

CLINICAL RESEARCH

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# The Effects of Childhood Experience on Later-Life Physical Activity

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## **ABSTRACT**

### **INTRODUCTION**

Metabolic illnesses are currently a worldwide pandemic. Physical activity is a widely accepted method to improve metabolic health. Identifying aspects of childhood experience that positively affect a person's life-long physical activity levels is vital to reducing the effects of metabolic illness. Objective: To gain perspective of child-parent relationship qualities that correlate with positive metabolic health and physical activity levels into adulthood.

### **METHODOLOGY**

233 participants participated in a survey gathering information on self-reported physical activity, sedentary behaviour, and familial background. Five subjects then participated in interviews, building in-depth insight into the information provided in the survey.

### **RESULTS**

Subjects belonging to families with a lack of perceived support for sports participation were significantly more likely to be classified as sedentary adults. Discussion: Correlations between physical activity's ubiquity align with positive health outcomes. Parental support plays an instrumental role in a person's motivation and continuation of healthy lifestyle choices.

### **CONCLUSION**

Parental support and fulfillment of basic needs within childhood have strong predictability power over a person's adult metabolic health.

### **KEYWORDS**

Childhood; Development; Behaviour; Health; Physical activity; Metabolic illness

## **INTRODUCTION**

### ***Metabolic Illness***

Obesity, hypertension, type-2 diabetes, and other metabolic illnesses permeate populations from every continent and every age, increasing mortality rates, straining healthcare systems, and reducing overall life quality [1,2]. Developing treatments that address all aspects of general metabolic illness have been varied in their effectiveness due to their pathogenesis' multi-faceted nature [3-5] Increasing physical activity levels has been highlighted in the literature as one of the most promising avenues to treat the swathe of symptoms related to metabolic illness [6].

During childhood, parental figures have an understated influence over their children's environment and behaviour installation [7,8]. This study aims to build understanding from the child's perspective regarding which aspects of their child-parent relationship have had lasting effects into adulthood. This study posits the way in which the child experiences parental practices is more important than the parent's intentions.

### ***Maslow's Hierarchy of Needs***

Recent studies in the literature have begun to include measuring their participants' daily needs and to what degree they are being met. These needs include 'Basic needs,' e.g., safety, warmth, shelter, and rest. 'Psychological needs,' e.g., friends, intimate relationships, feelings of accomplishment, and lastly 'Self-fulfillment needs' where people feel they can achieve one's full potential. Maslow's theory states that people cannot attempt to reach their self-fulfillment or psychological needs until all of their essential requirements have been met [9]. In a study from van Lenthe et al., [10], we see Maslow's hypothesis in action surrounding people's food choices. Their results indicate that being at a higher level of the hierarchy correlated with more forethought and concern for dietary habits, while the opposite for those with fewer needs being met.

### ***Environmental Hereditary***

Low, et al. [11] alludes explicitly to a positive feedback loop where lower-income populations develop obesity-related diseases at a greater rate, therefore, have reduced work opportunity and productivity, leading to limited annual income. This vicious cycle continues, often with no opportunities to escape, enveloping entire families and even multiple generations within the same family.

### ***Obesity in Childhood***

Childhood obesity in the first years is a less common occurrence than what is recorded in older age study participants. Worldwide estimates of childhood obesity claim roughly 9.1% of pre-schoolers to be overweight or obese in 2020. This number has been increasing steadily since 1990, when figures were measured at 4.2% [12]. Childhood obesity can be associated with adverse health effects in adolescence and adulthood [13].

### ***Parental Obesity Status' Effects on Offspring***

Steffen, et al. [14] and Whitaker, et al. [15], each using a cross-sectional study comparing body mass index (BMI) measurements between parents and their children, found that there is a strong correlation between obesity among children who have one or two obese parents. There is some debate on the heritability of the obese phenotype.

Magarey et al. (2003) [16] states that BMI measurements taken at six years of age are a better indicator of BMI at 20 years of age over parental obesity.

### ***Effects Parental Modelling on Physical Activity***

Parental influences have also shown to affect children's behaviour around physical activity (PA). A study by Stearns, et al., [17] investigated the predictive power of parental PA on offspring PA. They invited six-hundred and twelve 7 to 8-years-old and their parents to wear step counters and noted the relationship. At the end of the four-day study, Stearns et al. concluded, "physically active parents tend to have physically active children."

Although correlations between children's PA levels and the levels of their immediate family have been discussed within the literature for decades, there is still some debate about its relevance [18-20]. Welk, et al. [21] found that across their 994 child participants, child-parent PA levels were the lowest correlator factor. Their study also took into account the child's attraction to activity, perceived competence, and perceived parental influence. They found these three factors to have more substantial deterministic properties than parental PA levels alone [22]. These studies, show that even though PA levels and behaviour modelling/observational learning have some correlation within child-parent relationships, internal beliefs and personal perceptions of familial support proves also to have a strong influence on a child's PA habits [23,24].



**Figure 1:** Chart outlining Maslows hierarchy of needs.

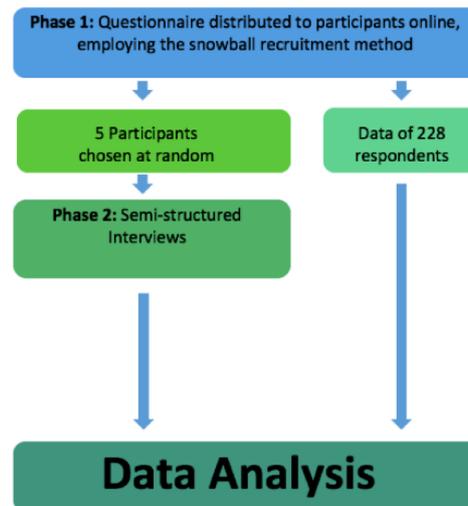
### ***Physical Activity Based Interventions***

Interventions aimed at increasing a child's PA levels often target sports participation as a primary objective and metric of success [25,26]. Lee, et al. [27] states that the increased youth PA levels persisted beyond the duration of intervention studies, but did not correlate significantly with obesity status. Although these interventions have short term limitations in their ability to reduce obesity, studies within the literature show a strong correlation that sports participation in childhood can have long-lasting effects on sport participation as adults [28], mainly if the sport includes a broad range of physical literacy and aims to improve feelings of physical competency.

## **METHODOLOGY**

### ***Research Design and Strategy***

This study employed a mixed method of collecting data. Phase one used a survey approach, including a multiple-choice questionnaire and short answer questions. Phase two involved 45-minute one-on-one semi-structured interviews with five respondents to the survey. Figure 2 outlines the overall flow of the project.



**Figure 2:** Flow chart outlining the sequence of the methodology.

### ***Procedures***

#### **Survey participants (Phase one)**

A total of 233 participants completed the survey. Forty-six males and 187 females over the age of 20-years-old were recruited via snowball recruitment using electronic “chain letter” style distribution.

#### **Measures/materials (Phase one)**

Participants completed a 34-question questionnaire, which included the Lipid Research Clinics Physical Activity Questionnaire (LRCPAQ) [29]. Additional open-ended questions were also presented pertaining to familial history with physical activity, and views on wellness.

#### **Analysis of data (phase one)**

Current physical activity levels were estimated using criteria from the LRCPAQ were used to classify each participant into one of four groups. These classifications were then compared against the participant's reported physical activity time and reported sedentary time; using a 5-points-scale to build a distinction between currently active adults (AA) and currently sedentary adults (SA).

Answers taken from the questionnaire concerning access to organized sports, family outings, and sports participation in childhood were extrapolated to classify each participant into two categories: Active child (AC) or Sedentary child (SA).

Using this method of comparison, phase one further categorized its participants into one of four groups:

1. Active child active adult (ACAA)
2. Active child sedentary adult (ACSA)
3. Sedentary child active adult (SCAA)

#### 4. Sedentary child sedentary adult (SCSA)

#### **Interview participants (phase two)**

A total of 233 participants who completed the survey were eligible for phase two. From these 233 participants, five were selected at random via Excel's RAND function, including one male and four females. The five selected participants from phase one were invited to a Human Performance Laboratory (HPL) to engage in a 45-minute one-on-one interview.

#### **Measures/Materials (phase two)**

Interviews lasted approximately 45-minutes in length. The questions used in the interview were guided by the questions used in phase one. The key topics that every participant was questioned about included:

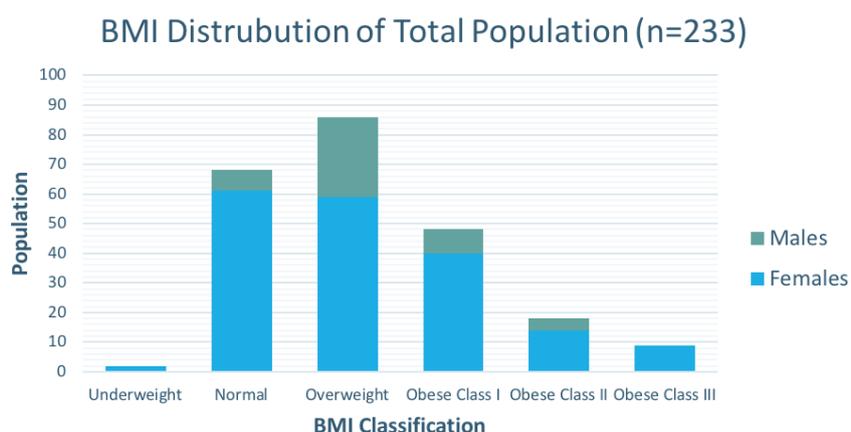
1. Family structure and relationship
2. Personal activity practices (currently and during their upbringing)
3. Perceived parental attitude surrounding physical activity

#### **Analysis (phase two)**

Audio recordings from interviews were taken and transcribed into written form and returned to participants for confirmation. Important and reoccurring themes/perspectives were noted and explored alongside current literature.

### **RESULTS**

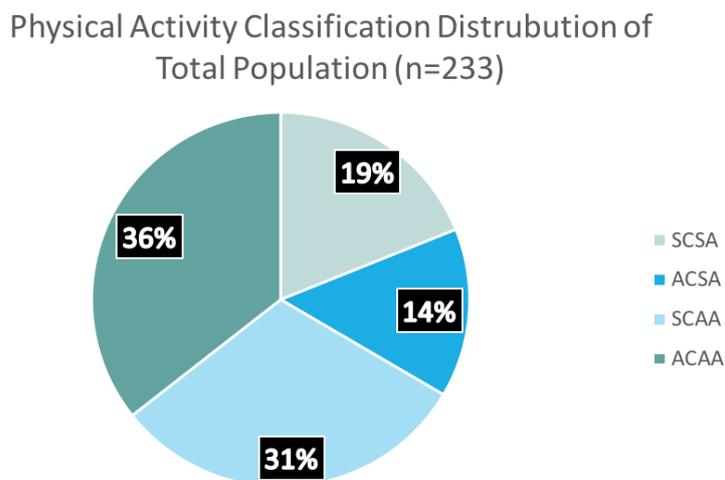
The sample population's BMI distribution loosely follows a bell-shaped curve, with males disproportionately represented in the overweight and obese categories; approximately 85% of all male respondents being categorized with an above-normal BMI. Female respondents are the only 4 representatives within the obese class III and the underweight classifications (Figure 3).



**Figure 3:** Histogram displaying BMI measurements' distribution curve across the entire surveyed population.

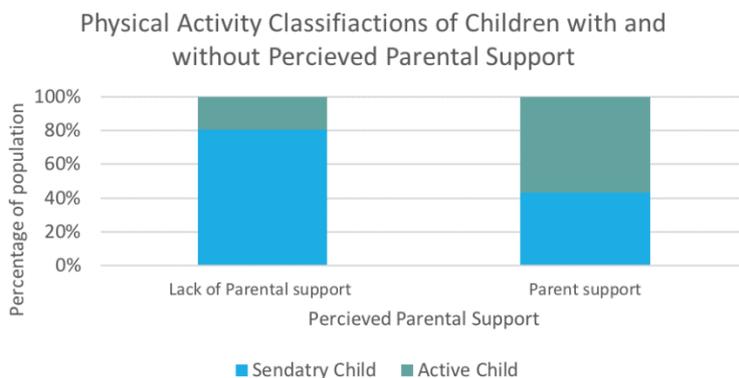
The sample population's distribution of physical activity classification shows that the majority of respondents have higher levels of reported physical activity when asked to compare themselves to other adults of the same age

and gender; as per the LRCPAQ. Childhood PA levels have a non-significant correlation to adult PA levels (Figure 4).

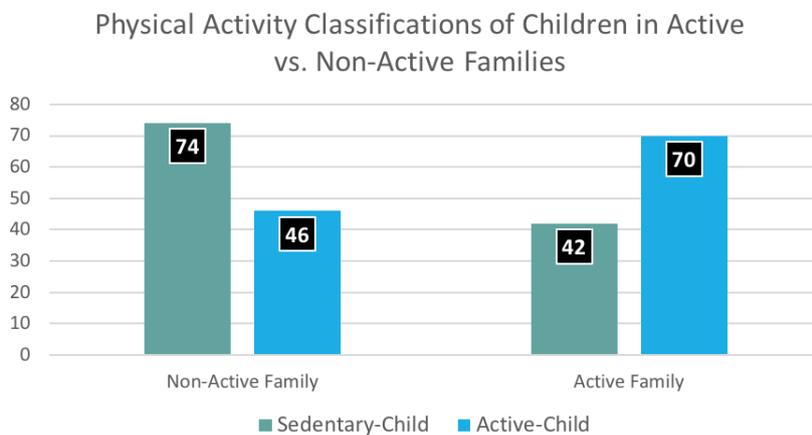


**Figure 4:** Compounded physical activity classification distributions among sample population.

Significant differences can be seen in the percentage of the population classified as sedentary, belonging to families where there was a lack of perceived support for sports participation (p value = 0.0009) (Figure 5).



**Figure 5:** Childhood physical activity classifications of children with and without perceived parental support.



**Figure 6:** Populations classified as SC or AC segregated as to whether they recall having siblings or parental figures who participated in regular sports.

Significantly more subjects classified as SC did not recall members of their family regularly playing sport (p value = 0.003). The data also shows that subjects that did recall immediate family members regularly participating in a sport were significantly more likely to be classified as AC (p value = 0.032) (Figure 6).

**Table 1:** Occurrences of interview topics not targeted through survey questionnaire.

Reoccurring Topics Impacting Physical Activity Participation in Childhood	Percentage of population (N = 5)
School-Based Physical Activity Interventions	100%
Economic Barriers to Physical Activity	100%
Peer Discrimination	80%
Familial Priorities Around Wellness Behaviour (Nutrition, Body Satisfaction, Self-Care)	60%
Traditional Family Sport Participation	60%

Topics noted in Table 1 are reoccurring themes mentioned by the majority of interviewees. The implied impact of reoccurring themes is weighted by the frequency of occurrence, not by the subjective impact on individual subjects. Every subject had brought up the influence of school-based physical activity interventions, and the effects of economic barriers to sports participation. Peer discrimination was a reported influence for four of the interviewees. Familial habits around sports participation and eating behaviour were reoccurring themes for 3 out of 5 interviews. Other topics were noted as influential the minority of participants, so have been excluded from this list due to low frequency within this sample population.

## **DISCUSSION**

### ***Survey Based Outcomes***

#### **Demographic distribution**

The sample population was categorized into one of four groups, as shown in Figure 4. The ACAA category has the highest representation, constituting 36% of the sample population. SCAA is the second most represented category. This data shows that the majority of the adult population have moderate to high levels of reported physical activity; as extrapolated from the LRCPAQ [29].

The most minor demographic represented was the ACSA; At only 14%. According to the literature, low rates of the ACSA classification is expected. The Palomaki, et al. [30] cohort study suggests that higher sports participation levels in childhood could promote healthier lifestyle habits in adulthood [27]. This explanation could be why we see very few ACSA classified respondents as active children are more likely to develop healthier habits, including regular physical activity.

Limitations of the self-reported methodology open these results to be influenced by social-desirability bias. This could also be a valid reason why we do not see a larger representation of sedentary population. This could be an expected outcome with the vast majority of the sample population having an above normal BMI measurement, as shown in Figure 3.

### ***Effects of Child-Parent Relationship on Later-Life Physical Activity***

Other key findings are best illustrated by Figure 6, showing that participants who did not recall their immediate family members playing a sport were significantly more likely to be classified as sedentary-child (SC) (p value = 0.003). The inverse is true of participants classified as an active-child (AC) (p value = 0.032). This evidence suggests that childhood environments where physical activity or sports participation is a regular occurrence or positively supported by the caregivers influences a child's willingness to partake in physical activity or sports. Data from Figure 5 confirms this theme, showing that subjects who perceived their parents as supportive of their sporting choices were significantly more likely to be classified as an active child (p value = 0.0009). This evidence is reinforced by responses received during phase one survey and phase two interviews. Multiple interviewees claiming the primary motivator of sports participation was due to family or group inclusivity. The inverse effect was also noted, with one subject reporting, "My mum was morbidly obese and unable to participate, so it was not something we did" (SCAA), as a reason for their lack of participation. From this data, it can be inferred that parental physical activity and sports participation can directly influence their offspring's motivation to be physically active and subsequent metabolic health.

### ***Interview Based Outcomes***

#### **School based interventions**

The interview process illuminated a separate series of influential factors that phase one did not target through the initial survey, as shown in Table 1. One of these influences noted by all interviewees was the way in which their school curriculum approached sports participation. Some participants felt as if mandatory participation dulled the drive to excel in competitive sports and stifled the abilities of those who did perform at a superior level in certain sports. One subject, in particular, reported participating and being the fastest in all of her school cross-country events and athletic running events; "I vividly remember going to (another district) to represent (their school) in cross-country. There was a motorbike that led everyone along the track... I felt the motorbike was going too slow for me, like, I was hundreds of meters ahead of everyone" (SCAA), and yet can only recognize their prowess in hindsight. Another subject commented that her experience with mandatory sports participation only lessened their interest in participating in it; "I'd always get picked last, I'd always get shunned because I wasn't very good at sport, and I was always a bigger (person)" (SCAA). Despite these anecdotes, recent publications report that mandated physical activity interventions in schools have a net positive effect on increasing children's physical activity levels [31,32].

### **ECONOMIC BARRIERS TO PHYSICAL ACTIVITY**

As shown in Figure 5, perceived parental support significantly influenced whether a subject was classified as an active child or a sedentary child (p value = 0.0009). An article from Vella, et al., (2014) [33] noted that low parental income is the leading cause of sport drop-out rates in childhood. Subjects from phase one commented that their parental figures often limited their choices to play sports based on what equipment was needed to participate, "I wanted to do track cycling. Was outright said no, due to cost" (SCAA). Other subjects stated that their parental figures limited their choices around how many sports they could participate in at the same time "It was a money issue. I was only allowed to play one sport per season, and it had to be the cheapest option" (SCAA).

Recommendations for future interventions targeting obesity within at-risk populations suggest that addressing socioeconomic issues is likely an effective method for reducing general obesity [34,35].

### **PEER DISCRIMINATION**

Weight-based discrimination and stigmatization can play instrumental to a young person's development of self-worth and motivation surrounding physical activity. Social stereotypes surrounding obesity affects all individuals regardless of their weight status [36]. Some recalled memories from the age of six where their size was noted as being 'bigger' than other kids in her class, while others stated they did not realize their peers had different body types to their own until late adolescence. There is a notable link to how early a person noticed differences in their peers' sizes and the degrees of difference their BMI was from a normal BMI measurement. This relationship suggests that lack of awareness surrounding obesity is not a predicting factor of a person's metabolic health. Anecdotally this study shows evidence that the earlier a person is aware of obesity, in themselves or others, the more likely they are to be obese themselves. A paper from Pont, et al., (2017) [37] comments on this phenomenon, stating that weight-based stigma, bullying, and victimization increase linearly with a student's BMI percentile. There is a false societal belief that social pressures and shame could have the ability to motivate someone to lose weight; however, in reality, it often leads to harmful behaviours such as binge eating, social isolation, and decreased physical activity [38].

### **MECHANISMS AND IMPLICATIONS**

#### ***Parental Support***

The strongest influence this study's results have determined is that of perceived parental support on a child's physical activity levels. This study's results suggest a very significant correlation between perceived support and physical activity levels ( $p$  value = 0.0009), but less of a correlation between actual parental sport participation ( $p$  value = 0.032). This means that currently, non-active parents are not automatically disposed to produce non-active children and vice versa for active parents producing active children. This difference in outcome from active parents versus supportive parents suggests that interventions targeting parenting styles may be more effective long term than interventions that solely focus on measurable physical activity minutes. The importance of parenting styles cannot be understated. Charbonneau and Camire [39] reports that parents who fulfilled their children's basic psychological needs; autonomy, competence, and relatedness, increased sports participation and enhanced the pleasure their children experienced while playing sports, while concurrently reducing symptoms associated with metabolic illness. These suggestions take into consideration the child's hierarchy of needs in order to best suit their situation but fail to address the parent's hierarchy of needs to allow them to seek or put into practice these interventions. As illustrated in Figure 1, Maslow's hierarchy of needs has five layers, with the uppermost layer featuring only self-actualization needs. A person's ability to even consider achieving self-actualization can only come once the base layers have been sufficiently met. Until then, habits that require forethought or long-term changes without immediate pay off are more challenging to install; as evidenced by Akinyele, et al., [40] Behjati, [41] and, van Lenthe, et al. [10] in their studies on food choices and cardiovascular health practices. It could also be postulated that in order for parents to educate themselves and implement parenting styles to best influence their children, they too must have their basic survival and psychological needs met.

### ***School Based Interventions***

Myers, et al. [42] argues that exercise-based interventions are likely the most effective, cost-efficient, and underutilized methodology in the battle against metabolic illnesses. Although unable to specifically treat insulin resistance, lipid disorders, and cardiovascular disease individually, physical activity positively influences each of these factors. It could then be inferred those interventions targeting physical activity and sports participation as major leads for large-scale interventions.

Results from this study illustrate the variable nature of childhood experiences and their effects on promoting or inhibiting physically active behaviours. Interestingly, the similar experiences reported by different subjects evoked opposing emotive responses and consequently had an opposing impact on their personal physical activity behaviours, such as the case with mandatory school sports and sibling sport participation. This evidence suggests that although curriculum-based interventions have historically increased sports participation in children, it may not consider the collateral damage caused to the minority of intervention participants [31].

This study does not suggest that curriculum-based sports have a negative effect, as evidenced by children classified as active being more likely to grow into active adults. However, qualitative results indicate that there is a minority demographic of children who 'slip through the cracks and enter a cycle of poor metabolic health. This outcome widens the population gap between those considered healthy and those considered unhealthy with a higher propensity to develop metabolic illnesses.

Razak, et al. [43] and Somerset and Hoare [44] suggest that interventions set in schools need to focus less on classical 'sports' that have historically been implemented in a competitive nature.

Their results show that unstructured free play significantly increases children's physical activity time. Two primary barriers to physical activity participation include 'not being good at the activity and 'fear of being judged,' which can both be overcome by removing competitive natured activity.

Over the past five decades there has been an exponential increase in physical activity-based interventions, primarily from non-for-profit organizations concerned with increasing physical activity in children, via interventions and community programs [45-47]. Multiple interventions and programs have consistently reported overall positive outcomes for a range of measurable variables [48,49]. It could then be assumed that with the greater number of interventions and programs being run, that there would be a general increase in physical activity within generations exposed to them, however, this is not the case. This discrepancy suggests that physical activity-based interventions, although effective acutely, do not translate to long-term benefits. This was the conclusion presented by Charles, et al. [50], who claimed the 'Girls Active' program was unable to increase moderate to vigorous physical activity levels at 14-months post-intervention. This study's insight and results suggest that there are limitations to the benefits gained through this type of intervention, and reports commenting on the immediate effects of physical activity may be misleading.

## **CONCLUSION**

This data's key findings suggest that subjects raised in households where regular sports participation was absent are more likely to be sedentary into adulthood (p value = 0.003). Subjects were more likely to participate in sports during childhood if they perceived their parental figure supported their interests (p value = 0.0009). This study's results also reported emerging themes that influence physical activity that did not originate from the home, such as school sports implementation, and psychosocial factors. These factors prove almost deterministic in predicting adult metabolic health.

From this research, it appears that parental support and fulfilment of basic psychological needs within childhood has far stronger predictability power over a person's adult metabolic health and physical activity levels, more so than observational learning and behaviour role-modelling alone. In the future, this study's results suggest that interventions aimed at improving a parent's ability to fulfil their children's basic psychological needs adequately would garner the greatest systemic results over that of pure activity-based interventions.

## **CONFLICT OF INTEREST**

The author certifies that they have no affiliations with or involvement in any organization or entity with any financial interest (such as honoraria; educational grants; participation in speakers' bureaus; membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or non-financial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript.

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