



Anxiety and Depression Among Socioeconomically Vulnerable Students with Learning Disabilities: Exploratory Meta-analysis

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Abstract

This study explored the hypothesis that socioeconomically vulnerable children and adolescents who have learning disabilities (LDs) more prevalently experience anxiety and depression than their otherwise similar peers in elementary or high school who are not socioeconomically vulnerable. A systematic search found eight relevant surveys published between 2000 and 2019 that were synthesized with an exploratory meta-analysis. The overall sample-weighted synthesis found that 56% of students with LD scored higher on validated measures of anxiety and depression than did their typical peer without LD [$d=0.16$, 95% confidence interval (CI) 0.04, 0.28]. In comparison, the sample-weighted synthesis among socioeconomically vulnerable students found that 74% of them with LD scored higher on anxiety and depression measures than did their typical peer without LD ($d=0.63$, 95% CI 0.45, 0.81). This novel synthetic comparison supported the exploratory hypothesis that socioeconomically vulnerable children and adolescents with LD are at much greater risk of being anxious and depressed than are more socioeconomically resourceful students with LD. This review-generated finding, especially given the relatively modest database available for meta-analysis, is probably best considered a screened hypothesis for future primary research testing. Future research needs are discussed. Preliminary practical implications are also discussed.

Keywords Learning disabilities · Anxiety · Depression · Socioeconomic status · Racialized minority group · Youth · Meta-analysis

Learning disabilities (LDs) are characterized by “persistent difficulties learning keystone academic skills” (American Psychiatric Association, 2013). These include skills that must be directly taught and learned, such as reading comprehension, written expression, spelling, reading and mathematical reasoning. A LD diagnosis can only apply to individuals with average or above average intelligence, and so cannot apply to individuals with intellectual disabilities or global developmental delays. Neurodevelopmental disorders with biological components and distinctive features relating to abilities to process information, LD may affect one or any number of academic domains.

LDs are one of the most prevalent academic challenges experienced by children and adolescents in the USA and Canada. Nearly half of all kindergarten to grade 12 students, aged 4 to 18, receiving special education services have LD and such estimates seem quite similar in Canada and the USA (Butterworth & Kovas, 2013; U.S. Department of Education, 2003, 2015). That amounts to an aggregate North American population estimate of three million students with LD. As these children typically have evident discrepancies between their academic abilities and achievements, one can imagine the stressors and related psychosocial and mental health challenges that they might also more prevalently experience. In fact, a generation ago it was suggested that students with LD were at consequently increased risk for anxiety disorders and depression (Huntington & Bender, 1993; Greenham, 1999). At the same time the World Health Organization (2008) predicted mental health challenges, including symptoms of anxiety and depression, would be one of the most prominent, yet undetected and untreated, causes of disability and death among children by 2020 (Herman, Reinke, Parkin, Traylor, & Agarwal, 2009; U.S.

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Department of Health and Human Services, 1999). Although well-known to be commonly experienced by at least one of every five school-aged children (Merikangas & Avenevoli, 2003), anxiety and depressive disorders are likely even more prevalent among those with LD. The original aim of this study was to synthesize this field's knowledge on the associations of LD with anxiety and depression among elementary and high school students.

Previous Research Syntheses of Anxiety, Depression and LD

The initial overview of this field found four previous systematic reviews or meta-analyses that synthesized the findings of 137 studies of 23,100 school-aged children published between 1979 and 2018, the vast majority of which were published before 2000 (Francis, Caruana, Hudson, & McArthur, 2019; Maag & Reid, 2006; Nelson & Harwood, 2011a, b). They importantly cross-validated the consistent observation that students with LD scored significantly higher on validated measures of anxiety and depression than students without LD. This study-weighted overview estimated that seven of every 10 of the study participants with LD scored higher on measures of anxiety and depression than did typical non-LD participants. This field's extant synthetic evidence, therefore, allows for the inference that symptoms of anxiety and depression are much more common among children and adolescents with LD. It also inferred that anxiety disorders and clinical depression are more prevalent among them, but that inference was much less generalizable as most of the primary studies were school, rather than clinic-based.

To date, these previous research synthesizers observed a significant and clearly important, but average, association between LD and symptoms of anxiety and depression (Francis et al., 2019; Maag & Reid, 2006; Nelson & Harwood, 2011a, b). Their findings, however, ranged fairly widely, having estimated that between six and eight children with LD have more symptoms of anxiety and depression than do their otherwise similar counterparts without LD. The explanation for this variability in LD-anxiety/depression estimates represents a critical knowledge gap. Previous synthesizers explored moderations of these associations by demographic characteristics such as age/grade and gender but found little to no explanation. Building upon this field's foundation, created for the most part by educators and psychologists, this proposed, social work/welfare-focused synthesis aims to explore the suspected moderating influence of socioeconomic factors. No previous synthesis has integrated how familial or community socioeconomic status (SES) or racialized ethnic minority group status affect LD-anxiety and depression relationships. This one will. Such

seems a practically important, social work extension of this field's interdisciplinary knowledge.

Need for this Research Synthesis among Socioeconomically Vulnerable Students

This research synthesis was developed to specifically look into preliminary symptoms of mental disorders affecting socioeconomically vulnerable children and youths with LD. Notwithstanding the personal-biological determinants of LD as well as anxiety and depressive disorders (Merz, Tottenham, & Noble, 2018; Ursache, Merz, Melvin, Meyer, & Noble, 2017; World Health Organization, 2018), as social workers and allied mental health professionals, this research team is more interested in their probably more potent and malleable social-environmental-structural determinants, particularly family and community-based socioeconomic factors. Previous reviews did not empirically test the potential moderating influence of low SES nor of its intimate correlate in Canada, the USA and other high-income countries, racialized ethnic minority group status (Macdonald & Wilson, 2016; Statistics Canada, 2017; Koball & Jiang, 2018). This seems a glaring knowledge gap given the well-known, very strong interrelationships between poverty, African-American, Hispanic or Indigenous group membership, LD, anxiety and depression among school-aged children in North America (Lemstra et al., 2008; Fluss et al., 2009; Jordan & Levine, 2009; Shiffrer, Muller, & Callahan, 2011; McLaughlin et al., 2011; McLaughlin, Costello, Leblanc, Sampson, & Kessler, 2012; Reiss, 2013).

Based on the 69 studies these above noted investigators accomplished or reviewed, the study-weighted estimates of the chances of having LD and or an anxiety or depressive disorder were three to five times greater among racialized ethnic minority children of color living in poverty than among non-Hispanic white children of more affluent families, neighborhoods or schools. However, the critically important synthetic research question about the risk of anxiety and depression specifically experienced by socioeconomically vulnerable students with LD remains unanswered. This meta-analysis aims to answer it and advances the following hypothesis: socioeconomically vulnerable children and adolescents with LD more prevalently experience anxiety and depression than their otherwise similar peers in elementary or high school who are not socioeconomically vulnerable.

Theoretical Context

Primary and synthetic research has consistently observed associations between social forces, LD and depression and anxiety (e.g., Maag & Reid, 2006). The onset, course and

severity of mental disorders have also been observed to be strongly associated with socioeconomic factors experienced in childhood (McLaughlin et al., 2011). Impoverished environments and associated chronic stressors can pervade all areas of a child's life, including, for example, the relatively unsafe neighborhoods in which they must live with less enriching, involved and resourceful homes, parents, schools and classrooms (Evans & Kim, 2013; Ursache et al., 2017). Such interrelated socio-environmental stressors related to SES can result initially in more prevalent fears among children naturally responding to the multiplicative stressors occurring in their life spaces (Tottenham & Sheridan, 2009; McEwen & Gianaros, 2010; Ursache et al., 2017). In turn, these may increase such children's feelings of anxiety and depression (Merz et al., 2018). This study begins to test this socioeconomic theory of LD and mental health and illness.

Methods

Search Strategies

Within temporal and budgetary constraints, a systematic search and exploratory meta-analysis was performed (Ganann, Ciliska, & Thomas, 2010; Tricco et al., 2015). The following published research databases were searched for relevant studies until July 1, 2019: *ERIC*, *Social Work Abstracts*, *Social Services Abstracts*, *ProQuest Social Services*, *PsycINFO* and *PubMed/Medline*. To provide some measure of control for publication bias, these unpublished literature databases were also searched: *ProQuest Dissertations and Theses*, and *Google Scholar* (de Smidt & Gorey, 1997; Grenier & Gorey, 1998). The primary keyword search schema was: "learning disabilities" and (anxiety or depression). Secondary searches with this additional parameter were then applied: "socioeconomic status" or "socioeconomic factors" or poverty or income or "parental educational achievement" or "parental occupational prestige."

Inclusion and Exclusion Criteria

Then the following primary study inclusion criteria were applied: (1) published in English in 2000 or more recently, (2) conducted in the USA, Canada or another high-income country (likely to have similar education systems), (3) samples included school-aged children or adolescents, 18 years of age or younger or were in kindergarten through grade 12, (4) one study group had LD diagnoses, (5) included validated anxiety and or depression measures and (6) samples were described in enough socioeconomic detail that a face valid categorization into relatively low or higher SES could be reliably ascribed. Finally, the bibliographies of this field's four previous systematic reviews or meta-analyses

and retrieved primary study bibliographies and author names were snowball-searched for any additional eligible primary studies. The study selection process that was cross-validated by two reviewers identified eight relevant studies, all analytic surveys. These were retrieved for exploratory meta-analysis and are noted with an asterisk in the reference list.

Coding Procedures

The eight surveys were then coded as relatively low or high SES. The meta-analytic database additionally included the following study characteristics: Author(s) and publication year, participants' diagnostic and demographic distributions (type LD, age and gender), participants' socioeconomic and or racial/ethnic distributions, place (metropolitan areas or region within states or provinces), nonparticipation rates and analytic samples of, respective, LD and non-LD groups, and the operational measure(s) of anxiety and or depression. Two reviewers abstracted study characteristics independently from full primary study manuscripts. After discussion their agreement was 100%.

Practical Statistical Methods

The effect size statistic used for this meta-analysis was Cohen's (1988) *d*-index. It was calculated from LD and non-LD comparison group means and standard deviations ($d = M_1 - M_2 / ([SD_1 + SD_2] / 2)$) or derived from other parametric or nonparametric statistics (Cooper, 2017). Positive and negative *ds*, respectively, indicate hypothetically supportive and counter-hypothetical findings. Primary study outcomes (*ds*) were then weighted by their inverse variances. This sample-weighting allowed for larger studies to influence the meta-analysis more than smaller ones (Greenland, 1987). As for sample-weighting, one outlying comparison groups was quite large, with 10,298 non-LD participants (Terras, Thompson, & Minnis, 2009). To ensure that this single study did not overwhelm and so distort this synthesis' findings, its non-LD group size was recoded to 67, the same size as the LD group, for the meta-analysis. It should also be noted that when primary studies reported separate anxiety and depression outcomes, their two *d*-indexes were averaged so that each study contributed only one data point to the meta-analysis.

Practical Moderator Analysis

The meta-analysis pooled fixed study effects weighted by the number of participants to produce a sample-weighted *d*. Statistical significance was estimated with 95% confidence intervals (CIs). A CI not including the null value of 0.00 indicates statistical significance at $p < .05$. The effect distribution was subsequently tested for homogeneity with

the Q statistic (Cohen, 1988; Cooper, 2017). With a Chi square (χ^2) distribution, it tested if the variability of effects was greater than could have been expected by sampling error alone. The study's central moderator hypothesis was then tested as follows with the Q_b statistic, again with a χ^2 distribution. Sample-weighted d -indexes among relatively high or low SES study samples were compared. All meta-analytic calculations were independently cross-validated by two reviewers. Finally, sample-weighted d s were converted to Cohen's (1988) U_3 statistics. U_3 is an intuitively appealing statistic that provides an accessible window into practical significance. It emphasizes people rather than statistics, comparing in this instance outcomes on measures of anxiety or depression of all the children or adolescents with LD with the typical such student without LD.

Results

Sample Description

Descriptive characteristics of the sample of studies, their participants, geographic contexts and outcomes are listed in Table 1. The eight surveys published between 2000 and 2012 were primarily conducted in the USA (six), one each was accomplished in Canada and Scotland. They included children and adolescents 6 to 16 years of age in elementary or high school with diverse LD compared with otherwise similar students without LD. Boys were clearly overrepresented. As for the survey methods, they seemed generally rigorous. For example, with two exceptions they seemed adequately powered, study samples ranging from 198 to more than 10,000 participants (median = 498). Furthermore, the surveys all used well validated measures of anxiety and or depression and, though participation rates were only reported for half of the surveys, they typically gained the participation of three-quarters of those eligible (median = 77%). As for the central meta-analytic variable, two of the studies were categorized as relatively low SES (bottom Table 1) while six were categorized as relatively high on SES (top Table 1). Those six studied predominantly non-Hispanic white children and adolescents with parents who tended to be professionals or managers residing in middle-class, suburban school districts. The two others were accomplished in public school systems in urban centers with much greater racialized ethnic minority representation, most typically, African American.

Meta-analytic Findings

D -index outcomes of the studies are displayed in the far-right column of Table 1. In support of the stated hypothesis, meta-analytic findings indicated that socioeconomically

vulnerable children and adolescents with LD scored higher on measures of anxiety and depression than non-socioeconomically vulnerable students with LD. The sample-weighted d among the six higher SES studies was 0.16, which was statistically significant (95% CI 0.04, 0.28), but practically modest ($U_3 = 56\%$). Fifty-six percent of the higher socioeconomic students with LD scored higher on anxiety and depression than did their typical peer without a LD. However, among the two more socioeconomically vulnerable studies the sample-weighted d was 0.63 (95% CI 0.45, 0.81). Again, the between-group difference was statistically significant, but in this instance, much larger. Three-quarters of the socioeconomically vulnerable students with LD scored higher on anxiety and depression than did their typical peer without a LD ($U_3 = 74\%$). Finally, the eight study effects were significantly heterogeneous, $\chi^2(7) = 51.76$, $p < .05$ and that observed variability was explained, at least in part, by SES. The sample-weighted LD-anxiety/depression association was, in fact, significantly larger among the socioeconomically vulnerable than among those students who likely were not; Q_b distributed as $\chi^2(1) = 18.80$, $p < .05$. As an addendum, the homogeneity of the two low SES studies ought to be noted (d s were 0.61 and 0.67). Moreover, although not part of the central meta-analytic plan, these two studies also observed grave practical risks. Among such socioeconomically vulnerable children of color with LD, for example, their chances of committing a delinquent act, dropping out of school or attempting suicide were, respectively, two-, six- and threefold greater than among similar students without LD (Daniel et al., 2006; Maughan, Rowe, Loeber, & Stouthamer-Loeber, 2003).

Discussion

Previous research, summarized in four previous systematic reviews or meta-analyses, consistently observed modest to moderately increased risks of anxiety and depression among children and adolescents with LD. This is the first synthetic study to specifically examine the influence of SES among this already at-risk population. Guided by the social structural notion that societal barriers associated with living in poverty, like going to an inadequately funded school, probably exacerbate the multiple challenges faced by such children and youths, the hypothesis that socioeconomically vulnerable students with LD would be at even greater risk of experiencing symptoms of anxiety and depression and, ultimately, of being diagnosed with anxiety disorders and depression was supported.

Efficiently building upon previous reviews, this meta-analytic review found hypothetically supportive, albeit tentative, evidence based on eight analytic surveys. Indeed, it did observe that socioeconomically vulnerable students with

Table 1 Characteristics and outcomes of studies included in the meta-analysis

Authors (year)	Sample characteristics	Place and SES	Participation rates (%)	Analytic samples	Outcome measure	<i>d</i> -Index
Higher socioeconomic status						
Heath and Ross (2000)	Learning disabilities	Toronto, ON and Montreal, QC		100		
	47% Female			104	Depression (CDI)	0.12 ^d
Willcutt and Pennington (2000)	Grades 4 to 8, mean _{age} = 12	“Middle SES neighborhoods”	75			
	Reading disabilities	Denver and Boulder, CO		209	Anxiety (DICA-C)	0.28
	46% Female			192	Depression (CDI)	0.63
Miller et al. (2005)	Mean _{age} = 11	85% Non-Hispanic white	nd			
	Dyslexic	USA suburban or rural		24	Anxiety (RCMAS)	0.41
O’Brien (2005)	33% Female			55	Depression (CDI)	0.18 ^d
	Ages 8 to 12, mean = 11	“Moderate SES”	nd			
O’Brien (2005)	Learning disabilities	Chester, PA suburban		24		
	41% Female			13	Anxiety (CTRS-R)	1.35
Terras et al. (2009)	Ages 7 to 15	88% Non-Hispanic white	nd			
	Dyslexic	Scotland		67	Anxiety and Depression (ESS)	
Mattison and Mayes (2012)	35% Female	52% Families		10,298		0.63
	Ages 8 to 16, mean = 11	Professional/managers	56			
Mattison and Mayes (2012)	Learning disabilities	Hershey, PA		437	Anxiety (PBS)	- 0.08 ^d
	28% Female	94% Non-Hispanic white		158	Depression (PBS)	- 0.25
Mattison and Mayes (2012)	Age 6 to 16, mean = 9	41% Professional/managers	na			
Lower socioeconomic status						
Maughan et al. (2003)	Reading problems ^a	Pittsburgh public schools		90		
	0% Female	51% African American		864	Depression (SMFQ)	0.61
Daniel et al. (2006)	Ages 7 to 13, mean = 9	40% Public assistance	85			
	Reading problems ^b	Southeastern USA		94		
	44% Female	Public schools		94	Depression (K-SADS-E)	0.67
	Age 15	44% African American ^c	79			

CDI Childhood Depression Inventory, *CTRS-R* Conner’s Teacher Rating Scale-Revised, *DICA-C* Diagnostic Interview for Children and Adolescents, *ESS* Emotional symptoms Scale, *K-SADS-E* Schedule of Affective Disorders and Schizophrenia for School-Age Children-Epidemiologic Version, *na* non-applicable (archival, client chart-based), *nd* no data, *PBS* Pediatric Behavior Scale, *RCMAS* Revised Childhood Manifest Anxiety Scale, *SES* socioeconomic status, *SMFQ* short form Mood and Feelings Questionnaire

^aCalifornia Achievement Test

^bLetter-Word Identification (LWID) subtest of the Woodcock–Johnson Psychoeducational Battery-Revised (WJ-R)

^cAlso prevalently urban and low SES (Hollingshead Index)

^dNot statistically significant ($p > .05$)

LD were a particularly vulnerable group regarding the risks of developing anxiety and depression. Synthesis of socioeconomically vulnerable LD students' experiences found that three-quarters of them scored higher on standardized measures of anxiety and depression than did their typical peer without LD, and this represented a near 20% increased risk relative to their more affluent peers. These findings emphasize the importance of socioeconomic factors in the lives of academically vulnerable children and youths.

Furthermore, two of the primary studies' practical findings (e.g., estimated threefold greater attempted suicide rate) strongly suggested that such symptom increases probably also resulted in more prevalent diagnoses of anxiety and depression (Maughan et al., 2003; Daniel et al., 2006). In the end though, this meta-analysis was clearly exploratory. In fact, this could be fairly-categorized a near-empty review of the most socioeconomically vulnerable students of color (Yaffe, Montgomery, Hopewell, & Shepard, 2012). Only two such studies were found. For this reason, in addition to the fact that all the primary studies were cross-sectional and this review itself was a synthetic cross-section, these review-generated findings are best considered developed hypotheses awaiting more rigorous future research testing.

Additional Limitations and Implications for Future Research

Primary Research

A major knowledge gap identified by this review was this field's lack of generalizable knowledge. Almost all its research was accomplished in restricted locales in the USA with very little, if any, sociocultural contextualization. Relatedly, its samples were generally not described in enough detail to understand any of their potential socioeconomic vulnerabilities. Systematically searching through hundreds of this field's studies only eight that so described the socioeconomic or related, racialized ethnic characteristics of their participants were successfully identified. Clearly, there are grave dangers in such homogenized analyses as they assume that all children with LD, for instance, those who live in poverty to affluence, non-Hispanic white or any other diverse racialized ethnic minority children of color, are similarly at risk. Here the call made a generation ago is echoed; social work and allied researchers ought to describe their study participants in detail and, when possible, report their findings separately for each, potentially oppressed, group (Gorey, 1996; Videka-Sherman, 1988). As future primary research better represents the experiences of diverse children with LD, future synthetic studies will be enabled to advance synthetic knowledge that is more relevant to understanding and meeting their specific needs.

Synthetic Research

Though its sampling frame included unpublished sources, this review's sample ultimately included only one unpublished study. One might legitimately wonder if publication bias could be a potent alternative explanation for its findings. This seems improbable for the following reasons. First, this review's hypothesis of more disadvantaged mental health status among socioeconomically vulnerable students with LD was not the primary hypothetical concern of any of its included studies. Second, the single unpublished study reported the largest effect ($d=1.35$), an effect approximately twice the size of the published studies' pooled effect. This pattern is the opposite one would expect if publication bias, that is, a preference to publish significant findings, was potent. Third, effects reported by the published studies ranged widely (d s of -0.16 to 0.67). This field's editorial review boards seemed to have been open to publishing null, even counter-hypothetical findings. Building upon this modestly funded meta-analysis, a well-endowed full systematic review might consider expanding its gray literature/unpublished research sampling frame.

For its admitted rapidity, this meta-analysis may be limited in another way. A bit more of its practical context may be illuminating. First, this synthesis was essentially unfunded. Second, all the research on any social, behavioral or health, including mental health correlates of LD was first informally scoped (Arksey & O'Malley, 2005; Tricco et al., 2016). The voluminous results of those preliminary searches in addition to funding constraints caused us to focus on a constrained review of the most scholastically interesting, practically important and social work relevant research: anxiety and depression among socioeconomically vulnerable students with LD. Exhaustive searches were accomplished, but of focused questions within rigorous methodological constraints and a streamlined meta-analysis. These may, in fact, be thought strengths of this meta-analysis. However, at least two preferred systematic review and meta-analytic (PRISMA) methods (Kelly, Moher, & Clifford, 2016; Moher, Liberati, Tetzlaff, & Altman, 2009) were not adhered to. As two reviewers independently searched for eligible studies, informally sharing their developing methods throughout the process, a unified flow chart, detailing each step of the information gathering process was not produced. Also, reviewers were not blinded to the primary study findings. Recall though that each step of the review process—study selection, data abstraction and meta-analysis—was cross-validated by at least two reviewers. Consensus was ultimately reached on all selected studies. For these reasons this systematic search and exploratory meta-analysis is believed to approximate the validity of a full systematic review and meta-analysis. Still, a better-endowed full systematic review, accomplished by independent reviewers, would be most welcome. Such

systematic replications are the hallmark of sound scientific inquiry, primary and synthetic.

Implications for Social Work and Allied Mental Health Practice

Though preliminary, this study's findings clearly suggest that children and adolescents with LD, particularly those who live in poverty and/or are members of a racialized ethnic minority group, are at significantly greater risk of developing an anxiety disorder or depression. It is easy to imagine how such clinically meaningful symptoms of anxiety and depression could compound existing learning challenges. It seems intuitive then that psychosocial interventions provided by social workers and allied mental health professions could serve not only to alleviate symptoms of anxiety and depression, but also to quite positively affect learning.

Schools seem ideal places to screen for mental health problems and to provide preventative and therapeutic interventions. In terms of life space interventions, school personnel may be ideally situated to identify early signs of anxiety or depression among at-risk students (Maag & Reid, 2006). Interdisciplinary alliances would facilitate identification of students in need and referral to psychosocial help. In fact, concomitant qualitative and preliminary quantitative knowledge strongly suggesting the great preventive potential of diverse social work and allied mental health interventions with such children and their families already exists (Mishna, Muskat, & Wiener, 2010; Lambie & Milsom, 2010; Hingley-Jones, 2013; López-Larrosa, González-Seijas, & Carpenter, 2017). Most regrettably though, there seems yet to have been very little uptake of any such additionally supportive, evidence-informed psychosocial interventions in North American school systems for students with LD (Shechtman & Pastor, 2005). Coalitions of researchers and knowledge users ought to advocate for ample funding to psychosocially support such students and their families. Given their likely preventive mental health impacts as well as their likely support of academic success such funding would very likely bring large dividends for these children and society.

Conclusion

This study found that the vast majority of socioeconomically vulnerable students with LD have more anxiety and depression symptoms than their typical non-LD peer. It also suggested that such impoverished children and adolescents are at much greater risk of having an anxiety disorder or being clinically depressed. These review-generated findings ought to be systematically replicated with more rigorous primary studies accomplished in wider geographic contexts and then

synthesized with a full systematic review and hypothesis testing meta-analysis.

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Compliance with Ethical Standards

Conflicts of interest The authors declare they have no conflict of interest.

Research Involving Human Participants or Animals This article does not contain any studies with human participants or animals performed by any of the authors.

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