

Self-Reported Differences on Measures of Executive Function and Hypersexual Behavior in a Patient and Community Sample of Men

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ABSTRACT

Patients seeking help for hypersexual behavior often exhibit features of impulsivity, cognitive rigidity, poor judgment, deficits in emotion regulation, and excessive preoccupation with sex. Some of these characteristics are also common among patients presenting with neurological pathology associated with executive dysfunction. These observations led to the current investigation of differences between a group of hypersexual patients ($n = 87$) and a non-hypersexual community sample ($n = 92$) of men using the Behavior Rating Inventory of Executive Function—Adult Version (BRIEF-A) and the Hypersexual Behavior Inventory (HBI). Significant differences between the groups emerged on eight subscales and all of the general indices of executive functioning with the most dramatic differences on BRIEF-A's Shift, Emotional Control, Initiate, and Plan/Organize subscales. Hypersexual behavior was positively correlated ($r = .37, p < .01$) with global indices of executive dysfunction and several subscales of the BRIEF-A. These findings provide preliminary evidence supporting the hypothesis that executive dysfunction may be implicated in hypersexual behavior.

KEYWORDS: hypersexuality, executive function, neuropsychology

Despite some theoretically related features associated with hypersexuality and executive dysfunction (e.g., impulse control, affect regulation, impaired decision-making), there is a paucity of research examining executive control among hypersexual patients, especially those presenting without organic brain pathology, head trauma, or neurological/psychiatric diagnoses (e.g., Alvarez & Emory, 2006; Reid, Carpenter, & Lloyd, 2009; Stuss & Alexander, 2000). This article attempts to fill a gap in the literature by offering some empirical data comparing a sample of male hypersexual patients with a community sample of men using self-report measures of executive functions to explore the hypothesis that hypersexual pa-

tients will exhibit greater executive dysfunction than controls.

EXECUTIVE FUNCTIONS AND HYPERSEXUALITY

Executive functions are hypothesized to consist of a constellation of mental processes associated with adaptive behavior that function to assist an individual to interact with his or her environment in an efficient and acceptable way. Cognitive processes theoretically linked to executive functions include inhibition of behavior, impulses, nonverbal and verbal working memory, affect regulation, motivation and arousal, planning, organization, decision making, judgment, task monitoring, attention, problem solving, hypothesis generation, abstract thinking, and cognitive flexibility (Baron, 2004; Cato, Delis, Abildskov, & Bigler, 2004; Lezak, 2004; Spinella, 2005; Stuss & Levine, 2002).

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Medical research on hypersexuality has historically focused on manifestations of sexual behavior in the context of acute changes in behavior provoked by brain injury (Britton, 1998; Kobayashi, 2004; Spinella, 2004), degenerative disorders (Higgins, Barker, & Begley, 2004; Robinson, 2003), multiple sclerosis (Gondim & Thomas, 2001), temporal lobe deficits such as epilepsy and Kluver-Bucy syndrome (Janati, 1985; Luef, 2008), medication effects (Ivanco & Bohnen, 2005; Voon & Fox, 2007), and etiology associated with endocrinological factors (Herzog, 1999). In these studies, hypersexual behavior is often secondary to a medical condition (e.g., a neurological insult, trauma, or a degenerative brain disorder), and the literature appears to support the primary medical etiology.

Some conceptualizations of hypersexuality draw upon concepts from psychology rather than medicine (e.g., Coleman, 1987; Kafka, 1997, 2001; Reid, 2007; Reid & Carpenter, 2009a). This perspective examines psychological, rather than medical, explanations for why such patients exhibit hypersexual behavior in outpatient mental health clinics without obvious neurological symptoms. These patients are the focus in the present investigation as their dysregulated sexual behavior raised questions about possible subtle deficits in executive functioning.

DEFINING HYPERSEXUAL BEHAVIOR

The definition employed in the present study required an individual to exhibit the following symptoms for a minimum of 6 months: (1) repetitive, increased, and intense preoccupation with sexual thoughts, urges, and behaviors; (2) multiple unsuccessful attempts at controlling sexual thoughts, urges, and behaviors; and (3) adverse consequences causing clinically significant distress or impairment in occupational, interpersonal, or social areas of functioning related to the intensity or frequency of sexual thoughts, urges, or behaviors. The presenting symptoms cannot occur exclusively within the context of another Axis I disorder (e.g., manic phase of bipolar), be substance induced, or occur in relation to neurological pathology (Coleman, 1991; Kafka, 2001;

Stein, 2008). Hypersexual behavior is also observed as a distinct and separate construct from the phenomena of persistent sexual arousal syndrome, in which an individual experiences persistent sexual arousal in the absence of desire (Leiblum & Seehuus, 2009; Mahoney & Zarate, 2007). Symptoms associated with hypersexual behavior can include solo or relational sexual activities and can occur in comorbidity with paraphilic tendencies (Kafka & Hennen, 2003).

RATIONALE FOR THIS STUDY

Executive dysfunction in pathology reflecting impulse control deficits, such as substance abuse and pathological gambling, has already been noted in the literature. Individuals with substance-related disorders, for instance, commonly exhibit dysexecutive symptoms, such as impulsivity, poor judgment and planning, and impoverished concentration (Giancola & Mezzich, 2003; Gonzalez, Bechara, & Martin, 2007; Ihara, Berrios, & London, 2000). Deficits in cognitive flexibility and affect regulation, as well as impaired decision making, have been noted among alcohol-dependent and pathologic gambling patients (Cavedini, Riboldi, Keller, D'Annunzi, & Bellodi, 2002; Fuentes, Tavares, Artes, & Gorenstein, 2006; Goudriaan, Oosterlaan, de Beurs, & van den Brink, 2006; Kalechstein et al., 2007). There are also characteristics found among hypersexual patients that reflect possible executive deficits such as the inability to regulate or diminish behavior and problems with affect regulation (Reid, Carpenter, Spackman, & Willes, 2008; Reid, Harper, & Anderson, 2009). These relationships provide some evidence in support of a conceptual model of hypersexuality influenced by executive dysfunction and it is reasonable, therefore, to ask whether findings from studies of substance and gambling disorders extend to hypersexual patients (see Figure 1).

In the present study, a self-report measure of executive function was chosen as objective neuropsychological tests have received substantial criticism for their lack of ecological validity, which raises doubts as to whether they would accurately reflect deficits in real-world environments (e.g., Chaytor, Schmitter-Edgecombe, & Burr, 2006; Gioia & Isquith, 2004;

| <i>Hypersexuality</i> | <i>Executive Function Processes</i> |
|--|--|
| Difficulties controlling sexual behaviors | Inhibition, impulse control |
| Motivational deficits to change behavior | Motivation, task initiation, sustained attention |
| Alexithymia, emotion dysregulation, rumination | Emotional control, cognitive flexibility, inhibition |
| Choose sex despite negative consequences | Decision making, judgment, inhibition, impulse control |
| Preoccupation and rumination about sex | Attention, behavior inhibition, cognitive flexibility |

FIGURE 1 Hypothesized correlates of hypersexual behavior and executive functions.

Manchester, Priestley, & Jackson, 2004). Furthermore, in some studies, self-report measures of executive function have produced findings that were unattainable through neuropsychological tests (Ready, Stierman, & Paulsen, 2001). The consideration of cost-effectiveness, resources, and available data also influenced the present research design.

METHODS

Participants

The patient sample used in this study consisted of men ($n = 87$) recruited from an outpatient clinic in Utah that specialized in the treatment of hypersexuality. These participants were selected consecutively based on (a) a primary complaint reported during intake and assessment being excessive and out-of-control sexual behavior and (b) willingness to participate in research, as reflected in consent provided at the outset of the treatment process. Of those invited, 94% of the men participated.

Ethnic representation among the patient sample included Asian ($n = 2$), Hispanic ($n = 3$), and Caucasian ($n = 82$), and participants ranged from 18 to 59 years of age ($M = 31.4$, $SD = 8.9$). Relationship status included never married ($n = 31$), first marriage ($n = 47$), remarried ($n = 5$), divorced ($n = 3$), and separated ($n = 1$). Sexual preferences included homosexual ($n = 5$), bisexual ($n = 2$), and heterosexual ($n = 80$).

Self-reported presenting sexual behaviors among the patient group were explored during a clinical interview and included compulsive masturbation (86%), pornography dependence (81%), extra-marital affairs (22%), habitual solicitation of commercial sex workers (16%), and excessive unprotected sex with multiple anonymous partners (15%). Additionally, criteria for paraphilic disorders were assessed; however, no participants met diagnostic criteria for these disorders.

The patients in this study reported numerous consequences for their hypersexual behavior including termination from employment; significant credit card debt caused by paying for sex and other adult entertainment; and legal problems and attachment ruptures in primary relationships. Some hypersexual college students sacrificed grades, failed classes, and were even expelled from school. A portion of patients required medical attention to treat genital lesions incurred from compulsive masturbation, and others received help for sexually transmitted diseases contracted from risky sexual behavior. In these cases, patients frequently reported feeling driven by, com-

pelled by, or obsessed with an intense preoccupation and desire for sex despite the negative consequences associated with such behavior.

The controls ($n = 92$) were drawn from a group of male university students who attended evening classes and from a sample of community men. The combined sample reflects a demographic composition similar to that of the patient sample, which also consisted of students and community men, most of whom had college education and came from a predominantly middle-class socioeconomic status. To further enhance comparability and similar demographic composition between the groups, student controls were drawn from evening classes to capture non-traditional students who were somewhat older and worked full-time.

Ethnic representation among the control sample included Asian ($n = 1$), Hispanic ($n = 3$), and Caucasian ($n = 88$), and participants ranged from 19 to 50 years of age ($M = 26.2$, $SD = 5.1$). Relationship status included never married ($n = 47$), first marriage ($n = 34$), remarried ($n = 2$), divorced ($n = 4$), separated ($n = 2$), cohabitating ($n = 2$), and widowed ($n = 1$). Sexual preferences included homosexual ($n = 4$), bisexual ($n = 1$), and heterosexual ($n = 87$). Participants from both groups who reported histories of attention-deficit hyperactivity disorder (ADHD) on the mental health history section of the demographic questionnaire, a substance-related disorder, drug use, or head trauma, or who had sustained any injury involving a serious concussion were eliminated from the study. For the patient sample, participants who met criteria for adult ADHD or substance-related disorders assessed during their clinical interview were eliminated from the study. These exclusion criteria were added because each could contribute to executive functioning deficiencies already reported in the literature and the purpose of this investigation was to determine whether hypersexual patients revealed executive dysfunction independent of conditions already known to contribute to such deficits.

Procedure

After the members of the patient sample signed informed consent, they completed a demographic survey and the two research measures at the outset of their treatment at an outpatient mental health clinic. These data provided information that was used as part of clinical interventions offered to the patient group. The combined community and college sample of men signed informed consent and anonymously completed the same survey and research measures.

Measures

Behavior Rating Inventory of Executive Function—Adult Version (BRIEF-A). The BRIEF-A is a self-report measure composed of 75 items with nine distinct empirically derived clinical scales that measure various aspects of executive functioning: Inhibit, Self-Monitor, Plan/Organize, Shift, Initiate, Task Monitor, Emotional Control, Working Memory, and Organization of materials. The clinical scales form two broader indices: the Behavioral Regulation Index (BRI) and the Metacognition Index (MI). These two indices generate an overall Global Executive Composite (GEC) score. Standard scores are calculated for the clinical scales, the indices, and the summary composite score. Comparisons to a normative sample of 1,050 self-reports and 1,200 informant reports generate *T* scores for each scale, with higher scores reflecting greater difficulties and levels of impairment. The BRIEF-A also includes three validity scales: Negativity, Infrequency, and Inconsistency (Roth, Isquith, & Gioia, 2005). Internal consistency for the self-report form yielded alpha coefficients ranging from .80 to .94 for the clinical scales and .96 to .98 for the index scores. The BRIEF-A has also shown reliability over time with test-retest correlations among the clinical scales ranging from .91 to .94 over a 4-week period. The BRIEF-A has been shown to be sensitive to subtle executive changes in a population with mild cognitive impairment and older adults with significant cognitive complaints when standardized neuropsychological tests failed to detect any decline (Rabin et al., 2006).

Hypersexual Behavior Inventory (HBI) (Reid & Garos, 2007). The HBI consists of 19 items such as “My sexual behavior controls my life” and “My sexual activities interfere with aspects of my life such as work or school.” The HBI is scored on a 5-point Likert scale ranging from never to very often with possible scores ranging from 19 to 95 with 53 regarded as the cut-off for those having difficulties with hypersexuality and higher scores reflecting greater hypersexuality. The HBI measures three domains of hypersexual behavior including (1) control over sexual thoughts, urges, and behavior, (2) consequences associated with hypersexual behavior, and (3) the extent to which an individual uses sex to cope with uncomfortable or unpleasant affective experiences. It is a valid and reliable measure of hypersexuality with its psychometric properties having been reported in several other studies (e.g., Reid, Carpenter, & Lloyd, 2009; Reid, Harper, & Anderson, 2009).

DATA ANALYSIS AND RESULTS

Group comparisons

The overall MANOVA for the subscales of the BRIEF-A revealed significant differences between the two groups (Wilks' $\lambda = .865$, $F(9,169) = 2.94$, $p = .001$). As shown in Table 1, post-hoc univariate tests showed significant differences between the groups on all but one of the nine subscales of the BRIEF-A. The three general indices of the BRIEF-A were also significant. The subscales reflecting the most dramatic

TABLE 1 Means, standard deviations, and group differences on study variables

| Study variables | Controls $n = 92$ | Patients $n = 87$ | <i>F</i> | Effect size |
|----------------------------|------------------------|------------------------|----------|-------------|
| | <i>M</i> (<i>SD</i>) | <i>M</i> (<i>SD</i>) | | η^2 |
| HBI | | | | |
| Total Score | 38.5 (16.9) | 68.8 (13.6) | 173.2*** | .49 |
| Control | 16.9 (8.9) | 32.1 (5.8) | 182.1*** | .51 |
| Coping | 15.3 (6.8) | 23.9 (6.5) | 75.0*** | .30 |
| Consequences | 6.3 (2.8) | 12.8 (3.5) | 182.0*** | .51 |
| BRIEF-A | | | | |
| Inhibit | 57.1 (10.2) | 59.3 (10.1) | 2.1 | .01 |
| Shift | 54.3 (10.1) | 59.4 (10.2) | 11.3*** | .06 |
| Emotion Control | 48.2 (9.4) | 53.5 (9.9) | 13.3*** | .07 |
| Self-Monitor | 52.5 (9.2) | 56.9 (10.5) | 9.2*** | .05 |
| Initiate | 54.2 (8.9) | 60.2 (10.4) | 17.1*** | .09 |
| Working Memory | 57.2 (11.4) | 60.9 (11.0) | 4.9** | .03 |
| Plan/Organize | 54.3 (10.0) | 59.6 (10.2) | 12.0*** | .06 |
| Task Monitor | 54.1 (9.7) | 57.9 (9.0) | 7.2** | .04 |
| Organization of Materials | 51.6 (9.5) | 54.8 (10.6) | 4.5* | .02 |
| Behavior Regulation Index | 52.9 (9.4) | 58.1 (9.8) | 13.2*** | .07 |
| Metacognition Index | 55.2 (9.7) | 60.3 (9.9) | 12.5*** | .07 |
| Global Executive Composite | 54.5 (9.5) | 60.0 (9.8) | 14.9*** | .08 |

* $p < .05$, ** $p < .01$, *** $p < .001$.

TABLE 2 Correlations between the HBI and the BRIEF-A, combined and by subgroup

| BRIEF-A scores | HBI total score | | |
|----------------------------|--------------------|----------------------|------------------|
| | Combined $n = 179$ | Hypersexual $n = 87$ | Control $n = 92$ |
| Behavior Regulation Index | .33* | .31** | .14 |
| Metacognition Index | .39** | .36** | .26* |
| Global Executive Composite | .39** | .37** | .23* |
| Principal factor | .39** | .37** | .23* |

* $p < .05$, ** $p < .01$.

differences between the groups were the Shift, Emotional Control, Initiate, and Plan/Organize, where patients on average reported significantly higher scores. The groups were not significantly different on the Inhibit subscale. One-way ANOVAs indicated significant differences between the groups on all HBI scales, a finding consistent with other studies using this measure.

Associations between the HBI and the BRIEF-A

To further clarify the nature of these associations, correlational analyses were performed on the BRI, the MI, the GEC, and the first factor of a principal components analysis of the 9 BRIEF-A subscales (accounted for 58% of the total variability; all subscales loaded at .67 or higher). As shown in Table 2, there were significant correlations for the combined group, but there were also correlations of roughly equal magnitude for hypersexual participants. This indicates that variation in HBI scores, even within the hypersexual group alone, is predictive of BRIEF-A scores.

As might be expected from the post-hoc univariate tests, a step-wise regression analysis of the patient group revealed that the Initiate subscale of the BRIEF-A was the most predictive of hypersexuality ($\beta = .39$, $p < .001$), accounting for approximately one-seventh of the variability in HBI total scores ($R^2 = .16$). No other subscales added significant additional predictive variance. Instead, if we first enter the Global Executive Composite into the regression equation, it accounts for a similar amount of variance ($\beta = .37$, $p < .001$). Only Working Memory had meaningful additional variance to add ($\Delta R^2 = .45$, $p < .05$), yielding a final prediction with $R = .47$, $p < .001$.

It was surprising that the groups did not differ significantly on the Inhibit scale of the BRIEF-A as this domain is hypothesized to capture respondent's inhibitory control and ability to stop behavior at the appropriate time. In reviewing items of this scale, we found several tended to measure aspects of psychomotor agitation (e.g. control over finger tapping

or trouble sitting still), which is not considered an associated feature of hypersexual behavior. The patient group did show a significant difference ($p = .01$) on one of the items of this scale that queried about making decisions that "get me into trouble" in legal, financial, or social aspects of their lives which is consistent with a constellation of consequences experienced by hypersexual patients in relation to their pursuit and preoccupation with sexual thoughts, urges, and behaviors.

Clinically meaningful elevations

In practice, we are usually interested in clinically meaningful elevations to determine whether patients fall within various groups. The same principle can be applied to understand how frequently hypersexual participants produce BRIEF-A elevations that are diagnostically significant (usually regarded as $T \geq 65$). To better understand how often such elevations are found in patients versus the control group, frequencies of participants falling above and below this threshold on the BRIEF-A subscales were computed (see Table 3). For these data, 67% of the patients had at least one clinical elevation, with 46% having two or more clinically elevated scales, and 36% having three or more elevated scales. As shown in Table 3, scales with the most frequent elevations are Initiate (37% of the hypersexual patients), Working Memory (37%), Plan/Organize (38%), and Inhibit (21%). As can be seen, elevations for the control sample are common, but overall, they occur much less frequently among this group than among hypersexual patients. This is especially true for Initiate, Emotion Control, Self-Monitor, and Plan/Organize subscales.

In examining the data, we noticed that 33% of the hypersexual patients ($n = 29$) did not have clinically significant scores ($T \geq 65$) across any of the BRIEF-A subscales. We isolated these patients as a separate group and compared their HBI total scores ($M = 62.7$) to that of the remainder of their cohort ($M = 71.8$; $n = 58$), revealing significant differences in the severity of hypersexuality ($t(85) = 3.17$, $p < .001$) in

TABLE 3 Prevalence rate comparisons for clinically elevated BRIEF-A scores

| BRIEF-A scales | Percentage with <i>T</i> -scores \geq 65 | | |
|---------------------------|--|----------|----------|
| | Patients | Controls | χ^2 |
| Inhibit | 26 | 22 | 0.54 |
| Shift | 22 | 11 | 3.96* |
| Emotion Control | 16 | 7 | 4.13* |
| Self-Monitor | 18 | 7 | 5.84** |
| Initiate | 37 | 12 | 15.01*** |
| Working Memory | 37 | 27 | 1.90 |
| Plan/Organize | 38 | 24 | 4.13* |
| Task Monitor | 13 | 9 | 0.74 |
| Organization of Materials | 14 | 10 | 0.69 |

p values for χ^2 are based on Fisher's Exact Test.

p* < .05, *p* < .01, ****p* < .001.

relation to their level of executive function deficits as measured by BRIEF-A subscales.

DISCUSSION

Of primary interest for this study, hypersexual participants scored higher than controls on BRIEF-A indices of problems in executive functioning. Even among hypersexual patients, the two domains are correlated with each other. Although the patient group yielded significantly different scores across all but one of the BRIEF-A subscales, the magnitudes of these differences are modest, as noted in the effect sizes. The most notable differences occurred on the BRIEF-A subscales of Emotion Control, Initiate, Shift, and Plan/Organize, providing insights about difficulties encountered by hypersexual patients. From a clinical perspective, having cognitive flexibility in problem solving and making transitions (Shift), being able to modulate or control one's own emotional responses (Emotional Control), being able to independently begin a task or generate ideas or responses or problem-solving strategies (Initiate), and managing current and future-oriented task demands (Plan/Organize) constitute executive function processes that would enable patients to effectively modulate their sexual urges and behavior. However, for hypersexual patients these executive deficits appear to contribute to difficulties regulating sexual thoughts, urges, and behaviors leading to a constellation of consequences in their lives. Thus, clinicians working with this population might focus on helping patients develop effective problem-solving strategies, cultivate cognitive flexibility, and learn to regulate emotions more appropriately. Patients will also benefit from learning multiple ways to cope with uncomfortable or stressful situations that often precipitate hypersexual

behavior. The emergence of impaired working memory in this study may be implicated as a moderating variable which exerts an effect on the strength of other executive relationships, such as cognitive flexibility, planning, organizing, and decision making. This finding is consistent with other studies linking impulsive behavior to working memory impairment and deficits in frontostriatal circuits (Cools, Sheridan, Jacobs, & D'Esposito, 2007; Jentsch & Taylor, 1999; Whitney, Jameson, & Hinson, 2004). Overall, these findings can provide prognostic information regarding treatment using psychotherapy and possible pharmacogenetic endophenotypes.

Interestingly, the BRIEF-A composite captures much of the association of the BRIEF-A with the HBI, emphasizing the role of the common and shared elements of the BRIEF-A as opposed to the unique aspects of subscales. A possible exception is that the concentration and memory aspects of executive functions captured by the Working Memory subscale might also contribute to hypersexuality. For example, a paucity of working memory can diminish an individual's ability to perform tasks, predisposing the individual to feel demoralized or easily stressed, which in turn can precipitate hypersexual behavior (Reid et al., 2008; Reid & Carpenter, 2009b).

These data suggest a substantial percentage of hypersexual patients presenting for treatment in an outpatient setting do not appear to exhibit executive dysfunction based on self-report. However, the clinical elevations on BRIEF-A indices of Inhibit, Initiate, Working Memory, and Plan/Organize for a portion of this group (25%–38%) suggest that those experiencing deficits in executive functioning are likely to be individuals with more pronounced elevations on measures of hypersexuality. Together, these findings reinforce other studies' caution against homogeneous classifications of this population (Reid & Carpenter, 2009a) and suggest that future research might consider exploring possible subtypes of hypersexuality in this population.

Although we found only modest support for an executive function conceptualization of hypersexual behavior, there were patients who may fit this model aside from patients with comorbid conditions, such as ADHD or substance-related disorders, who were excluded from this study.

Limitations to this study include the use of self-report instruments and lack of standardized clinical neuropsychological test batteries. Future studies might consider replication using both the BRIEF-A self-report and informant report forms. Additional research using objective neuropsychological measures of executive functions should also be strongly considered.

Inferences about the findings beyond those listed in this study should be made with caution, in part because the sample consisted exclusively of male participants who were predominantly Caucasian and heterosexual. A more diverse ethnic representation among participants in this sample would have been ideal, as would greater numbers of men with varying sexual preferences. The lack of representation of these groups makes generalizing these results beyond Caucasian heterosexual men questionable. Similarly, causal conclusions cannot be drawn from these data.

Future studies may consider using other comparison groups such as a chemically dependent population, a non-hypersexual clinical population, or subsamples with greater diversity of ethnicity or sexual orientation. There is also an important need to explore hypersexual behavior among female populations.

CONCLUSIONS

The present study investigated differences between a sample of hypersexual male patients and a comparison group on indices of hypersexual behavior and a self-report measure of executive functions. On average, the patient group experienced significantly greater degrees of deficits in executive functions as measured by the BRIEF-A, with the Initiate subscale being most predictive of hypersexual behavior. When global indices of executive functions are considered, they appear to account for a significant portion of variance in hypersexuality, with Working Memory making an additional, albeit modest, contribution. This study found evidence supporting the notion that hypersexual behavior is correlated with deficits in executive functioning, and this was particularly true for the patient group compared with controls.

Declaration of Interest: The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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