$; $t = 4.94$, $p < .001$; partial $r = .50$) and ACT score ($b = .04$; $t = 2.19$, $p = .03$; partial $r = .25$).

Predicting a Dropped Course

Results supported our hypotheses. There was a significant effect of general distress ($\chi^2 = 5.34$, $p = .02$) on the likelihood of a student dropping a course (see Table 2 and Figure 1). Students with higher levels of general distress were more likely to drop a course than students with lower levels of general distress. There was also a significant main effect of cumulative GPA from baseline ($\chi^2 = 7.16$, $p = .007$) on dropping a course. Students with lower GPAs were more likely to drop a course than students with higher GPAs. Next, we tested the specificity hypothesis. Results showed that there was a significant main effect of anxiety specific symptoms ($\chi^2 = 9.98$, $p = .002$), but not depression specific symptoms ($\chi^2 = .90$, $p = .34$) on the likelihood of a student dropping a course (see Table 2 and Figure 2).

Importantly, when all significant predictors were entered simultaneously, only anxiety specific symptoms ($\chi^2 = 4.81$, $p = .03$) remained a significant predictor of whether or not a student dropped a course (see Table 2) even when controlling for cumulative GPA and ACT score (note that results remain the same if depression specific symptoms were also entered into the equation). That said, although anxiety specific subscale was the only symptom scale to be a significant predictor of dropping a course, the difference in odds-ratios among the subscales was not large.

Table 2

Logistic regression analyses predicting whether or not a participant dropped a course

Model Coefficients – Dropped Course

		95% Confidence Interval						95% Confidence Interval	
Predictor	**Estimate**	**Lower**	**Upper**	**SE**	**Z**	**p**	**Odds ratio**	**Lower**	**Upper**
Intercept	-.245	-8.525	8.034	4.224	-.058	.954	.782	1.98e-4	3084.162
Year	-.204	-.764	.356	.286	-.715	.475	.815	.466	1.427
Cum-GPA	-1.975	-3.475	-.475	.765	-2.581	.010	.139	.031	.622
ACT	.126	-.166	.419	.149	.845	.398	1.134	.847	1.520
Distress	.064	.009	.120	.028	2.293	.022	1.067	1.009	1.127

Note. Estimates represent the log odds of "Dropped Course = 1" vs. "Dropped Course = 0".

Model Coefficients – Dropped Course

		95% Confidence Interval						95% Confidence Interval	
Predictor	**Estimate**	**Lower**	**Upper**	**SE**	**Z**	**p**	**Odds ratio**	**Lower**	**Upper**
Intercept	.665	-7.424	8.755	4.127	.161	.872	1.945	5.97e-4	6341.481
Year	-.243	-.789	.304	.279	-.871	.384	.785	0.454	1.355
Cum-GPA	-1.720	-3.169	-.311	.729	-2.387	.017	.176	0.042	.733
ACT	.113	-.171	.398	.145	.780	.435	1.120	0.843	1.488
Depression	.011	-.020	.041	.016	.699	.484	1.011	0.981	1.042

Note. Estimates represent the log odds of "Dropped Course = 1" vs. "Dropped Course = 0".

Model Coefficients – Dropped Course

		95% Confidence Interval						95% Confidence Interval	
Predictor	**Estimate**	**Lower**	**Upper**	**SE**	**Z**	**p**	**Odds ratio**	**Lower**	**Upper**
Intercept	-1.392	-9.908	7.124	4.345	-.320	.749	.249	4.98e-5	1241.778
Year	-.208	-.774	.359	.289	-.718	.472	.812	.461	1.432
Cum-GPA	-1.912	-3.458	-.367	.788	-2.426	.015	.148	.032	.693
ACT	.149	-.156	.454	.156	.955	.339	1.160	.855	1.574
Anxiety	.092	.033	.150	.030	3.060	.002	1.096	1.034	1.162

Note. Estimates represent the log odds of "Dropped Course = 1" vs. "Dropped Course = 0".

Model Coefficients – Dropped Course

		95% Confidence Interval						95% Confidence Interval	
Predictor	**Estimate**	**Lower**	**Upper**	**SE**	**Z**	**p**	**Odds ratio**	**Lower**	**Upper**
Intercept	-1.341	-9.881	7.199	4.357	-.308	.758	.262	5.11e-5	1337.912
Year	-.204	-.771	.363	.289	-.706	.480	.815	.463	1.437
Cum-GPA	-1.901	-3.454	-.347	.793	-2.398	.016	.149	.032	.707
ACT	.149	-.157	.454	.156	.953	.340	1.160	.855	1.574
Anxiety	.094	.029	.159	.033	2.819	.005	1.099	1.029	1.173
GSTRESS_2	-.006	-.070	.059	.033	-.170	.865	.994	.932	1.061

Note. Estimates represent the log odds of "Dropped Course = 1" vs. "Dropped Course = 0".

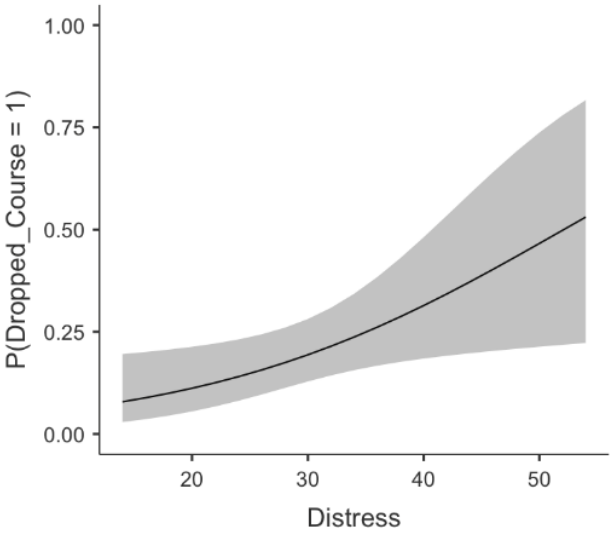

Figure 1.
Odds ratio of dropping a course as a function of distress level

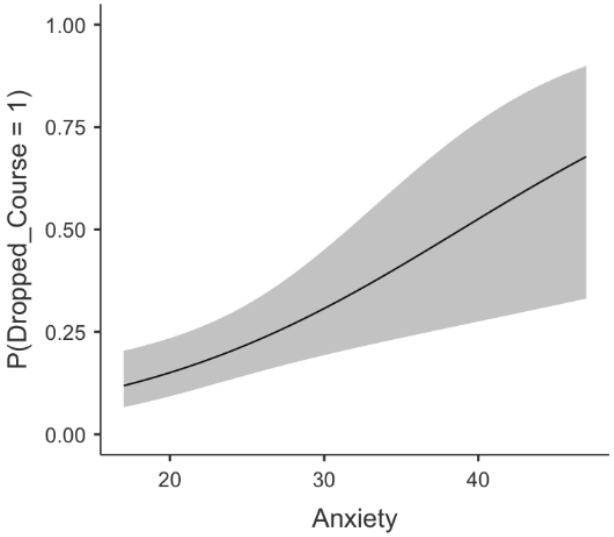

Figure 2.
Odds ratio of dropping a course as a function of anxiety specific symptom level

Discussion

Prior research shows that depression and anxiety are related to academic performance. However, these studies could not distinguish between the unique effects of depressive and anxious symptoms, respectively. The purpose of the current study was to address this limitation and test the specific effects of these constructs on academic outcomes. Consistent with prior research, results showed that general distress was associated with the likelihood of a student dropping a course. This finding was due specifically to anxiety, not depression. The present findings add to a growing body of research showing the detrimental effects of anxiety in school [11]. In particular, these results suggest that anxiety specific symptoms may increase avoidance-related behaviors,

which may ultimately interfere with their overall academic functioning. The next step in this line of research is to determine the mechanisms by which anxiety exerts its negative effects (e.g., avoidance) as well identify potential moderators that determine the strength the effects (e.g., time of onset, comorbid conditions, parental psychopathology).

Our results also raise questions. First, why were none of the symptom measures associated with GPA? One explanation is that our longitudinal period was too short. We examined GPA for a single semester, which is a snapshot in time relative to a four-year college career. It is possible that anxiety and depression would predict GPA over longer time periods. Further, students in the study who received low grades in the past were more likely to drop a class, which may have decreased variability in the GPA (i.e., created a truncated range). Second, why were depression specific symptoms not a significant predictor of any academic outcome? The most parsimonious explanation is that depression is not a strong predictor of academic outcomes and that prior results in which depression was linked to academics were due to the non-specific nature of the measures used (and comorbid anxiety was driving the results). However, it is important to replicate the current findings before making definitive statements about the association between depression and academic outcomes.

The study had both strengths and limitations. Strengths include a longitudinal design that allowed us to establish temporal precedence among the study variables (i.e., anxiety specific symptoms preceded and predicted a dropped course). Additionally, we used symptom specific measures for anxiety and depression so that we could tease apart their unique influence on academic outcomes. There were also limitations. Most concerning is the degree to which the results will generalize to other student populations. The students in this sample were very high achieving (higher than average ACT scores and GPAs), mainly white, and from a selective private University. Further, the students in the study had relatively low levels of depression and anxiety, and thus, our results may not generalize to students with clinically significant depression or anxiety. An additional limitation is that we only tested two academic outcomes – end of semester GPA and dropping a course. It is possible that depression specific symptoms have a negative effect on academic outcomes not measured in this study (e.g., low motivation, attendance rates, or performance-based measures). Similarly, we focused only on depression and anxiety, which may not fully capture participants' psychological health. For example, according to the dual-factor model of mental health, subjective well-being must be considered alongside symptoms of psychopathology to fully assess one's psychological wellness [3].

Conclusion

In conclusion, our study is among the first to tease apart the specific effects of depression specific and anxiety specific symptoms on academic outcomes. Our findings indicate that anxiety, not depression, may be a stronger predictor of poor academic outcomes such as dropping a class. If our results stand up to replication and generalize to other academic outcomes, then this would suggest that interventions in schools targeting anxiety would be more productive in improving some academic outcomes (e.g., student retention) than interventions targeting depression. Indeed, research shows that attempts to mitigate anxiety have positive effects on academic performance [32]. The next stop in this line of research is to understand the mechanisms by which anxiety exerts its negative

influence on poor academic outcomes. For example, it might be that anxiety leads to cognitive interference on tasks [10] or it might exert its influence more proximally in the form of test anxiety [34]. We look forward to future work to more fully understand the factors that mediate the anxiety to academic outcomes association.

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Специфика влияния симптомов депрессии и тревоги на академические результаты
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Исследования показывают, что депрессия и тревожность могут оказывать негативное влияние на школьную успеваемость подростков. Однако в предыдущих работах использовались неспецифические методы измерения депрессии и тревоги, что затрудняет понимание их уникального эффекта на академические результаты. Настоящее исследование направлено на устранение этого пробела и дифференцирует степень влияния специфических симптомов депрессии и тревоги на средний балл по учебным дисциплинам (Grade Point Average, GPA) и на вероятность отказа подростка от продолжения курса обучения. Авторы провели трехмесячное лонгитюдное исследование 130 учащихся из США. Результаты показали, что только совокупный средний балл по GPA и стандартизированному тесту для поступления в колледжи США (American College Testing, ACT) предсказывает средний балл GPA в конце семестра. Высокий показатель специфических для тревожности симптомов (тревожное возбуждение) являлся предиктором того, продолжит ученик курс или нет, тогда как для специфических для депрессии симптомов (ангедония) такой связи не выявлено. Данные результаты позволяют предположить, что выделение специфических симптомов тревожности в школах может быть эффективной мерой для улучшения успеваемости.

Ключевые слова: депрессия, тревожность, академическая успеваемость.

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Case Series of Transcranial Direct Current Stimulation as an Augmentation Strategy for Attention Bias Modification Treatment in Adolescents with Anxiety Disorders

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This article presents the results of a case series to assess the feasibility, acceptability, and clinical promise of transcranial Direct Current Stimulation (tDCS) as an augmentation strategy in clinic referred adolescents. Attention Bias Modification Treatment (ABMT) is a computer-based attention-training protocol designed to reduce rapidly deployed attention orienting to threat and thereby reduce anxiety symptom severity. Studies of ABMT reveal overall small to medium effect sizes. Advances in the neural underpinnings of attention to threat and attention-training protocols suggest the potential of tDCS of the dorsolateral prefrontal cortex (dlPFC) as a novel augmentation strategy to enhance ABMT's efficacy (ABMT + tDCS). However, tDCS has never been tested in a sample of adolescents with anxiety disorders. Six adolescents with a primary anxiety disorder completed all four ABMT + tDCS sessions. Adverse effects were mild and transient. Adolescents and parents independently reported fair to excellent levels of satisfaction. Impairment ratings of the primary anxiety disorder significantly decreased. Further, electrophysiological data recorded via electroencephalography (EEG) suggested decreases in neural resources allocated to threat. These findings support the feasibility, acceptability, and clinical promise of tDCS as an augmentation strategy in adolescents with anxiety disorders, and provide the impetus for further investigation using randomized controlled designs in larger samples.

Keywords: anxiety, adolescents, attention bias modification, transcranial direct current stimulation, neuromodulation, electroencephalography (EEG), event related potential (ERP).

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Introduction

Despite the established efficacy of cognitive behavioral therapy (CBT) and antidepressant medications for the treatment of anxiety disorders in adolescents, treatment protocols are lengthy, and up to one-half of anxious adolescents do not respond well to treatment [15; 53; 59]. This highlights the need for alternative, brief, and efficacious treatments. In this case series, we present data on Attention Bias Modification Treatment (ABMT) augmented with transcranial Direct Current Stimulation (tDCS) as an alternative, brief treatment for anxiety in adolescents.

Behavioral and neuroscience research extensively documents that adolescents with anxiety disorders show heightened attention to threat such as angry faces [3; 17; 59]. Neural regions corresponding to attentional processes develop rapidly during adolescence, suggesting a developmental window of opportunity for delivering treatments that target these neural regions subserving attention to threat. The most commonly used paradigm for assessing attention to threat has been through behavioral responses (i.e., reaction times) to a visual probe dot-probe task. Research using behavioral responses to the dot-probe task provides support for an association between attention bias to threat and anxiety (for reviews see [24; 37]); however, behavioral responses calculated from reaction times are a distal measure of attention, evidenced by poor internal consistency and test-retest reliability [10; 29; 45; 48]. Event-related potentials (ERPs), the neural activation in response to a discrete event, are a common measure for assessing the chronometry of neural activity in relation to attention [54] and provide a more proximal measure of attention to threat than traditional behavioral reaction time measures [36].

Evidence supports ERP components P1, P2, and P3 as potential neural measures of attention to threat [2; 19; 41; 54; 57]. P1 and P2 represent early stage processes involved in attention orienting and detection of threat [27; 31], whereas P3 represents later stage processes involved in the strategic regulation of attention (i.e., attentional control [18; 26; 49]).

ABMT is the translational treatment implication of heightened attention to threat that shows promise for reducing anxiety and its disorders (e.g., [21; 32; 35], including in adolescents [34; 39; 42; 44]. Despite the promise of ABMT, effect sizes on changes in attention to threat and anxiety symptom severity are usually small to medium in samples of children and adolescents with anxiety disorders (for reviews see [32; 34; 37; 46]). These small to medium effect sizes highlight the critical need for novel therapeutics that could be used as augmentation strategies to reduce attention to threat and enhance the anxiety reducing effects of ABMT.

Advances in the neural underpinnings of attention to threat and attention training suggest that tDCS of the dorsolateral prefrontal cortex (dlPFC) may enhance the effects of ABMT [14; 24; 25]. tDCS is a noninvasive technique that facilitates spontaneous neuronal activity and plasticity in specific areas of the brain by applying electrical current to corresponding regions of the scalp [7; 13]. Heightened attention to threat signals corresponds to perturbations in amygdala-prefrontal cortex (PFC) circuitry. The amygdala

facilitates vigilance through rapid threat processing, whereas the ventro- and dorsolateral PFC (vlPFC and dlPFC) facilitate regulation of attentional deployment to threat [20; 22; 23; 56]. ABMT targets neural circuitry subserving attention to threat [9; 11; 55; 60], and tDCS of the dlPFC enhances neuronal activity and plasticity [7; 28; 50]. Thus, it is reasonable to expect that tDCS of the dlPFC during ABMT (ABMT + tDCS) would enhance ABMT's effects.

Data from two studies support this expectation [14; 24]. In Clarke et al., 77 nonreferred college students with trait anxiety in the middle quartiles of a sample distribution were randomly assigned to either anodal tDCS of the dlPFC or sham stimulation while completing a single ABMT session [14]. Participants who received active stimulation showed significant changes in attention to threat in the expected direction compared to participants who received sham stimulation. In Heeren et al., 56 nonreferred college students with elevated trait anxiety were randomly assigned to anodal tDCS of the dlPFC, cathodal tDCS to inhibit activity of the dlPFC, or sham stimulation while completing a single ABMT session [24]. Compared to participants who received cathodal or sham stimulation, participants who received anodal tDCS of the dlPFC displayed significant reductions in attention to threat. Together these data from single sessions in nonreferred samples show that stimulation of the dlPFC enhances ABMT effects on attention to threat. However, neither of these studies used a sample of clinic-referred adolescents with anxiety disorders, used a standard multi-session protocol of ABMT, or reported on anxiety outcomes.

The purpose of the present case series was to examine the feasibility, acceptability, and clinical promise of tDCS of the dlPFC as an augmentation strategy for a standard multi-session ABMT protocol in referred adolescents who met criteria for anxiety disorder diagnoses. We hypothesized that participants and their parents would find the treatment acceptable and that participants would experience reductions in anxiety severity and attention to threat, as indicated by lower amplitudes on P1, P2, and P3 ERP components during the presentation of angry faces on the dot-probe task. Such data lay the groundwork for further testing and clinical administration of ABMT + tDCS.

Research Program

Participants

For study inclusion, participants had to be between the ages of 13 and 17 and were required to meet criteria for a primary Diagnostic and Statistical Manual of Mental Disorders-4th Edition (DSM-IV [1]) diagnosis of Social Phobia/Anxiety Disorder (SOP) or Generalized Anxiety Disorder (GAD) using the Anxiety Disorders Interview Schedule for Children (Child and Parent Versions; ADIS-IV:C/P [52]). Exclusionary criteria were (1) organic mental disorders, psychotic disorders, pervasive developmental disorders or attention deficit hyperactivity disorder, (2) severe risk of suicide, (3) serious and uncorrected vision problems, (4) physical disability that would interfere with ability to perform the dot probe task, (5) left-handedness or ambidexterity, (6) current psychotropic medication, and (7) seizure disorder or recent traumatic brain injury.

Participants were recruited from a university-based outpatient clinic specializing in the treatment of child and adolescent anxiety in a large urban area. Ten families on the clinic's waitlist were identified and contacted by telephone to share information about this study. The parents of all 10 adolescents expressed interest in participating. One adolescent declined due to distance and travel time, and three adolescents declined without providing a reason. These four adolescents also declined clinical services unrelated to a research study (i.e., cognitive behavioral therapy) and never came to our clinic for an intake assessment. The remaining six families consented to participate (i.e., parents provided informed consent and adolescents provided assent) and completed the pretreatment assessment. Age, sex, and diagnoses for each participant are provided in Table 1. Four participants identified as white Hispanic/Latino and two identified as non-Hispanic white.

Table 1

Demographic, diagnostic, and symptom data

Sex	Age	DSM-IV-TR Diagnoses		ADIS Impairment Ratings				PARS		SCARED				CSQ	
				Parent	Parent	Child	Child			Parent	Parent	Child	Child	Parent	Child
		PRE	POST	PRE	POST	PRE	POST	PRE	POST	PRE	POST	PRE	POST	POST	POST
F	14	SAD	SAD	6	4	6	4	14	12	10	10	60	37	31	16
F	16	GAD	GAD	5	-	7	4	17	14	37	13	42	44	32	26
F	15	SAD	SAD	4	4	4	-	13	10	5	12	21	24	29	28
M	16	GAD	No Dx	-	-	7	-	22	9	26	15	46	34	31	32
F	16	SAD	SAD	6	8	7	7	23	19	53	60	68	56	19	18
F	14	SAD	SAD	8	6	7	7	25	24	45	39	41	52	29	18

Notes. SAD – Social Anxiety Disorder; GAD – Generalized Anxiety Disorder; No Dx – diagnosis was not endorsed by neither parent nor child. ADIS – Anxiety Disorders Interview Schedule for Children; PARS – Pediatric Anxiety Rating Scale; SCARED – Screen for Child Anxiety Related Emotional Disorders; CSQ – Client Satisfaction Questionnaire. F – Female; M – Male. PRE – pretreatment; POST – posttreatment.

Procedures

This study was conducted as approved by the Institutional Review Board. Participants were compensated for their time completing the assessments. Participants completed a pretreatment assessment to determine anxiety diagnosis and severity, as well as to obtain a baseline measure of attention bias to threat. Participants then completed four weekly treatment sessions (ABMT + tDCS; described below), and a posttreatment assessment conducted one week after treatment sessions finished, all at the university clinic. Acceptability, feasibility, and satisfaction were measured by the (1) number of eligible families who consented to participate, (2) number of adolescent participants who completed the study, (3) adverse effects and acclimation to stimulation, and (4) adolescent

and parent ratings of satisfaction with treatment. Neural resources allocated to nonthreatening and threatening stimuli (i.e., attention to threat) were measured using event related potentials (ERPs) during an emotional faces dot-probe task [5; 19; 54]. A multi-informant anxiety outcome assessment was conducted, which included clinician-, parent-, and adolescent self-ratings of anxiety symptom severity and impairment.

Attention Bias Modification Treatment (ABMT). The ABMT protocol (TAU-NIMH ABMT initiative) was the same as has been used in previous studies of ABMT in children and adolescents [42; 43]. The training protocol is identical to the attention to threat measurement (i.e., dot-probe) task with three exceptions: (1) a different set of faces was used during treatment than during measurement; (2) each block consisted of 160 trials instead of 240 during measurement, presenting 120 angry–neutral and 40 neutral–neutral combinations, with two consecutive blocks completed per treatment session; and (3) the probe replaced the neutral face on 100% of trials to establish a training contingency between neutral face location and probe location. On average, completion of the training protocols took participants 15 minutes.

Transcranial Direct Current Stimulation (tDCS). tDCS was administered using a Soterix 1X1 tDCS Limited Total Energy (LTE) Stimulator while adolescent participants completed the ABMT protocol at each session. Direct current was transferred via two 5 cm x 5 cm conductive silicone electrodes each within a disposable 5 cm x 7 cm saline-soaked (6 ml per side) sponge pouch. The anodal (active) electrode was secured over the left dlPFC, localized using F3 on the 10/20 international EEG system, and the cathodal (reference) electrode was secured over the contralateral supra-orbital area [24]. The intensity of tDCS was 1 mA with a 30 sec ramp up/down time. Stimulation began two minutes before the initiation of the ABMT protocol to allow for a ramp up period and acclimation to stimulation before training began. Stimulation was administered continuously for 20 minutes after ramp up. Once the full intensity (1 mA) was reached and adolescents had two minutes to acclimate, the ABMT protocol began. In cases where adolescents reported adverse effects/discomfort that did not abate during the two-minute period, we extended the acclimation period until discomfort ceased or an additional five minutes had passed. At the end of the additional five minutes, the ABMT protocol was initiated and tDCS was administered at 1 mA or the maximum intensity tolerable to the adolescents (e.g., 0.8 mA). Participants were instructed that they could discontinue at any time.

Measures

Anxiety Diagnosis, Impairment, and Symptom Severity. Youth anxiety disorders were assessed using the Anxiety Disorders Interview Schedule for Children, Child /Parent Versions (ADIS-IV: C/P [51]). The ADIS was administered independently to parent and adolescent. Anxiety-related impairment was assessed using a severity/impairment rating scale as reported by each informant, scored from 0 to 8. A severity/impairment rating ≥ 4 was used as a clinical cutoff of impairment for diagnosis. Youth anxiety symptom severity was assessed using clinician ratings on the Pediatric Anxiety Rating Scale (PARS [47]) and adolescent and parent ratings on the Screen for Child Anxiety Related Emotional Disorders – Child/Parent Versions (SCARED-C/P [8]). All anxiety measures were administered by trained and supervised psychology doctoral students.

tDCS Adverse Effects. Adverse effects were assessed using the tDCS Adverse Effects Questionnaire [12], a clinician-administered rating scale that assesses the severity of ten adverse effects on a 4-point likert scale (1 – "absent", 2 – "mild", 3 – "moderate", 4 – "severe"). It was administered at each session immediately before stimulation, to obtain a baseline measurement, and immediately after the end of stimulation, to compare to baseline and determine if adverse effects were related to stimulation (1 – "none", 2 – "remote", 3 – "possible", 4 – "probable", 5 – "definite"). A score ≥ 3 indicated an adverse effect of stimulation.

Client Satisfaction. Satisfaction with treatment was assessed using the Client Satisfaction Questionnaire-8 (CSQ-8 [30]). Adolescents and parents independently rated the quality of and satisfaction with treatment on a 4-point likert scale (1 – "poor/quite dissatisfied", 2 – "fair/indifferent or mildly dissatisfied", 3 – "good/mostly satisfied", 4 – "excellent/very satisfied"). Overall satisfaction ratings were categorized as ''poor'' (8–13), ''fair'' (14–19), ''good'' (20–25), and ''excellent'' (26–32).

Attention to Threat. Consistent with prior research, the angry/neutral faces dot-probe task (TAU-NIMH ABMT initiative; http://people.socsci.tau.ac.il/mu/anxietytrauma/research/) was used while EEG/ERP data were collected to obtain a measure of attention to threat [6; 19; 54]. In the task, participants are presented with 240 trials. In each trial, a white fixation cross appears in the center of the screen for 500 milliseconds (ms), followed by a pair of faces of the same actor for 500 *ms*, arranged vertically (one above the other). In each trial, the faces display one of three combinations: neutral-angry, angry-neutral, or neutral-neutral. This is immediately followed by a visual probe ("<" or ">") replacing either the top or bottom face. Participants are asked to respond as fast as possible and indicate the orientation of the probe by clicking the left or right mouse button (left for "<" and right for ">") using their dominant hand. The probe remains on the screen until participants respond, and the next trial starts immediately. Angry-face location, probe location, probe type, and actor are fully counterbalanced.

Electrophysiological Recording and Processing. Participants were fitted with a 64-channel Geodesic Sensor Net (Electrical Geodesics Inc., Eugene, OR) previously soaked in a non-toxic, potassium chloride solution for 10 minutes. The raw EEG signal was amplified using an high-impedance EGI NetAmps 400 amplifier and sampled at 1000 Hz. Impedance values were checked and adjusted to be below 50 kΩ prior to data collection. EEG was recorded continuously during the completion of the dot-probe task and was referenced to Cz after artifact rejection. Continuous raw EEG was processed using EEGLab [16] and ERPLab [33]. Offline, data were resampled to 512 Hz and filtered using a high pass filter of .1 Hz and a low pass filter of 30 Hz. Data was segmented into epochs with a 200 ms baseline period and 500 ms post-face stimulus onset period. Data were baseline corrected to the average voltage during the 200 ms prior to stimulus onset. Epochs were processed for artifacts using a voltage threshold of ± 75 μV. Remaining epochs were visually inspected for ocular and motor artifacts. Of the trials not rejected, individual bad channels were identified and replaced using spherical spline interpolation. Individual subject averages were constructed separately for neutral-neutral (NN) and neutral-threat (NT) stimuli.

Stimulus-Evoked ERP Components. ERP neural activity was time-locked to the onset of the face stimuli. Specific components of interest were P1, P2, and P3. In line with previous studies, P1 and P2 components were examined at midline occipital sites (Oz or E37 [4; 19; 38; 40]), and the P3 component was examined at frontal sites (Fz or E4 [18]). ERP latency windows were determined by visually inspecting grand average waves. Peak and mean amplitudes for P1 (0-100 ms), P2 (150-250 ms), and P3 (280-400 ms) were generated separately for NN and NT trials in ERPLAB and data were imported into SPSS version 22.0 [53] for final statistical analysis. In addition, for each ERP component at pretreatment and again at POST, we computed ΔNT-NN scores as the difference between the amplitudes for NT and NN trials. ΔNT-NN scores indicate the relative allocation of neural resources when a threat stimulus is present (NT trials) versus when only neutral stimuli are present (NN trials). We examined pretreatment to posttreatment changes in ΔNT-NN scores for each component.

Results

Feasibility, Acceptability, and Satisfaction

All contacted parents expressed interest in participating. All six remaining adolescents completed all four treatment sessions as well as pretreatment and posttreatment assessments. Treatment satisfaction ratings by adolescents and their parents appear in Table 1. Five parents rated satisfaction as Excellent and one as Fair. Three adolescents rated satisfaction as Excellent and three as fair.

Adverse Effects and Dosage Toleration

Figure displays rates of specific adverse effects at each of the four sessions reported in the tDCS Adverse Effects Questionnaire. Excluded adverse effects that were also assessed but not endorsed include: neck pain, scalp pain, burning sensation, and sudden mood change. Following stimulation, the most common adverse effects were mild skin redness, itching, and sleepiness. In session one, three adolescents displayed mild redness, two reported mild itching, one reported mild tingling, and two reported mild sleepiness. In session two, two adolescents displayed mild redness, one reported mild itching, and one reported mild headache. In session three, two adolescents displayed mild redness and one reported mild sleepiness. In session four, three adolescents displayed mild redness, one reported mild itching, one reported mild headache, and four reported mild sleepiness. Moreover, one adolescent reported moderate tingling and a moderate hot sensation in session one. No adolescent reported a severe adverse effect. Adolescents stated that adverse effects decreased during stimulation, and attributed sleepiness to boredom with the procedures.

All adolescents required additional acclimation time beyond the allocated two minutes in at least one session, mostly in earlier sessions, meaning that they requested stimulation be lowered from 1 mA, prior to stimulation being ramped up to full intensity (1 mA). In one session, two adolescents did not reach full intensity after an additional five minutes; after those five minutes, the ABMT protocol was initiated and stimulation was administered at the maximum tolerable intensity.

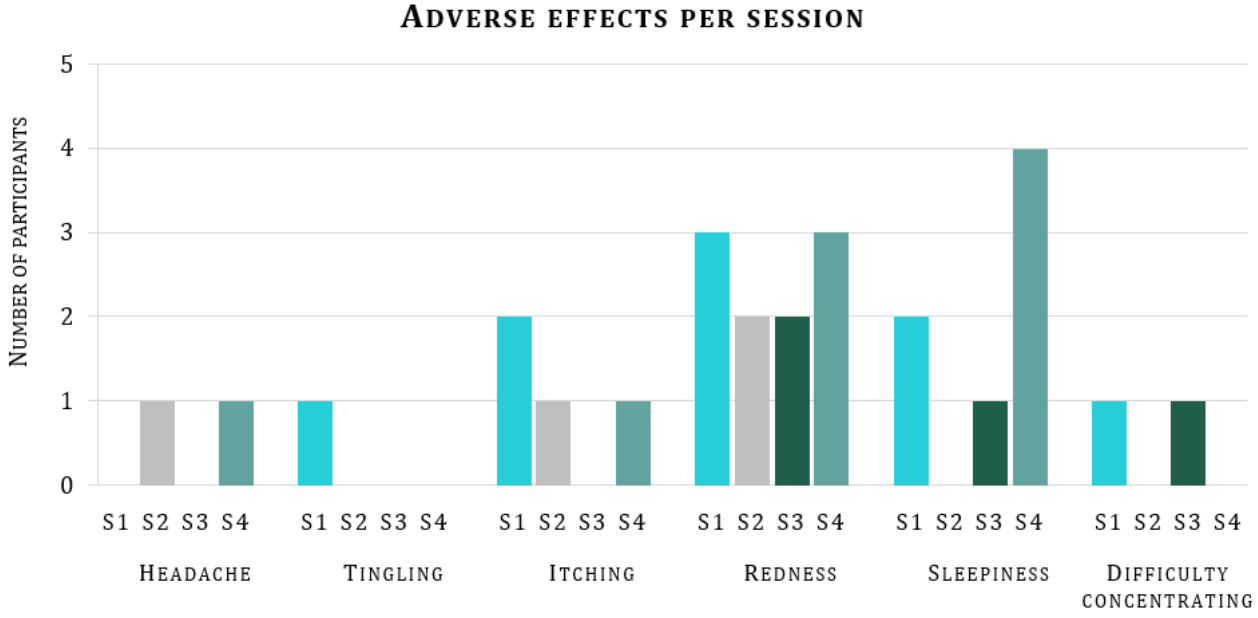

Figure. Distribution of endorsed mild adverse effects per session and participant

Notes. S1, S2, S3, S4 – Sessions 1-4. Figure includes adverse effects that were endorsed for at least one participant at least once. The Adverse Effects Questionnaire was administered before stimulation to determine baseline, and immediately after stimulation. It was considered an adverse effect if it was endorsed immediately after stimulation and not present (or mildly present and increased in intensity) before stimulation (sensations present prior to stimulation were considered to be unrelated to stimulation).

Attention to Threat

Peak and mean amplitudes for ERP components are presented in Table 2. Most effects were not statistically significant, as we expected in this small feasibility study with six cases. We therefore focus our presentation of results on effect sizes. For the P1 component peak amplitude, we found a medium (d = .47) pretreatment to posttreatment decrease on neutral-threat (NT) trials (ns), a large (d = 1.58) pretreatment to posttreatment increase on neutral-neutral (NN) trials ($p < .05$), and a large (d = 4.17) pretreatment to posttreatment decrease in ΔNT-NN (pretreatment: NT > NN; POST: NN > NT; $p < .05$). For the P2 component peak amplitude, we found a large (d = 1.97) pretreatment to posttreatment decrease on NT trials ($p < .05$), a large (d = 1.27) pretreatment to posttreatment increase on NN trials ($p < .10$), and a large (d = 1.73) pretreatment to posttreatment decrease in ΔNT-NN (ns). For the P3 component peak amplitude, we found a small (d = .16) pretreatment to posttreatment increase on NT trials (ns), a small (d = .19) pretreatment to posttreatment decrease on NN trials (ns), and a large (d = 1.46) pretreatment to posttreatment increase in ΔNT-NN (pretreatment: NN > NT; POST: NT > NN; $p < .05$).

For P1 and P2 components mean amplitude, we found medium to large (ds = .61–1.99) pretreatment to posttreatment changes on NN and NT trials (ns), in the same direction as changes in peak amplitude, and large (ds = 1.60–1.77) pretreatment to posttreatment decreases on ΔNT-NN (ns). For P3 mean amplitude, we found small

(*d*s = .21–.35) pretreatment to posttreatment changes on NN and NT trials (ns) and a large (*d* = 1.27) pretreatment to posttreatment increase on ΔNT-NN (pretreatment: NN > NT; posttreatment : NT > NN; p < .05).

Table 2

Peak and mean amplitudes for ERP components

Component	Trial	Pretreatment	Posttreatment	*t*	*d*
Peak Amplitude					
P1 (*M, SD*)	NT	0.95 (0.92)	0.45 (1.19)	0.75	0.47
	NN	-0.20 (1.34)	2.83 (2.36)	-3.61*	1.58
P2 (*M, SD*)	NT	1.32 (0.98)	-1.06 (1.40)	2.85*	1.97
	NN	-0.13 (1.21)	1.55 (1.43)	-1.49	1.27
P3 (*M, SD*)	NT	1.95 (3.12)	2.36 (1.97)	-0.40	0.16
	NN	2.80 (3.49)	2.31 (1.17)	0.45	0.19
Peak Amplitude ΔNT-NN					
P1 (*M, SD*)		1.15 (0.42)	-2.38 (1.12)	2.90*	4.17
P2 (*M, SD*)		1.44 (1.88)	-2.61 (2.73)	2.11	1.73
P3 (*M, SD*)		-1.56 (2.22)	0.96 (1.0)	-3.59*	1.46
Mean Amplitude					
P1 (*M, SD*)	NT	-0.25 (0.10)	-0.77 (1.20)	1.05	0.61
	NN	-1.80 (0.50)	-0.60 (0.69)	-2.11	1.99
P2 (*M, SD*)	NT	-0.61 (0.63)	-1.87 (1.69)	1.86	0.99
	NN	-1.35 (1.42)	-0.40 (0.70)	-1.76	0.85
P3 (*M, SD*)	NT	0.82 (2.61)	1.29 (1.65)	-0.55	0.21
	NN	1.20 (2.95)	0.35 (1.67)	0.81	0.35
Mean Amplitude ΔNT-NN					
P1 (*M, SD*)		1.55 (1.15)	-.71 (1.39)	2.20	1.77
P2 (*M, SD*)		0.74 (1.13)	-1.48 (1.61)	2.10	1.60
P3 (*M, SD*)		-0.63 (2.34)	1.71 (1.13)	-3.11*	1.27

Notes. M – mean; *SD* – standard deviation. NT – Neutral-Threat trials; NN – Neutral-Neutral trials. *N* = 5 (one participant did not complete posttreatment EEG due to a scheduling conflict); *df* = 4; * – *p* < .05.

Anxiety-Related Impairment and Symptom Severity

Participants' demographic and clinical characteristics are presented in Table 1, and pretreatment to posttreatment differences in anxiety-related impairment and symptoms severity are presented in Table 3. Most effects were not statistically significant, as we expected in this small feasibility study with 6 cases. We therefore focus our presentation of results on effect sizes. Mean adolescent impairment ratings on anxiety diagnoses decreased from pretreatment (M = 6.50, SD = 1.38) to posttreatment (M = 2.67, SD = 3.08), with a large effect size (Cohen's d = 1.60). Mean parent impairment ratings on primary diagnosis decreased from pretreatment (M = 6.17, SD = 1.60) to posttreatment (M = 4.83, SD = 2.86), with a medium effect size (Cohen's d = .58). Four of six parents rated the impairment of adolescents' primary diagnosis lower at posttreatment than pretreatment.

Table 3

Mean scores and pretreatment to posttreatment differences for primary diagnoses' impairment ratings, SCARED, and PARS scores

	Pretreatment	**Posttreatment**	***t***	***df***	***p***	***d***
ADIS Impairment-P (*M, SD*)	6.17 (1.60)	4.83 (2.86)	1.40	5	.221	0.58
ADIS Impairment-C (*M, SD*)	6.50 (1.38)	2.67 (3.08)	3.01	5	.030*	1.60
SCARED-P (*M, SD*)	29.33 (19.19)	24.83 (20.29)	0.93	5	.397	0.23
SCARED-C (*M, SD*)	46.33 (16.40)	41.17 (11.91)	1.01	5	.360	0.36
PARS (*M, SD*)	19.00 (5.02)	14.67 (5.79)	2.43	5	.059+	0.80

Notes. ADIS – Anxiety Disorders Interview Schedule for Children. P – parent; C – child/adolescent. *M* – mean; *SD* – standard deviation. SCARED – Screen for Child Anxiety Related Emotional Disorders; PARS – Pediatric Anxiety Rating Scale. N = 6; * – $p < .05$; "+" – $p < .10$.

Mean anxiety severity on clinician ratings, adolescent self-ratings, and parent ratings decreased from pretreatment to posttreatment; these decreases were large for clinician ratings (Cohen's d = .80) and small for adolescent self-ratings (Cohen's d = .36) and parent ratings (Cohen's d = .23). For all six adolescents mean clinician-rated PARS ratings decreased from pretreatment (M = 19.00, SD = 5.02) to posttreatment (M = 14.67, SD = 5.79), and for one-half of parents and adolescents mean anxiety ratings on the SCARED-C/P decreased from pretreatment (P: M = 29.33, SD = 19.19; C: M = 46.33, SD = 16.40) to posttreatment (P: M = 24.83, SD = 20.29; C: M = 41.17, SD = 11.91).

Discussion

This case series presents preliminary data on the feasibility and acceptability of tDCS augmentation of ABMT in adolescents with anxiety disorders. Of the 10 families recruited, all parents agreed for their adolescent child to participate, and six adolescents agreed to

participate. Adolescents tolerated treatment well and adverse effects were mild and transient. Additional acclimation time to stimulation was required for all adolescents in at least one session, and two adolescents did not reach full stimulation intensity in one session. This suggests that while adolescents with anxiety disorders can tolerate stimulation at 1 mA, tDCS protocols may need to be modified to allow for a longer ramp up period and flexibility in intensity of stimulation when working with this population. Overall, both parents and adolescents rated treatment satisfaction in the excellent to fair range, supporting the acceptability of the treatment.

With regard to anxiety reduction effects, anxiety-related impairment ratings decreased from pretreatment to posttreatment, with medium to large effect sizes. Anxiety symptom severity reduction effect sizes on rating scales ranged from large on clinician ratings to small on parent and adolescent ratings, and scores were in the moderate range for several adolescents at posttreatment. These effects, while in the expected direction, were largely not statistically significant. The direction of these effects however suggests that four sessions of tDCS augmented ABMT (ABMT + tDCS) at 1 mA may be sufficient for some but not all adolescents with anxiety disorders. Lengthier and/or higher intensity monotherapy protocols have been used in past research, including up to eight ABMT sessions and 2 mA tDCS intensity. In future studies, it will be important to investigate whether additional treatment sessions and/or higher intensity tDCS may lead to greater anxiety reduction effects, and characteristics of adolescents with anxiety disorders who are most likely to benefit from tDCS augmentation of ABMT.

With regard to the target of treatment, attention to threat, tDCS augmentation of ABMT led to reductions in neural resources allocated to threatening stimuli and increases in neural resources allocated to neutral stimuli in components associated with rapidly deployed attention orientation. This is indicated by pretreatment to posttreatment reduction in the P1 and P2 components on NT trials and pretreatment to posttreatment increase in the P1 and P2 components on NN trials, as well as pretreatment to posttreatment changes in the relation between NT and NN. At pretreatment, participants allocated relatively more neural resources at rapidly deployed attention stages when threat stimuli were present, whereas at posttreatment participants allocated relatively more neural resources when only neutral stimuli were present. tDCS augmentation of ABMT also led to reductions in neural resources allocated to neutral stimuli and increases to threatening stimuli in the component associated with later strategic attention regulation and effortful disengagement from threat. This is indicated by pretreatment to posttreatment reduction in the P3 component on NN trials and pretreatment to posttreatment increase in the P3 component on NT trials, as well as pretreatment to posttreatment changes in the relation between NT and NN. At pretreatment, participants allocated relatively more neural resources at a later stage when only neutral stimuli were present, whereas at posttreatment participants allocated more neural resources when threat was present.

Conclusion

Overall, these preliminary data support the feasibility, acceptability, and clinical promise of tDCS augmentation of ABMT as a treatment for adolescents with anxiety

disorders. It further supports the promise to engage the treatment target by increasing attention orientation in the presence of neutral stimuli and increasing attention regulation when a threat was present. We urge caution in interpreting these results, as most effects were not statistically significant in this small feasibility case series. Future research is encouraged to investigate the optimal dosing parameters to produce adequate treatment response and examine the efficacy of tDCS augmentation of ABMT in larger samples of adolescents with anxiety disorders using a randomized controlled design.

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В данной статье представлены клинические случаи прохождения курсов транскраниальной микрополяризации (tDCS) с целью оценки обоснованности, приемлемости и клинических перспектив данного метода в качестве поддерживающей стратегии у подростков, направленных в клинику. Терапия модификации искаженного внимания (Attention Bias Modification Treatment, ABMT) – это компьютерный протокол тренировки внимания, разработанный для снижения непроизвольного переключения внимания на источники кажущейся угрозы и, соответственно, для уменьшения тяжести симптомов тревоги. Исследования эффективности ABMT демонстрируют его умеренную общую результативность. Достижения в исследованиях нейронных механизмов внимания к угрозам и протоколов тренировки внимания указывают на высокий потенциал транскраниальной микрополяризации применительно к дорсолатеральной префронтальной коре в качестве новой поддерживающей стратегии повышения эффективности ABMT (ABMT + tDCS). Однако метод tDCS никогда не проверялся на выборке подростков с тревожными расстройствами. Шесть подростков с первичным тревожным расстройством прошли все четыре сеанса ABMT + tDCS. Побочные эффекты были легкими и временными. Подростки и родители независимо друг от друга сообщали о среднем или высоком уровне удовлетворенности результатами терапии. У подростков, прошедших курс ABMT + tDCS, значимо снизились первичные симптомы тревожного расстройства. Кроме того, электрофизиологические данные (в частности, результаты ЭЭГ) свидетельствовали об уменьшении нейронной активности, вызванной ситуацией воспринимаемой угрозы. Полученные результаты подтверждают обоснованность и перспективность применения tDCS в качестве поддерживающей стратегии у подростков с тревожными расстройствами, что дает импульс для дальнейших исследований контрольных групп с более крупными выборками.

Ключевые слова: тревожность, подростки, модификация искажения внимания, танскраниальная микрополяризация, нейромодуляция, электроэнцефалография, событийно-связанные вызванные потенциалы.

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Clinical Training with Undocumented Latinx Immigrant Minors: Case Examples and Reflections using the Multicultural Developmental Supervisory Model (MDSM) as a Framework

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As of 2017, the number of international immigrants worldwide increased from 220 million to 248 million, and will continue to rise [16]. Growing diversity worldwide requires a stronger emphasis on multicultural competency among mental health professionals. Learning multicultural competency skills is a career-long commitment that begins in

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practicum training and is modeled and reinforced through supervision. The Multicultural Developmental Supervisory Model (MDSM) is an evidence-based model that focuses on supervisory dyads and multicultural competence [12]. Using the MDSM [12] as a guide reflective of our training, four graduate supervisees share their supervision experiences in learning to conduct clinical interviews in Spanish with undocumented Latinx immigrant minors in government custody in the United States, a rising population with unique clinical considerations. Our supervisor includes her experience in training and fortifying beginning mental health professionals' skills in conducting these evaluations. In this contribution, we illustrate our trajectory from different training developmental stages, including the process of conceptualizing clinical cases, and transitioning languages in conducting clinical interviews, as well as considering our own cultural identities in clinical work. While our experience focuses on bicultural and bilingual training in the U.S., this aspect of clinical training is growing increasingly relevant around the world, especially in Europe where 54% of the population is multilingual [10]. Although we used the MDSM model as a helpful framework in guiding our multicultural development, empirical research is needed to examine the utility of this model.

Keywords: immigration, minors, supervisee-supervisor, multicultural competence.

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Clinical supervision is an important component of multicultural competence for mental health professionals in training. Indeed, "it is during clinical training and supervision that multicultural competence is initially developed and applied, which sets a foundation for lifelong practice" [7; 11], thus allowing supervisees to find their own voice in clinical interviewing. Additionally, competent supervision working with various cultures is crucial in the development of self-efficacy in supervisees working with culturally-diverse populations [8]. Although multicultural competence is also gained through coursework, supervised clinical training bridges the gap between theory and practice [7].

Given the continuously changing demographics worldwide, mental health professionals need to be adequately trained to serve individuals from diverse backgrounds – including immigrants [2]. Europe, Asia, and North America have the highest number of international migrants worldwide at 78, 80, and 58 million respectively. In the United States (U.S.) a large number of those migrants are of Latinx origin, prompting creation of the National Latinx Psychological Association (NLPA; [18]) and their professional guidelines for serving Latinxs clients. These guidelines emphasize the importance of ethics, competence, and consideration of within-group heterogeneity in the immigrant group being served. Furthermore, NLPA guidelines call for "culturally and

linguistically responsive supervision" [18; 21]. In accordance with these guidelines, supervisory models that focus on multicultural competence provide a framework to foster necessary competencies for clinical practice; one such model is the Multicultural Developmental Supervisory Model (MDSM; 12]. The MDSM is a model of supervision emphasizing multicultural competence at every level of interaction between a supervisor and a supervisee, and is based on previous models of supervision [12]. Although the MDSM focuses on the supervision process between same-ethnic dyads, we posit that the model is applicable to members of other ethnic groups as well when cultural humility is considered. The MDSM integrates four supervisory models, yet only two will be discussed: The Integrated Development Model (IDM; [22]) and Multicultural Counseling Competencies (MCC; [21]). The other two models focus on supervisors' developmental stages and in depth examination of supervisees' Latino identity development, and as so, are outside the scope of this paper. Although both are important in clinical training, this paper aims to discuss the supervisees' reflection on their clinical training in relation to working with Latinx immigrant children.

The IDM is a comprehensive model of supervisee development; it identifies three developmental levels (*beginner*, *emergent*, and *advanced*) over eight dimensions: skills competence, assessment techniques, interpersonal assessment, client conceptualization, individual differences, theoretical orientation, treatment plans and goals, and professional ethics [12; 22]. According to the IDM, *beginner* supervisees are highly anxious and motivated, but have low autonomy and self-awareness; thus, supervisees are highly dependent on their supervisor who assumes the role of expert or teacher. *Emergent* supervisees have fluctuating motivation and confidence, including variations in autonomy and dependency; thus, supervisees may benefit from supervisors that are flexible and ready to prompt for self-reflective practices. *Advanced* supervisees have stable motivation and are relatively autonomous, seeking supervision when needed, and are aware of their strengths and weaknesses. They work on creating a professional identity and focusing on the client, the process, and their own internal reactions [12; 22]. Although supervisees may be at an *advanced* level with certain populations or in certain contexts, they may be at the *beginner* level in others.

Further, MCC emphasizes the need to consider culture in training programs and supervision approaches. This includes helping supervisees become aware of their own assumptions, values, and biases; developing an awareness of the worldview of the client; and providing appropriate recommendations [12; 21]. For example, it is essential for supervisors to recognize and adapt to supervisees' developmental needs, expected outcomes of supervision, and language proficiency, adjusting as needed to provide culturally effective supervision to each supervisee [12; 20].

In addition to cultural competence emphasized by the MDSM framework, cultural humility is integral in working with clients from different cultural backgrounds and cross-cultural dyads. Tervalon and Murray-García introduced and operationalized cultural humility as a life-long commitment to self-evaluation and critique, amending the power differential between the physician and the patient, and creating symbiotic partnerships with communities to benefit individuals and defined populations [23]. Cultural humility is a key process within the construct of cultural competence that may foster fruitful cross-

cultural interactions [9]. Cultural humility may normalize the process of becoming aware of an unfamiliarity or bias instead of seeing it as a failure [19]. When supervisors employ cultural competence and cultural humility, power differentials can be attenuated to allow supervisees to find their voices, improve the supervisory alliance, and act as a model for how to approach cultural differences with clients [15; 19].

One important attribute of cultural humility is self-awareness, which encompasses the awareness of one's own "strengths, limitations, values, beliefs, behavior, and appearance to others" [13, p. 211]. This attribute was vital in our clinical work not only in our interactions with clients from various Latin American regions, but also in the supervisory dyad. While four of the authors of this paper (the supervisor and three supervisees) are of Latinx descent, it is critical to highlight that the Latinx community is not a monolith. The supervisor is a first-generation American of Cuban heritage whose first language was Spanish. One of the emergent supervisees is a Mexican immigrant woman who was undocumented for most of her childhood and whose first language was Spanish. The second emergent supervisee is a Mexican-American woman, child of immigrant parents, whose first language was Spanish. The beginner supervisee is a first-generation Puerto Rican woman who, although is a heritage Spanish speaker, did not speak Spanish often due to her fear of being judged for speaking it "incorrectly". The advanced supervisee is a European-American who learned Spanish in school. It took engaging in self-awareness of our individual strengths and limitations to produce the necessary dialogue within the supervisory dyad, between supervisees, and with clients to conceptualize the clinical information provided by the immigrant youth within their cultural context.

Supervisee–Supervisor Experiences

Using the MDSM as a guide reflective of our clinical training experience, the following section focuses on the experiences of a team of four graduate supervisees at various levels and their supervisor. Specifically, our experiences come from conducting clinical interviews with undocumented Latinx immigrant minors in government custody in the U.S. Our supervisor, a licensed clinical psychologist, is called upon by clinicians working at governmental shelters housing immigrant minors to conduct psychodiagnostic evaluations. The purpose of the evaluation is to conceptualize the minors' symptoms, make a diagnosis(es), make treatment recommendations, and inform on placement. Supervision is conducted in a group, with input from all present parties. Our supervisor is present in the room while we interview the minors, asking questions as needed, and checking and editing the written report. It is important to note that we did not provide therapy services during these evaluations nor did we collect data for research purposes due to the delicate nature of interviewing undocumented minors who may already be in vulnerable situations. Likewise, our supervisor did not collect empirical data to analyze our progress during our clinical training, nor was there specific criteria or a checklist that the supervisees had to meet, rather this manuscript comments on supervision and training in a naturalistic, albeit unique, context. Our progress through each level of autonomy was based on an ongoing discussion with our supervisor including our comfort level and motivation. As such, the following manuscript is not an empirical, quantitative study.

While our case examples are unique to the U.S., similar bilingual and bicultural training experiences are like to become the norm worldwide given increasing

diversification. We begin by discussing key considerations in our work with immigrant minors in line with cultural humility. Then, we delineate the process of learning, moving through different developmental stages – from beginning to near autonomy. Next, we discuss the process of transitioning languages in interviewing (i.e., English to Spanish), given that our clinical training in academia has been primarily in English. Finally, we address the reasons the supervisees' experiences have been enriching to their multicultural training – suggesting the utility of this training process for multicultural competence and acquisition of knowledge.

Utilizing Cultural Humility in Clinical Work with Immigrant Minors

Working with immigrant minors calls for key considerations during the evaluation process given the unique needs of this population. Foremost, it is important to provide a thorough informed consent because some individuals may have little or no knowledge of factors to consider in providing consent [24]. Additionally, it is important to consider the minor's developmental level and ability to understand the information being relayed. Unique to undocumented immigrant minors, we emphasize that we do not work for Immigration and Customs Enforcement (ICE) and do not have the power to deport or report individuals for deportation in order to mitigate any immediate fears of deportation that may interfere with the minor's comfort in sharing their story [3; 6; 25]. Moreover, we disclose to minors that we do not have the power over their immigration case, including their length of stay in the U.S. This is done so minors are forthcoming rather than exaggerate or minimize their symptoms in the hopes of changing their legal situation. Further, we assure them that participating in the evaluation will not result in any monetary costs to the minor. Lastly, we inform the minors that we will write a report that will be sent to their clinician and encourage both the clinician and the minor to sit together to discuss the content and the treatment recommendations. Together, these practices help build rapport with the minor [3].

When working with immigrant minors that are not proficient in the language(s) in the country to which they migrated it is important to consider ahead of time whether an interpreter will be needed to conduct the evaluation in the minor's primary language [3]. The use of interpreters carries its own considerations because information or the cultural context may be lost in the process of interpretation [24]. Yet, even when speaking the same language as the examiner, minors may use colloquialisms to describe an event or emotion. As such, evaluators must be careful to ask minors to clarify ambiguities rather than making assumptions.

Training Process in Clinical Work with Latinx Immigrant Minors

The authors of this article had varying levels of clinical, linguistic, and cultural competence prior to initiating work specifically with Latinx immigrant populations. We also came to the clinical team with differing levels of cultural and linguistic familiarity with the Latinx clients we serve. Further, our ethnic, cultural, and linguistic diversity meant different levels of proximity to our supervisor's own identity as a first-generation American and heritage Spanish speaker. Given the dynamic nature of the IDM across clinical scenarios, we all started our training journey with this specific population at the *beginner* level.

As beginners, we became familiar with the clinical interview process including its idiosyncrasies specific to Latinx undocumented immigrant minors. This stage includes discussing referral information and directions of inquiry before the interview, observing our supervisor and senior peers conduct clinical interviews, as well as participating in case conceptualizations in group supervision after every clinical interview. Yet, one of the most important lessons of the *beginner* stage is learning how to build rapport with clients, though building rapport is more of an implicit skill not easily or explicitly taught. For example, minutiae such as asking a client if they would like the disclosure form read to them, or if they have a signature, rather than assuming they can read and write could be overlooked or generalized as "every client is different" in explicit training. For this reason, our supervisor scheduled sessions of observation, to ensure trainee's exposure to the informed consent process, and a wide range of clients, circumstances, and presenting problems.

After having witnessed and participated in the process of a clinical interview several times, we are then asked to score the client's self-report questionnaires, and incorporate them into a clinical report, the rest of which is written by a more senior student or the supervisor. After writing the self-report section of the report, our supervisor and the more senior student give corrective feedback. Incorporating a more senior student in the process allows beginner students to shadow the journey of an older student in a similar position. Indeed, the senior student is often able to provide feedback from a different perspective from the supervisor, having recently been in the more beginner student's shoes.

After several experiences writing portions of the clinical report, we are then tasked with writing the entire report. At this stage, the beginner student takes their own notes, which are supplemented by notes transcribed by the interviewer (i.e., either the supervisor or the more senior student). This step is essential in preparing supervisees for the final task of conducting the clinical interview because it allows the supervisees to learn the essential information to acquire from the client to accurately assess and diagnose, and ultimately, to answer the referral question. This step also accustoms supervisees to the language and skill of writing clinical reports. Again, each report is reviewed and corrected by the more senior student, first, and supervisor, second, except for the first report which is reviewed solely by the supervisor. This series of steps has the purpose of providing supervisory experience to the more senior student, meanwhile allowing the supervisor to understand the beginner student's independent style. In the event that corrections by the more senior student dilute the beginner student's voice in the report, corrections can be rejected and returned, or can be further discussed, reinforcing the collaborative nature in clinical interviewing training. It has been our experience that at this stage in the process we begin approaching the *emergent* developmental level, accompanied by elevations in motivation and confidence as we began to undertake more challenging tasks [12]. Yet, it is important to note that all supervisees did not reach this stage at the same time – some felt ready after two months while others requested six months of observation. As noted earlier, the advancement through each developmental level is an ongoing discussion not based on time-specific criteria or a predetermined checklist of qualifications.

The next step in our training is to conduct the clinical interview, with our supervisor observing, beginning with the preparation of our own interview questions. During the first

couple of interviews our supervisor is focused on our ability to navigate through a clinical interview smoothly. Indeed, it is less essential an individual know which questions to ask during an evaluation, and more imperative the supervisee can do so with the finesse required of a successful clinical interview. The following illustrative example denotes a supervisee's experience in learning how to ask questions at the beginning of her training.

Emergent Supervisee: *"I found that the way I phrased questions during clinical interviews sounded assuming at times, which could be damaging to building rapport. For example, instead of asking the client about whether they experienced traumatic events during immigration, I phrased it as "You didn't experience any traumatic events, right?" Our supervisor spoke with me about it in a respectful manner, suggesting instead I re-word my questions. After that conversation, I realized I had done this at numerous points in the interview when asking about difficult topics (e.g., substance use, gang affiliation); thus, this exchange allowed me to clearly see how to improve my questioning style."*

Because of the supervisor's constructive feedback, the supervisee became cognizant of their interviewing style and, therefore, developed better strategies that would both build rapport and elicit information fundamental to understanding the client's clinical presentation. Through this supervisory feedback, the trainee became aware of her own assumptions, values, and biases and the worldview of the client, following the MCC model of the MDSM [12; 21]. Furthermore, in the case of missed information, our supervisor interjects with questions of her own, modeling key questions that may have been overlooked by more beginner interviewers. Notably, this occurs with decreasing frequency as training continues and autonomy becomes more established. However, even in the *advanced* level, our supervisor continues to provide comments, corrective feedback and praise, which allows us to acknowledge our evolving strengths and weaknesses. The following is an example from a supervisee describing her experience in conducting her first clinical interview followed by our supervisor's reflection on the topic:

Emergent Supervisee: *"Despite being initially nervous about conducting my first clinical interview, I found that writing reports provided a mental map for asking questions. After my first interview, my supervisor provided praise and commented on areas I could inquire about in the future. For example, the client in this case had a history of using substances to cope with negative emotions. It was unclear as to whether he would resort to substances again if he was under peer pressure or distress, given that he would soon be released from government custody and live in a new country with unfamiliar caregivers. Near the end of the interview, my supervisor asked the client questions to determine his future substance use risk. I now keep these questions in mind when interviewing minors with prior substance use."*

Supervisor: *"The most difficult aspect of a developmental model of clinical training for me, the supervisor, is remembering to stop myself from interjecting when the trainee is growing from one developmental level to the next. Many times, I have found myself needing to apologize to a trainee for taking over a portion of the interview. When I have succeeded in stopping myself from asking what I consider to be the next logical question, I am often rewarded by hearing the trainee ask that very question themselves. My interruption would have thwarted the very development I have been trying to foster."*

Case Conceptualization

As the supervisee moves along in their training, they become more involved in the process of case conceptualization and recommendations. This portion of supervision allows each of us to explain our reasons for considering a diagnosis and discuss key information obtained during the interview that provide support for our conceptualization. Per the IDM of the MDSM [12; 22], the dimensions of case conceptualization and treatment plan and goal are at the forefront. In working with Latinx undocumented immigrant minors, it is important to consider factors that may influence the current clinical presentation: pre-migration stressors and reasons for migration (i.e. violence in home country, abuse, gang involvement, substance use), the migration journey, separation from caregivers, and the experience of being held in government custody. Immigrant minors' life experiences place them at risk for developing psychopathological symptoms, including symptoms related to trauma, depression, and anxiety [17]. In line with NLPA recommendations, we consider each case individually and provide treatment recommendations that are tailored to each minor – further considering whether the minor will remain in custody or be released to a caregiver soon [18]. We discuss with our supervisor until we agree on the case conceptualization, diagnoses, and recommendations – all based on information obtained during the interview, the self-report measures, and collateral information. The following example illustrates a supervisees' experience in practicing case conceptualization with a supervisor:

Emergent Supervisee: *"Case conceptualization has been the most difficult skill for me to learn thus far. After one of the first interviews I conducted, my supervisor asked me to summarize the case in one sentence, which I found difficult to do. Because I could not initially identify the most pressing concerns, I asked my supervisor to summarize the case in her own words, and she provided a model of how to conceptualize succinctly. After every interview, I summarize the case in my own words and share my thought process with our supervisor with greater confidence."*

The final step culminates with the transition to peer-supervisor, which helps solidify concepts, skills, and the process. Yet, regardless of one's level of autonomy we always have our supervisor present to consult with. Indeed, this model of supervision creates a supervisor-supervisee and peer-supervisor-supervisee relationship that allows each supervisee to slowly and comfortably transition through the IDM developmental levels.

Supervisor: *"Vertical supervision teams are a gift to the supervisor – not only do we get to learn from the client, but we get to learn from the fresh perspective of the junior trainee and the more seasoned, yet different from our own, perspective of a more senior student. It is also an important opportunity to observe and shape the supervision style of students – that is an aspect of clinical training that we often neglect."*

Transitioning to Interviewing in Another Language

Mental health professionals who speak more than one language are becoming more needed as the world becomes more diversified with the constant flux of immigration; however, not enough professionals are bilingual or feel comfortable in their dual-language

abilities [4]. For example, the growing population of Latinxs in the U.S. presents a need for more Spanish-English bilingual mental health professionals. Yet, the reality is that most Spanish-English bilingual therapists feel more comfortable using English simply because it is the language used in their professional training. Thus, even bilingual mental health professionals may not practice in their non-English language, suggesting a need for training in providing services in other languages [1; 4]. Although the exact number of bilingual mental health professionals worldwide is not available, the U.S., for example, experiences a dearth of bilingual clinicians [14]. With over half of Europeans being able to speak an additional language and bilingualism projected to grow in many areas worldwide, the need for bilingual, competent mental health providers is likely expected to increase [5; 10].

In our experience, the transition from interviewing in English to Spanish began in observing our supervisor conduct an interview in Spanish. Indeed, our supervisor's ability to speak Spanish made the linguistic transition attainable, further serving as an effective method for scaffolding the language that is appropriate to use in clinical contexts. As stated by Field and colleagues, "the ability to speak Spanish [between supervisor and supervisee] can be an important relational piece in the supervisory relationship as well as an essential aspect of culturally competent supervision" [12, p. 50]. The following example illustrates a non-native Spanish supervisee's experience in sharing her concerns about interviewing in Spanish:

Advanced Supervisee: *"Given that Spanish is not my first language, I was very nervous to conduct interviews in Spanish. I did not feel confident because my Spanish is 'textbook-Spanish' and I do not know all of the colloquial terms. Our supervisor encouraged me to disclose that Spanish was my second language to our clients prior to every interview and to let them know that if at any point they did not understand me, I could clarify, and vice versa. Both my supervisor and I have observed that such disclosure has helped with building rapport with immigrant minors. Most importantly, she never assumes I do not know certain vocabulary or translates a client's discourse for me unsolicited. This puts learning into my own hands, fomenting independence, and bolstering my confidence in my Spanish language skills."*

Yet, the ability to further develop Spanish-speaking skills in supervision is not circumscribed to only non-native Spanish speakers. As per the MCC within the MDSM, a culturally competent supervisor is able to recognize and adapt to the language proficiency of each supervisee, and grow as a supervisor in the process [12; 20]. The following is an illustrative example:

Supervisor: *"Serving clients in a second language seems to be an equalizer for all members of our vertical supervision team. Just like the advanced and beginner supervises, I am insecure about my Spanish – acquired mostly from my grandparents and never refined through formal education. I have found it helpful to share that insecurity with trainees and even with clients, admitting when I don't know a word they have used or when I can't think of the Spanish word that I want to use. These moments of humility tend to personalize the clinical and training experiences, in my experience. The discomfort all of us share surrounding bilingualism is also a proxy for the insecurity we share about multiculturalism. In almost every interview, a client uses a culturally laden word or phrase that leaves at least some of*

our team in the dark. These moments are important reminders that sharing a language may not be the same as sharing a culture and that humility in that context is needed."

Conclusion

This article described the learning process of four supervisees and their supervisor in conducting clinical interviews with Latinx undocumented immigrant minors. After providing necessary background, we provided a step-by-step process of navigating each developmental level (*beginner to advanced*), then discussed the process of case conceptualization with a unique population, and concluded with describing the transition of interviewing from English to Spanish. Through the article, we provided case examples from both the supervisee and the supervisors' perspective, highlighting how the IDM and the MCC of the MDSM reflected our experiences in clinical work. The style of supervision we outlined provides an easier transition into clinical work. Indeed, steadily increasing responsibilities in the interviewing process prevents supervisees from feeling overwhelmed, incompetent, or anxious to ask questions. Foremost, this gradual transition allows the supervisee to understand how to conduct an interview and the importance of assessment measures and collateral information, and how to incorporate these during conceptualization in clinical reports. Thus, when supervisees interview on their own, they have developed a consistent flow of questions, transitioning smoothly during the interview, and ultimately obtain the necessary information to answer the referral question. Given the unique circumstances of immigrant minors, this process establishes a better understanding of both the challenges and experiences of this population, and prepares supervisees to ask questions that address these topics with sensitivity. Still, to our knowledge, the MDSM [12] has not been empirically tested for its effectiveness in supervision processes in dyads. Future research should focus on empirically assessing its utility with diverse supervisory dyads, including those working with diverse populations.

In sum, this supervision process we outlined in accordance with the MDSM, served as a supplement to our graduate training, and not only prepared us to serve Latinx immigrant minors in the future, but will aid in training other incoming students as well. Providing services to individuals with diverse backgrounds and unique clinical needs, such as immigrant populations, is likely to increase worldwide [16]. Thus, emphasizing cultural competence in both clinical training and supervision worldwide will facilitate delivering services to a diverse clientele in cross-cultural settings.

Executive Summary

- The Multicultural Developmental Supervisory Model (MDSM) is useful in guiding engagement in "culturally and linguistically responsive supervision" [18; 21] when working with Latinx immigrant minors [12].

- It is easier to navigate each developmental level and learn the nuances of working with Latinx immigrant minors with an ongoing dialogue between supervisor and supervisee.

- Through vertical supervision, assessment through a lens of cultural humility is more attainable.

- Transitioning into interviewing in another language must be adapted based on the supervisee's incoming level of other language proficiency but is an important process for non-native and native Spanish-speakers alike.

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Клинический тренинг психологов, работающих с нелегальными несовершеннолетними латиноамериканскими иммигрантами: примеры из практики и критический анализ результатов использования концепции Модели супервизии мультикультурного развития (MDSM)

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По состоянию на 2017 год число иммигрантов во всем мире увеличилось с 220 миллионов до 248 миллионов и продолжает расти [25]. Растущее этнокультурное разнообразие требует пристального внимания к проблемам формирования мультикультурной компетентности у специалистов в области психического здоровья. Совершенствование мультикультурных компетенций у специалистов происходит на протяжении всей карьеры; овладение базовыми навыками работы с представителями разных культур начинается в рамках практикумов, а далее моделируется и подкрепляется супервизиями. Модель супервизии мультикультурного развития (MDSM) – научно обоснованный подход, фокусирующийся на формировании мультикультурных компетенций в супервизионных диадах [6]. В статье представлен опыт четырех аспирантов, прошедших супервизию по модели MDSM, в проведении клинических интервью на испанском языке с несовершеннолетними нелегальными иммигрантами-латиноамериканцами, находящимися в заключении в Соединенных Штатах Америки и представляющих активно растущую популяционную группу, имеющую свои уникальные клинические особенности. Приводится собственный опыт супервизора в проведении тренингов и укреплении мультикультурных навыков у начинающих специалистов в области психического здоровья. В данной статье авторы проиллюстрируют собственную траекторию различных этапов обучения, включая процесс концептуализации клинических случаев и смену языков при проведении клинических интервью, а также значимость учета собственной культурной идентичности в клинической работе. Несмотря на то, что авторский опыт сосредоточен на тренинге компетенций, необходимых в клинической работе с представителями билингвальных культур, обучение мультикультурным компетенциям становится все более актуальным во всем мире, особенно в Европе, где 54% населения говорят на нескольких языках [23]. Хотя авторы оценивают модель MDSM как результативный метод мультикультурного развития, необходимы эмпирические исследования, позволяющие доказать эффективность применения этой модели.

Ключевые слова: иммиграция, несовершеннолетние, супервизор-супервизант, мультикультурные компетенции.

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Complementary and Alternative Treatments for Autism Spectrum Disorders: A Review for Parents and Clinicians

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Complementary and alternative therapy (CAT) methods for children with autism spectrum disorders (ASD) are widespread in European countries and the Russian Federation; however, their efficacy and safety is not routinely considered by parents and clinicians when recommended or used. The current narrative review presents the most widely known CAT interventions for children with ASD synthesizing data from meta-analyses, systematic reviews, and randomized controlled trials obtained from the PubMed database based on the safety-efficacy model. We have found that, of the reviewed CATs, only the melatonin intervention can be considered safe and effective for children with ASD with comorbid sleep problems. The methods that were classified as safe but had inconclusive efficacy are recommended to be implemented only when they do not interfere with front

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line treatment for ASD, Applied Behavior Analysis (ABA). Methods with the lack of current evidence for the efficacy such as auditory integration therapies, bioacoustic correction, sensory integration therapy, micropolarization, animal assisted therapy, and dietary interventions should not be recommended as alternative treatments and can only be used as complimentary to ABA-based interventions. We advise against the use of chelation, hyperbaric oxygen therapy, and holding therapy due their documented harmful psychological and physical effects. When considering CAT for ASD we recommend parents and clinicians use the criteria suggested by Lofthouse and colleagues [59]: only the therapies that are safe, easy, cheap, and sensible can be recommended and used, as opposed to therapies that are risky, unrealistic, difficult, or expensive that should not be recommended or utilized.

Keywords: autism spectrum disorders, complimentary treatments, alternative treatments, complementary and alternative therapy, safety-efficacy model.

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Introduction

Autism spectrum disorders (ASD) is a group of neurodevelopmental disorders characterized by social communication deficits and repetitive and restricted forms of behavior that can be accompanied by difficulties in language, intellectual, and adaptive functioning. Empirically supported treatments for ASD include treatments based on intensive applied behavioral analysis, ABA [35], and pharmacotherapy to address specific comorbid features of the spectrum such as irritability (e.g., risperidone and aripiprazole and self-aggression) [40; 41]. Along with conventional evidence-based treatments, methods of complementary and alternative therapy (CAT) are widespread [37]. Complementary treatment is used together with conventional medicine, while alternative treatment is used instead of conventional medicine [73]. It is assumed that a truly complementary therapy should have empirically demonstrated incremental effects when added to conventional therapy. Likewise, a truly alternative therapeutic approach should have effects comparable to conventional therapy [59]. Applying an efficacy-safety model, described by Kemper and Cohen [48], we have classified the most widely known CAT interventions for ASD. The model helps to evaluate the pros and cons of particular CATs and make a decision about their use. According to this model, CATs with well supported efficacy and safety can be recommended when they do not interfere with conventional interventions. CATs with scientifically proven safety, but with inconclusive, unknown efficacy, or the ones with no demonstrated efficacy, can be accepted and monitored by clinicians as long as they do not prevent families from receiving front line interventions. The use of CATs with little or no efficacy and potentially harmful side effects should be

discouraged. Additionally, expensive and time-consuming CATs should be avoided. The current narrative review integrates results of meta-analyses, systematic reviews, and randomized controlled trials (RCTs) that evaluated efficacy and safety of specific CAT interventions for children with ASD.

Method

Decisions about efficacy and safety were made after evaluation of the results of identified studies that were searched in PubMed database. The combination of the search terms "autis*" and names of specific CATs were used. The list of the most widely known CATs was derived from the recent meta-analyses and studies of on the prevalence of CATs for the treatment of ASD [85; 86]. The search was performed on articles published in English between the years 2000 and 2020. We report only studies of CAT interventions for children under 18 years old, unless stated otherwise. The identified CATs were assessed using efficacy-safety model described by Kemper and Cohen [48]. The results from meta-analyses and systematic reviews were synthesized to determine efficacy and safety of a given intervention. In the absence of thereof, the results from individual RCTs were included in the assessment of efficacy/safety.

Results

Safe/well-tolerated, effective

CAT was classified as safe, well-tolerated, and effective if its efficacy and safety for treating ASD or related symptoms was supported by the results of meta-analyses or systematic reviews of RCTs and calculated effect sizes in the identified studies varied from medium to large. Only one intervention was assigned to this category.

Melatonin. A number of studies have demonstrated that sleep problems and alterations of circadian rhythms are frequent in ASD across all ages [17]. Melatonin is an endogenous neurohormone released by the pineal gland in response to decreasing levels of light. Decreased levels of melatonin in individuals with ASD were linked to their symptom severity [18]. In the literature, we identified two systematic reviews and meta-analyses [77; 83], six systematic reviews [17; 18; 36; 46; 68; 83], and one meta-synthesis [25]. A meta-analysis of 5 RCTs revealed significant improvements with large effect sizes for sleep duration (73 min compared with baseline (g = 1.97, 95% CI [1.10, 2.84]) and 44 min compared with placebo (g = 1.07, 95% CI [.49, 1.65]) and amount of time it takes to go from being fully awake to sleep, measured by sleep onset latency (66 min compared with baseline (g = -2.42, 95% CI [-1.67, -3.17] and 39 min compared with placebo (g = -2.46, 95% CI [-1.96, -2.98]), but night-time awakenings were unchanged [83]. The dosage varied from 2 to 10 mg. The time of administration was from 10 days to 3 months. The duration of treatment was between 10 days and 12 weeks. Overall side effects of melatonin were minimal (tiredness, dizziness, and diarrhea). A meta-analysis performed by Parker and colleagues found a statistically significant increase in diary-reported total sleep time for melatonin compared with placebo for various disorders (pooled MD = 29.6 min, 95% CI [6.9, 52.4], p = .01), with the largest effect for populations with ASD (pooled MD = 64.7 min., 95% CI [58.8, 70.7] vs pooled MD = 15.9 min., 95% CI [9.2, 22.6] [77]. The dosage was from

.5 to 9 mg. According to a meta-synthesis [25], melatonin had high efficacy for sleep latency, duration, and bedtime resistance. The question about the optimal dosage remains open as the protocols differed across studies. Melatonin is considered a safe and well-tolerated intervention, which can be recommended for children with ASD with comorbid sleep problems. The existing evidence is based on studies of children from 2 to 18 years of age.

Safe/well-tolerated, inconclusive efficacy

CAT was classified in this category, if its safety was confirmed in meta-analyses, systematic reviews, or RCTs, while inconclusive results were revealed. Six different groups of intervention comprise this category: music therapy, massage, physical activity interventions, acupuncture, neuromodulation and brain stimulation techniques, and omega-3 supplements.

Music therapy. A meta-analysis of music interventions for children and adolescents with ASD that included 9 studies revealed positive effects overall with effect sizes ranging from .09 to 3.36 and an overall effect size of d =.77 [99]. A later systematic review that included 10 studies (N = 156) reported positive effects in the areas of generalized social interaction (standardized mean difference, *SMD* = .71, 95% [CI .18, 1.25], non-verbal communicative skills within the therapy context (*SMD* = .57, 95% CI [.29, .85], verbal communicative skills (*SMD* = .33, 95% CI [.16, .49], initiating behavior (*SMD* = .73, 95% CI [.36, 1.11], and social-emotional reciprocity (*SMD* = 2.28, 95% CI [.73, 3.83]. No side effects were reported in any of the studies [31]. This CAT can be classified as safe, but the evidence is inconclusive, partially due to small sample sizes.

Massage. Massage therapy is traditionally used to handle hypo- or hypersensitivity and anxiety of a child with ASD, however, the related evidence is equivocal [98]. Primarily, meta-analytic studies of massage effects are limited to pain treatment [23] and do not focus on the treatment of ASD. According to systematic reviews [15; 54], massage therapy is associated with improvements in parents' and teachers' evaluation of a child's adaptive behavior, compared to control non-conventional intervention or conventional language/special education treatment alone. Moreover, massage seems to have a positive effect on comorbid sleep problems in ASD as revealed by a systematic review of four studies: two of them utilized Qigong massage, one – Thai, and one – traditional massage; the duration of the intervention was in the range of 1–5 months, one or two times a week [69]. Authors of reported studies note the insufficient empirical evidence for firm conclusions regarding efficacy, however, massage therapy is considered to be safe [96]. The studies included in the systematic reviews were conducted with children from 1 to 10 years of age.

Physical activity interventions. Physical activity interventions are aimed at managing difficulties with movement control that are common in individuals with ASD (large overlap between the ASD and developmental coordination disorder [94]; poor gross motor skills [62]; reduced bodily awareness [8; 28]; lack of bodily connectedness [78]. Body-oriented treatments are motivated by the bottom-up embodiment approach [27; 30]. Meta-analyses reported that motor activity programs are beneficial for both the physical and mental

health of children with ASD [93; 103]. For example, a meta-analysis by Healy et al. [38] found the overall moderate positive effect of physical activity (g = .62) on manipulative skills, strength, locomotor skills, social functioning, and endurance; however, great heterogeneity in the studies was detected. A more recent meta-analysis by Howells et al. [42] that targeted the physical activity in kindergarten and school-aged children with ASD found no statistically significant effect on communication (k = 4; g = .13, 95% CI [-.12, .38], p = .13) but revealed a moderate effect for social functioning (k = 6; g = .45, 95% CI [.19, .72], p = .001). Overall, the heterogeneity in the studies, utilized intervention programs and measured outcomes make the findings on efficacy inconclusive. If delivered by a qualified specialist, the physical activity interventions are safe. Studies were conducted with children from 3 to 16 years of age.

Acupuncture. Acupuncture is a type of traditional Chinese Medicine that uses stimulation of special points of the body (acupoints) by insertion of thin needles to skin to unblock the flow of qi ("energy") [72]. Acupuncture techniques vary from hand to electro- or laser-acupunctures; the sessions usually last for 20-30 minutes (but may vary from 15 seconds to 8 hours), and the duration of treatment ranges from 4 weeks to 9 months [63]. A recent meta-analysis of 17 RCTs revealed that acupuncture complementary to behavioral and educational intervention decreased the overall scores on the Childhood Autism Rating Scale (CARS; *MD* = -8.10, 95% CI [-12.80, -3.40]) and the Autism Behavior Checklist (ABC; *MD* = -8.92, 95% CI [-11.29, -6.54]) in comparison to behavioral and educational monotherapy in children under the age of 18 [54]. Reported side effects varied from none to initial fear or irritability in some children, thus authors cautiously considered acupuncture as a safe method with mild possible adverse effects. Moreover, meta-analytic study of 11 RCTs claims that scalp acupuncture as monotherapy is more effective in lowering both CARS and ABC scores for core ASD symptoms than conventional behavioral and educational interventions [57]. However, the observed studies had methodological issues due to the difference in the onset times of intervention effects that were not taken into account.

Neuromodulation and brain stimulation techniques. Neuromodulation techniques are non-invasive methods that use currents of low intensity to stimulate different brain regions in order to change cortical excitability. The most widely applied techniques are transcranial magnetic stimulation, delivered as a single (TMS) or repetitive pulses (rTMS) and transcranial direct current stimulation (tDCS). They are typically delivered in a couple of weekly sessions, but some interventions involve up to 29 days of consecutive therapy [55]. A recent systematic review found that the largest therapeutic effects of TMS and tDCS for a range of neurodevelopmental disorders were observed when treatments were combined with the cognitive training [29]. Another meta-analysis based on 23 studies evaluated the effectiveness of rTMS for the treatment of ASD separately for controlled and non-controlled studies. Findings show that rTMS treatment results have small to moderate effects on stereotyped behaviors (g = -.52, 95% CI [-.72, -.32]), social behaviors (g = -.35, 95% CI [-.67, -.03]) and executive functioning tasks (g = -.38, 95% CI [-.61, -.16]). The observed effects should be considered with caution as authors have identified a risk of reporting bias and no information about the robustness of the gains over time was available [9]. These techniques are considered a safe intervention with minor side effects of physical discomfort such as itching, burning sensations, and headaches, which are not significantly

different from placebo group [16]. A review of 2015 concluded that there is not enough evidence for the use of either tDCS or rTMS in children with ASD due to the lack of understanding of the mechanisms, uncertainty regarding the areas for stimulation, and unclear length of intervention [95]. Most studies were conducted with predominantly male participants in the age range of 9 to 17 years. More research is needed to better understand the demographic and neurophysiological factors that predict the response to stimulation.

Omega-3. The rationale for using omega-3 (ω-3) fatty acids in patients with ASD is based on the findings of reduced ω-3 in children with ASD [92]. Four systematic reviews and meta-analyses investigated effects of ω-3 on the symptoms of ASD. While the first of them, synthesized findings from 2 RCTs with the doses from 1.3 to 1.5 mg/day and the duration of supplementation from 6 to 12 months, demonstrated no statistically significant improvements in social interaction, communication, and stereotypical behaviors [44], further meta-analyses, all published in 2017, revealed more positive results. A systematic review and a meta-analysis of 6 RCTs [22] identified significant reductions in hyperactivity (*MD* = -2.69, 95% CI [-5.36, -.02]), lethargy (*MD* = -1.97, 95% CI [-3.57, -.37], and stereotypical behavior (*MD* = -1.07, 95% CI [-2.11, -.03]), while no significant differences between supplementation of ω-3 and placebo were found in the global assessment of functioning or social responsiveness. The dosage varied from .2 to 1.5 g/day and the duration of administration was from 6 to 24 weeks. Another systematic review and meta-analysis of 5 RCTs [41] reported differences in lethargy symptoms (*MD* = 1.98; 95% CI [.32, 3.63]), positive effects for externalizing behavior (*MD* = -6.22; 95% CI [-10.9, -1.59]), social skills (*MD* = -7.0; 95% CI [-13.62, -.38]), and daily-living (*MD* = 6.2; 95% CI [.37, 12.03]). The third meta-analysis of 4 RCTs [67] with dosage from .24 to .84 g/day and administration time from 6 to 16 weeks identified significant improvements in social interaction (*MD* = -1.96, 95% CI [-3.5, -.34]), repetitive and restricted behaviors (*MD* = -1.08, 95% CI [-2.17, -.01]). The age of participants ranged from 3 to 28 years of age. The problem of small sample sizes and the need for further investigation of the ω-3 in complementary treatment of ASD was mentioned in all studies. All described studies characterized ω-3 as a safe and well-tolerated supplement.

Safe/well-tolerated, no evidence of efficacy

This category includes CATs that do not pose any safety concerns, according to meta-analyses, systematic reviews and RCTs; however, there are no efficacy data for the treatment of ASD. Three types of interventions were included in this group: dance therapy, multivitamin/mineral, and prebiotic/probiotic supplements.

Dance therapy. Dance therapy and dance movement therapy (DMT) lies at the junction of movement-based therapies, art-therapy and mind-body practices. In DMT, the client follows or leads therapist's motor behaviour (mirroring technique) to achieve mutual attunement; in dance intervention client practices various dance styles [24]. While 2.4% of individuals with ASD use dance and DMT [34], the empirical support for its effectiveness is inconsistent and limited to adult samples [39; 50–52; 66]. The meta-analysis of Koch and colleagues [51] included 41 controlled interventions that implemented dance or DMT for an average of 11 weeks and two sessions per week (range 1–4) that lasted for around one hour (range 40–120 min). The authors reported a medium

effect (*d* = .60) on mental health outcomes with a highly heterogeneous effect of dance therapy and a more consistent effect of DMT. However, those interventions were implemented in a wide range of clinical populations and age groups, thus results cannot be extrapolated to children with ASD specifically.

Multivitamin/Mineral Supplements. The rationale for multivitamin treatment is based on the frequently observed deficiency of vitamins and micronutrients in children with ASD that could result from food selectivity or altered gastrointestinal absorption [15]. Biomarkers of general nutritional status are associated with autism severity [70]. Surveys of 539 physicians found that multivitamin/mineral supplements are widely recommended (by 49% of physicians) [33]; however, the evidence for their efficacy in the treatment of ASD is limited. No systematic reviews and meta-analysis in ASD samples were identified. The only RCT showed significant improvements in hyperactivity, tantruming, and receptive language scores of children with ASD after 3 months of treatment [5]. While more research is needed, micronutrient supplements are safe in prescribed doses and can be recommended for children with restricted or idiosyncratic diets [59].

Probiotic/Prebiotic Supplements. An idea of the using of probiotic supplementation in complementary treatment of ASD is based on the evidence about comorbidity of ASD with dysbiosis and gastrointestinal problems, as well as on the assumption that alterations in microbiota composition may contribute to underlying mechanisms of neurodevelopmental disorders [43]. We have identified four systematic reviews investigating effects of pro- and/or prebiotics in treatment of ASD and related problems, meta-analyses have not been found [10; 58; 74; 82]. Despite of the potential positive role of pro- and/or prebiotics in treating ASD, these studies are consistent in the conclusions that there is limited evidence to support this CAT and additional rigorous RCTs are needed. For example, the study by Liu and colleagues identified two RCTs and three non-RCTs indicating trends to improvement in caregiver reported ASD symptoms and gastrointestinal problems. However, both RCTs have revealed flaws in statistical analysis, short trial duration (less than 1 month), small sample and effect sizes, and some additional methodological flaws. Similar concerns were found for non-RCTs. Adverse effects of probiotic therapy are reported to be infrequent and non-severe (in some cases diarrhea, bloating, abdominal cramps, and skin rash were mentioned). While additional studies of side effects are needed in general, pre- and probiotic therapy in prescribed doses is appreciated as safe for the treatment of gastrointestinal problems in ASD. The RCTs listed in this section the age range of children was from 4 to 16 years. Approximately 98% were male and approximately 2% were female. Non-RCT studies included children from 3 to 16 years.

Unknown safety, inconclusive or no efficacy

CATs with unknown or unclear safety and few or no efficacy data were included in this category. Five interventions form this category: sensory-integration therapy, micropolarization, auditory integration therapies, animal assisted interventions, and gluten and/or casein-free diets.

Sensory Integration Therapy. Sensory integration therapy is targeting impairments in sensory information processing, associated with ASD. Existing interventions can be grouped into two categories: Ayres Sensory Integration, ASI, and Sensory-based

Interventions, SBIs [97]. ASI therapy sessions are delivered by a certified occupational therapist in the form of guided play in a sensory enriched environment [88]. SBIs primarily occur in the context of everyday life. The procedures include the use of weighted vests and blankets, bouncing balls, brushes, and special moving seating devices [19]. We were unable to identify a meta-analysis on any category of sensory integration therapies. According to the recent systematic reviews, ASI shows promising results for children aged 4-12; the observed effects were positive, effect sizes ranged from $\eta^2 = .23$ to $\eta^2 = 1.2$ [88; 87], while the results for SBIs are less conclusive as most of the studies employed single-subject or case report design [11; 19].

Micropolarization. Micropolarization is a variation of tDCS with a current of significantly lower frequency, i.e. up to 100 times smaller than traditional tDCS [26]. The technique was developed in Russia which explains its local popularity in the clinical settings. Clinical trials using this method lack randomization and systematic protocol with regard to current intensity and duration. The evidence described is in favor of its effectiveness points to normalization of EEG patterns and reductions of paroxysmal activity in children 6-16 years [14; 90], but the data can only be seen as preliminary. Importantly, medical service providers in Russia often use the term "micropolarization" to refer to tDCS; therefore, in order to determine the efficacy and safety, current intensity should be considered.

Auditory integration therapies. Auditory integration therapies lie at the junction of neuromodulation and sensory integration techniques and include auditory integration training (AIT), Tomatis method, and Samonas sound therapy. The rationale for AIT is to ameliorate auditory processing deficits typical of individuals with ASD. They involve listening to the electronically modulated presentation of voice, classical music, or brain activity which is usually delivered over the headphones. AIT is provided in two 30 minutes intervention blocks a day over the course of 10 days. While no significant side effects were reported, some studies report physical discomfort due to excessive loudness [7; 13]. The outcomes of AIT have questionable clinical significance [91]. We have identified one meta-analysis based on 6 RCTs that reported controversial results. Three studies found no effect over control conditions and the other three showed improvements of ASD symptoms after 3 months of AIT. According to the authors, the validity of the studies is questionable and no effect sizes could be computed [91]. The reported age range was wide from 3 to 39 years. Bioacoustic correction, a type of AIT that is based on listening to computerized transformation of the patient's EEG, suggests that the method allows to ameliorate the sensory deficits by letting the patient "hear his or her brain working" [102]; however, the method has not been systematically studied and lacks evidence for the use with children with ASD.

Animal Assisted Interventions. Animal Assisted Interventions (AAI) includes animal assisted therapy that has clear goals and animal assisted activities such as recreational activities with animals [32]. The literature on AAI is rather large, with two meta-analyses and five systematic reviews focusing on its efficacy for different neurodevelopmental disorders. An early meta-analysis, conducted by Nimer and Lundahl [75] and based on 49 studies, found that AAI has a low to moderate effect size in decreasing ASD symptoms in children and adolescents (0-17) and problem behaviors: for well-being (d = .39, 95%

CI [.29, .50]), behavioral (d = .51, 95% CI [.38, .65]) and medical indicators respectively (d = .59, 95% CI [.26, .77]). However, the study was later criticized for the lack of specificity for ASD [61]. Another systematic analysis conducted in 2013 demonstrated that children and adolescents (5-19 years of age) in AAI showed increased social interaction, decreased self-absorption, and avoidance that was reported in 9 of 14 studies [76]. However, some studies included interactions with animals as a measure of social communications and language, so the results can be inflated. The most current systematic review and a meta-analysis found support for AAI improving the social skills of individuals with ASD, based on 9 studies that were analyzed [21]. Sample sizes were small, and the effect sizes could not be computed. A review by Kamioka and colleagues [47] that summarized 11 RCTs on the effects of AAI for various mental health problems concluded AAI may be an effective treatment for people who like animals. Though no study has systematically investigated adverse effects of AAI, there are data supporting increased sensory seeking (willingness to touch objects or people), and reduced sensory sensitivity (aversion to jumping or falling) in children exposed to AAI [12; 49]. Some data also points to increased discussion about the animal after the sessions [65], which can be interpreted as promotion of fixations in children with ASD. Currently, both safety and evidence regarding AAI is inconclusive due to heterogeneity of samples and a wide range of animals used in therapy [47; 76].

Gluten and/or casein-free diets. Gluten and/or casein-free (GFCF) diets in treatment of ASD are based on the assumption that abnormal metabolism of these two proteins in ASD may lead to excessive opioid activity in the central nervous system, thus altering its functions; this assumption is referred to as “opioid excess theory” [100]. While there is no statistically significant association between ASD and celiac disease [60], GFCF are widely used in ASD treatment with 13% of parents reporting the use of GFCF diets in European countries [85]. Parental reports on GFCF dietary effects found positive rates of symptoms improvement in 41–65% of cases [81]. We identified 3 systematic reviews of GFCF in treatment of ASD [64; 79; 87]. The most recent systematic review that included 6 RCTs (ages 2–16 years) [79] reported that only two trials indicated statistically significant differences in core symptoms of ASD with improvements in communication and social interaction. Included RCTs varied in treatment protocol, duration (from 7 days to 2 years), and outcome measures. No adverse effects were reported (but only 2 RCTs explored this issue). A systematic review of 19 RCTs concluded that there is not enough evidence for the use of dietary treatment in ASD [87]. Taking into account inconclusive efficacy and a risk of deficiency of some nutrients caused by food aversions and selectivity associated with ASD [64; 80], GFCF diets should only be recommended in the cases of diagnosed gluten and/or casein intolerance or allergy.

Harmful, inconclusive or no efficacy

CATs with questionable efficacy, severe side effects, and/or documented cases of injuries were included in this category. Three interventions (chelation, hyperbaric oxygen, and holding therapy) form this category.

Chelation. Chelation is a process of removing heavy metals from the blood. This treatment is based on an unsupported theory that ASD is caused by heavy metal toxicity. One systematic review [45] with only one RCT of a poor quality (N = 82, aged 3–8 years)

compared children who received one versus multiple rounds of oral dimercaptosuccinic acid (DMSA) at doses of 10 mg/kg/d 3 times per day. No significant group differences in ASD symptoms were found. While safety was not examined in this study, other studies have shown that chemicals utilized in chelation treatment have a number of harmful side effects, including gastrointestinal symptoms, fever and vomiting, hypocalcemia, renal impairment, musculoskeletal, hypertension, and cardiac arrest [53]. Reported adverse effects of using pharmaceutical chelating agents for ASD currently outweigh its potential benefits.

Hyperbaric Oxygen Therapy. Hyperbaric oxygen therapy, which requires the patient to breath 100% oxygen intermittently, is hypothesized to reduce the biochemical dysfunction and clinical symptoms of ASD [84]. Usually, this therapy is recommended for patients affected by decompression sickness, carbon monoxide poisoning, or infections involving compromised tissue [6]. The most recent systematic review [101] identified only one low quality small RCT (N = 60, age 3–9 years) which showed no improvements in ASD symptoms. Adverse effects included increased occurrence of ear barotrauma. Taking into account the absence of persuasive theory underlying the use of oxygenation, its questionable efficacy, possible barotraumas, and unknown long-term safety, Xiong and colleagues concluded further clinical trials for children with ASD are not appropriate [101].

*Holding Therapy***.** Holding therapy of ASD is based on the unsupported assumption that ASD originates from the disrupted attachment. In a holding therapy session, a caregiver physically restrains a child with ASD in order to force eye contact and repair attachment. The only systematic review [71] identified 8 studies of holding interventions in treatment of ASD. While all of them reported positive effects, the studies were methodologically flawed. Severe side effects, including lethal cases, were documented. In the absence of a scientifically based theory, documented deaths during treatment, and the violent nature of the intervention, this therapy was banned by a number of leading professional organizations. Holding therapy along with other controversial attachment interventions, such as rebirthing, was banned by the American Professional Society on the Abuse of Children [56] and strongly condemned by the ethics code of American Psychological Association [20]. However, in Russia holding therapy is still accepted in academic and clinical settings [1–4], which contradicts international standards of care for individuals with ASD.

Presence of CAT among Russian medical services

To evaluate the popularity of CATs in the treatment of ASD in Russia, we have conducted a small-scale study, analyzing publicly available information from the state and private medical centers of the seven largest cities in Russia. The analysis included website searches and brief surveys broadly asking about the types of services provided for ASD, with regard to CATs specifically. Out of 93 identified clinics, data from 60 clinics were analyzed (Table). Most of the CATs offered in the clinics in Russia are safe but have inconclusive efficacy, which is important considering available resources and the cost of treatment. Alarmingly, 5% of clinics reported the use of holding therapy and another 5% reported the use of hyperbaric oxygen therapy which are classified as harmful CATs with no efficacy.

Table

Frequency of interventions used by approached clinics (*N* = 60)

Group	Intervention	Frequency, n (%)
Evidence-based treatment	Applied Behavioral Analysis (ABA)	21 (35%)
Safe/well tolerated, inconclusive efficacy	Physical Activity Interventions	27 (45%)
	Massage	22 (36.7%)
	Acupuncture	11 (18.3%)
	Transcranial Direct Current Stimulation (tDCS)	8 (13.3%)
	Music Therapy	7 (11.7%)
	Transcranial Magnetic Stimulation	5 (8.3%)
Safe/well tolerated, no evidence of efficacy	Art Therapy	20 (33.3%)
	Dance and Dance Movement Therapy	6 (10%)
Unknown safety, inconclusive or no efficacy	Sensory Integration Therapy	23 (38.3%)
	Tomatis Method	10 (16.7%)
	Bioacoustic Correction	10 (16.7%)
	Dietary Interventions	10 (16.7%)
	Animal Assisted Interventions	5 (8.3%)
Harmful, inconclusive or no efficacy	Holding Therapy	3 (5%)
	Hyperbaric Oxygen Therapy	3 (5%)
	Chelation	0 (0%)
Unclassified	Speech Therapy	17 (28.3%)
	Speech Therapy Massage	9 (15%)
	Balance Stimulation Activities	8 (13.3%)
	Biofeedback	6 (10%)
	Interactive Metronome	3 (5%)

Conclusion

In this synthesis, we reviewed available complementary and alternative treatments (CAT) for children with ASD based on their efficacy and safety. Oral melatonin is the most investigated complimentary intervention with the most consistent results in favor of its efficacy and safety. Thus, it can be recommended for children with ASD with sleep

disturbances, when ABA-based and cognitive-behavioral therapy alone are not effective. However, further investigations to determine optimal doses and treatment duration, as well as studies on long-term safety of melatonin, are still needed. The methods that were classified as safe but had inconclusive efficacy are recommended to be implemented only when they do not interfere with the front line treatment for ASD, that is ABA-based therapies. Given the lack of current evidence for the efficacy of auditory integration therapies, bioacoustic correction, sensory integration therapy, micropolarization, animal assisted therapy, and dietary interventions, these methods should not be recommended as alternative treatments and can only be used as complimentary to ABA-based interventions. The use of chelation, hyperbaric oxygen therapy, and holding therapy is unethical and unadvised due to harmful psychological and physical effects. In addition to the efficacy/safety model proposed above, we recommend that parents and clinicians use the criteria suggested by Lofthouse et al. [59]: only the therapies that are safe, easy, cheap, and sensible can be recommended, as opposed to therapies that are risky, unrealistic, difficult, or expensive that should not be recommended. Most of the studies reviewed here were conducted with predominantly male samples of children in a wide age range from 1 to 18 years of age. Notably, information on ethnicity and socio-economic characteristics was missing in most studies. Future systematic reviews and meta-analyses should address this shortcoming by including demographic information. Although we have tried to conduct this review as comprehensively as possible and avoid biases associated with the selection of literature, it has a number of limitations. While it was not a systematic review, a number of meta-analyses, systematic reviews, and RCTs may not have been identified. Thus, offered recommendations should be interpreted with caution. It is also worth noting that the paper only focuses on the most popular CATS and does not cover the full spectrum.

In addition to our review, we have also conducted preliminary research of the extent to which alternative interventions for children with ASD are offered in clinical settings in Russia. Obtained information is preliminary and future studies of the prevalence of CATs should be conducted systematically. Additionally, there is a need for dissemination work among parents and professional communities about harmful CATs such as chelation, oxygenation, and holding therapy that are still used in Russia.

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Дополнительные и альтернативные вмешательства при расстройствах аутистического спектра: обзор для родителей и клиницистов

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Дополнительные и альтернативные вмешательства при расстройствах аутистического спектра: обзор для родителей и клиницистов
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Методы дополнительных и альтернативных вмешательств (Complementary and Alternative Therapy, CAT), применяемые в работе с детьми с расстройствами аутистического спектра (РАС), распространены в европейских странах и в Российской Федерации, однако их эффективность и безопасность обычно не рассматриваются клиницистами и родителями составлении рекомендаций и использовании. Данный аналитический обзор посвящен наиболее распространенным дополнительным и альтернативным вмешательствам, применяемым в работе с детьми с РАС. На основе анализа информации, представленной в мета-анализах, систематических обзорах и рандомизированных контролируемых исследованиях в базе данных PubMed, рассматриваются безопасность и эффективность каждого вида вмешательств. Обнаружено, что из всех рассмотренных методов только вмешательства с применением мелатонина можно считать безопасными и эффективными для детей с РАС с сопутствующими нарушениями сна. Методы, которые были классифицированы как безопасные, но не доказавшие свою эффективность, рекомендуется применять только в том случае, если они не противоречат терапии РАС «первой линии» – применению прикладного анализа поведения (Applied Behavioral Analysis, ABA). Методы, доказательств эффективности которых обнаружено не было, такие как терапия слуховой интеграции, биоакустическая коррекция, терапия сенсорной интеграции, микрополяризация, пет-терапия и диета, не должны рекомендоваться в качестве альтернативных методов терапии и могут использоваться только в дополнение к методам лечения на основе ABA-вмешательства. Не рекомендуется использовать хелатирование, гипербарическую кислородную терапию и холдинг-терапию по причине их установленного вредоносного психологического и физического воздействия. При выборе методов дополнительных и альтернативных вмешательств при РАС мы рекомендуем родителям и клиницистам использовать критерии, предложенные Н. Лофтхаусом и коллегами (2012): могут быть рекомендованы только безопасные, простые, экономные и разумные методы вмешательств, тогда как методы лечения, которые являются рискованными, трудно реализуемыми или дорогими, использовать не следует.

Ключевые слова: расстройства аутистического спектра, дополнительные вмешательства, альтернативные вмешательства, CAT, модель безопасность-эффективность.

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