Implications of disability severity on 24-hour movement guideline adherence among children with neurodevelopmental disorders in the United States

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Background: Research has established beneficial associations between 24-hour movement guideline adherence and several health outcomes in typically developing (TD) children, but these relationships are poorly understood in children with neurodevelopmental disorders (NDD). This study examined: (1) 24-hour movement guideline adherence; (2) the influence of disability severity; and (3) associations between guideline adherence and health outcomes in children with NDD and TD children.

Methods: This cross-sectional study used data from the 2018 and 2019 cycles of the US National Survey of Children's Health. Parental/caregiver reports of movement behaviors (physical activity, screen time, and sleep), disability severity (limitations to daily activities) and health outcomes (general health status, anxiety, and depression) were provided for 8,554 children with NDD and 19,669 TD children aged 6-17 years.

Results: Children with NDD had significantly lower odds of meeting each movement behavior guideline compared to TD children and these effects were most pronounced for those who experienced consistent limitations to daily activities. Meeting at least two guidelines significantly lowered the odds for anxiety and depression, and increased the odds for better general health for children with NDD.

Discussion: These findings suggest degree of disability severity has a strong influence on adherence to 24-hour movement guidelines among children with NDD.

Implications of disability severity on 24-hour movement guideline adherence among children with neurodevelopmental disorders in the United States

In the past five years, there has been a shift from investigating the physical activity, sedentary, and sleep behaviors (i.e., movement behaviors) of children in isolation to an integrated approach that takes into account all movement behaviors across an entire 24-hour period. This approach emphasizes that the "whole day matters". Recognizing the collective importance of these behaviors for healthy development,[1,2] the Canadian 24-Hour Movement Guidelines for Children and Youth were the first to provide evidence-based recommendations for movement behaviors across the whole day.[3] While these guidelines may be appropriate for typically developing (TD) children, its development did not include children with chronic medical conditions or disabilities, such as neurodevelopmental disorders (NDD), and thus their applicability to this population is largely unknown. More recently, however, the World Health Organization (WHO) updated their guidelines on physical activity and sedentary behavior, which include recommendations for individuals with disability for the first time.[4] Similar to the Canadian 24-hour movement guidelines, these guidelines suggest children and adolescents aged 5-17 years, including those living with disability, do at least an average of 60 minutes of moderate-to-vigorous physical activity each day, while time spent sedentary should be limited, particularly recreational screen time. Although the evidence base for these guidelines did include some literature from children with disabilities or chronic medical conditions, the majority of the evidence was extrapolated and applied from TD children and downgraded due to indirectness. As such, the WHO has called for more research examining the applicability and benefits of the guidelines across different chronic conditions and disabilities.[4–6]

Several studies have demonstrated that up to approximately 90% of North American children fail to meet all three of the threshold-based 24-hour movement guidelines,[7,8] but very little is known about children with chronic medical conditions or disabilities. A recent study of fifty-four Canadian children with disabilities found that only 3.7% met all three guidelines concurrently.[9] Furthermore, research using National Survey of Children's Health (NSCH) data found that only 5.4% of children with chronic health conditions met all three guidelines,[10] which was significantly lower than the 8.2% of TD children. Given the infancy of this research, more data investigating 24-hour movement behaviors is needed to understand how guideline adherence may be different for children living with chronic medical conditions or disabilities. Although there is considerable diversity across disability diagnoses, studying multiple conditions together represents a key first step that could provide a transdiagnostic understanding of movement behaviors otherwise not available with a diagnosis-by-diagnosis approach. Focusing instead on limitations to daily activities, regardless of diagnosis, may help identify groups of individuals who are less likely to meet the 24-hour movement guidelines, and therefore, could stand to benefit the most from targeted interventions to improve movement behaviors.[6]

The health benefits of 24-hour movement guideline adherence are well-established for TD children,[1,2] but a lack of research among children with chronic medical conditions and disabilities has left associations largely unexplored. Undeniably, the inclusion of people living with disability in the 2020 WHO guidelines on physical activity and sedentary behaviour was a key step forward to recognize a population that has often been omitted in global recommendations.[5] However, scholars have highlighted that extrapolating evidence from TD populations may be inappropriate as physiological responses to physical (in)activity may differ considerably in people with disabilities;[11] thus, the associations between physical (in)activity and

health outcomes may be different for children with NDD. Given that children with NDD are at increased risk of various comorbidities,[12] one may posit that they would experience even greater benefits from meeting the 24-hour movement guidelines than TD children. On the other hand, it is also possible that meeting only one or two of the guidelines may provide health benefits for children with NDD given the medical complexities they experience. To date, however, associations between guideline adherence and health outcomes have yet to be explored among children with NDD. Exploring these links across multiple disorders will serve to accelerate our ability to begin creating efficient solutions to related health problems commonly observed among children with NDD.[12]

Therefore, the objectives of this study were to: (1) examine 24-hour movement guideline adherence among children with NDD compared to TD children; (2) determine the influence of disability severity/limitations to daily activities on guideline adherence; and (3) explore the associations between guideline adherence and health outcomes in children with NDD and TD children.

METHODS

Data Source and Participants

This cross-sectional study used data from the 2018 and 2019 cycles of the NSCH. The NSCH is a nationally representative, population-based survey of non-institutionalized children living in the United States. A parent or guardian with knowledge of the child's health and health care needs completed the surveys.

Responses from 59,963 participants were available from the 2018-2019 cycles of the NSCH (30,530 in 2018; 29,433 in 2019). Although the 24-Hour Movement Guidelines for Children and Youth are applicable to children as young as 5 years old,[3] the NSCH does not

collect physical activity data on children under age 6; and were thus excluded from analyses. Thus, a total of 28,223 children between 6 and 17 years were included in this study, which included 8,554 children with NDD and 19,669 children with neither a chronic health condition nor special health care needs (defined as TD children). By definition, NDD are a group of disorders that often manifest during the developmental period and occur as a result of deficits to the developing central nervous system that affect one or more areas of functioning.[13] To identify children with NDD for this study, we included participants that responded "Yes" to one of the following questions: "Does this child have any of the following?" (a) Deafness or problems with hearing; (b) Blindness or problems with seeing, even when wearing glasses; or if a doctor or other health care provider ever told them that their child currently has one of Autism Spectrum Disorder, Cerebral Palsy, Epilepsy, Down Syndrome, Developmental Delay, Intellectual Disability, Learning Disability, Speech or Language Disorder, Attention-Deficit/Hyperactivity Disorder, or Tourette Syndrome. The severity of the disability was also identified for each participant based on two descriptors of function: (1) how often the child's health condition or problems affect his or her ability to do things other children of his or her age do; and (2) the extent to which the child's health condition or problem affected his or her ability to do things. Based on scoring instructions outlined in the NSCH codebook for data users, the effect of children's conditions on their daily activities (disability severity) was classified as one of "daily activities never affected"; "daily activities moderately affected some of the time"; or "daily activities consistently affected."

Measurement of Movement Behaviors

Physical activity

Parents/guardians responded to a single item that asked: "During the past week, on how many days did this child exercise, play a sport, or participate in physical activity for at least 60 minutes?" Response options included "0 days"; "1 to 3 days"; "4 to 6 days"; and "every day." Responses were dichotomized to represent whether participants met the guideline of engaging in ≥ 1h of physical activity per day ("every day") or not (6 days or less).[3]

Screen time

Parents/guardians responded to a single item that asked: "On most weekdays, about how much time did this child spend in front of a TV, computer, cellphone, or other electronic device watching programs, playing games, accessing the internet or using social media? Do not include time spent doing schoolwork." Response options included "Less than 1 hour"; "1 hour"; "2 hours"; "3 hours"; and "4 or more hours." Screen time values were dichotomized to represent whether or not participants met the guideline for ≤ 2h of screen time per day.[3]

Sleep

Parents/guardians responded to a single item for sleep that asked: "During the past week, how many hours of sleep did this child get on most weeknights?" Response options included "Less than 6 hours"; "6 hours"; "7 hours"; "8 hours"; "9 hours"; "10 hours"; and "11 or more hours." Responses were dichotomized to represent whether or not the child met the guideline of 9-11h of sleep per night for children aged 6 to 13 years old and 8-10h for children aged 14-17 years old.[3]

Health Outcomes

General Health Status

General health status was defined by answering: "In general, how would you describe the child's health?". Response options included: "Excellent"; "Very good"; "Good"; "Fair"; and "Poor".

Internalizing disorders

Children were identified as having anxiety or depression when their parent/caregiver answered "yes" to whether a doctor or other health care provider has told them the child currently has the condition.

Covariates

These included age (years), race/ethnicity (Hispanic, black, white, other), sex (male/female), household income level relative to the 2010 federal poverty line (<100%, >100%), and highest parental education (less than high school, high school, more than high school).

Data Analysis

Statistical analyses were performed following the recommended NSCH protocols using the Complex Samples module of SPSS (V25, Armonk, NY, USA; IBM Corp). Cases with incomplete data (3.2%) were removed from the analyses. Demographic variables were compared between children with NDD and TD children using general linear models for continuous variables, and Rao-Scott adjusted chi-square tests for categorical variables. Separate logistic regression analyses were performed to determine if adherence to each of the 24-hour movement guidelines and total number of guidelines met differed between children with NDD and TD children (Objective 1). After separating children with NDD based on disability severity, separate logistic regression analyses examined if there were differences in adherence to each of the 24-hour movement guidelines and total number of guidelines met between children with NDD who experienced varying limitations in their daily activities and TD children (Objective 2). Finally, separate logistic regression analyses were performed to explore associations between 24-hour movement guideline adherence and internalizing disorders for children with NDD and general health status for children with NDD and TD children (Objective 3). Each model was adjusted for age, sex, race/ethnicity, household income, parental education and disability severity (models

examining health outcomes among children with NDD only). Adjusted odds ratios (aORs) with 95% confidence intervals (CIs) were reported for all logistic regression analyses. All statistical tests were performed using two-sided tests at the 0.05 level of significance.

RESULTS

Demographics

Children with NDD were slightly older and more likely to be male than TD children (Table 1). Across both groups, most participants were either White or Hispanic, lived in a household with income classified above the federal poverty level, and had a parent/caregiver that had more than a high school education. Slightly greater than half of the children with NDD did not experience limitations in their daily abilities, whereas the remainder experienced moderate or consistent limitations.

24-Hour Movement Guideline Adherence

Compared to TD children, children with NDD had 19 to 34% lower odds of meeting each of the movement behavior guidelines and 32% lower odds of meeting a greater number of total guidelines (Table 2). Children with NDD who experienced moderate or consistent limitations in their daily activities had 40% lower odds of meeting a greater number of total guidelines compared to TD children; whereas children with NDD with no limitations had 23% lower odds of meeting more guidelines.

Examining each movement behavior guideline separately revealed no differences for physical activity between TD children and children with NDD with no limitations, but those who experienced moderate or consistent limitations had at least 35% lower odds of being considered sufficiently active. For sleep, the odds of meeting the guidelines were inversely related to disability severity with odds of guideline adherence 25% lower for those with consistent

limitations. Finally, children with NDD with no limitations had 27% lower odds of meeting the screen time guidelines compared to TD children, but this effect was even more pronounced (~40% lower odds) for those who experienced moderate and consistent limitations.

Associations Between 24-hour Movement Guideline Adherence and Health Outcomes

Findings revealed meeting at least one of the 24-hour movement guidelines was associated with lower odds of anxiety and depression as well as higher odds of reporting better general health status for children with NDD (Table 3). Meeting the sleep guideline was consistently associated with lower odds of internalizing disorders and higher odds of better general health status. Screen time guideline adherence only demonstrated benefits for internalizing disorders, and adherence to the physical activity guideline was only associated with higher levels of general health status for children with NDD. For TD children, adherence to each of the guidelines provided similar benefits for general health status and a positive linear relationship was observed between total guidelines met and odds of reporting better general health status.

DISCUSSION

Research to date regarding movement behaviors in children with NDD has largely focused solely on the prevalence of meeting guidelines developed for children who are TD.[9,10] The present study examined 24-hour movement guideline adherence among children with NDD compared to children who were TD – including a focus on the impact of disability severity – and explored associations between 24-hour movement guideline adherence and health outcomes in children with NDD and children who were TD. For the first time, we have shown inverse associations between disability severity and 24-hour movement guideline adherence in children with NDD. Our findings are novel and address calls from the WHO and other agencies for research aligned to the agenda of inclusion for individuals living with disability.[4,6,14]

Furthermore, our findings lend support for further research into a *transdiagnostic* approach to develop and implement interventions to improve movement behaviors in children with NDD on the basis of daily activity limitations or level of functioning, rather than diagnosis/disability. Specifically, children with moderate or consistent activity limitations were 40% less likely to adhere to more of the guidelines compared to TD children. Our findings complement recent qualitative research where parents of children and youth with disabilities perceived the 24-hour movement guidelines were not inclusive or compatible with the abilities of their children.[15] Together, these findings might suggest a need to develop 24-hour movement guidelines with and tailored for children with NDD, and their evaluation, focused on degree of disability severity.

The results from this study support previous work showing North American children with chronic health conditions or disabilities meet the 24-hour movement guidelines at lower rates than TD children.[9,10] Together, these findings may reflect the fact that current 24-hour movement guidelines may not translate to populations beyond TD children. There has been progress in this regard of late: WHO recently released Guidelines for Physical Activity and Sedentary Behavior for children and adolescents with disabilities,[4,5] but these recommendations were largely based on findings from studies examining TD children due to a lack of research that provides data specific to children with disabilities. Thus, the present study is timely as findings lend insight for the recent call to address the under-representation of research among children with chronic health conditions and disabilities[11] and highlights the need to improve our understanding of factors that contribute to disparities in 24-hour movement guideline adherence.

There is a strong recommendation that physical activity is considered safe for individuals with chronic conditions and disabilities and beneficial when it is appropriate to an individual's current activity level, health status and physical functioning level.[4] For children with NDD who

experience no activity limitations, 24% were able to adhere to physical activity guidelines, which was not significantly different from TD children. However, children with moderate or consistent activity limitations were approximately 35% less likely to be sufficiently active, which supports the notion that children with activity limitations struggle to meet physical activity recommendations for optimal health benefits. Interestingly, children with NDD who met the physical activity guidelines did not experience significantly lower rates of internalizing disorders, but did report higher levels of general health status. This is contrary to findings from a meta-analysis that showed children that were clinically diagnosed with a disorder or disability having greater mental health benefits from physical activity than TD children.[16] The lower end of the confidence intervals in our aORs might suggest associations between physical activity guideline adherence and anxiety or depression for children with NDD who experience consistent or moderate activity limitations. At the very least, this supports the ongoing knowledge gap of determining appropriate physical activity thresholds to incur mental health benefits in children in general, let alone children with NDD, and challenges the recommendation of 60 minutes of MVPA per day to obtain positive health outcomes for children with NDD.

A unique finding in our study was the independent benefits of meeting the sleep recommendation on anxiety, depression, and general health status in children with NDD, even after adjustment for disability severity. Our findings contradict previous work,[17] which used 2016 NSCH data, but did not observe a significant inverse association between meeting the sleep guideline and anxiety or depression. A noteworthy difference in the previous study[17] was children and adolescents were not classified based on disability or diagnosis. This is an important disparity since sleep issues for children with NDD are not necessarily comparable to TD children.[18] It is well documented in the literature that children with NDD experience various

sleep problems including onset, maintenance, and early arousal.[19] For these children, the relationship between sleep and disability might be bidirectional, such that sleep problems may worsen severity or functional aspects of the disability or diagnosis, while the condition itself may contribute to poor sleep.[20] Our findings support evidence from a recent systematic review on developing transdiagnostic behavioral sleep interventions to improve health outcomes in children with NDD.[21]

Although it is possible that children with NDD may stand to benefit more from meeting the 24-hour movement guidelines than TD children, our findings suggest otherwise. Intriguingly, we observed a dose-response pattern between the number of guidelines met and odds of reporting better general health status in TD children. Our observation of a dose-response relationship is consistent with findings from a representative sample of over 17,000 Canadian children.[22] However, a notable difference in their study[22] was students completed a self-reported questionnaire, whereas data from the NSCH were parent-reported. These findings suggest the relationship between movement behaviors and health may be more complex for children with NDD, which may be attributable to high rates of comorbidities.[12] Regardless, intervention efforts targeting children with NDD should not be overlooked; promoting positive behavior modifications is critical due to the high proportion of health care utilization and costs accounted for by this group.[23,24] Given the limitations that children with NDD face daily, focusing on achieving at least one and striving for two movement guidelines is a favorable starting point for this population. From a preventive medicine standpoint, this idea is supported in the evidence we present, which shows a relative plateau in health benefits beyond meeting two guidelines. Nonetheless, the question remains whether or not guidelines for TD children are in fact applicable to children with NDD and other disabilities. Further research in this area is strongly

encouraged,[4,6] and could support the development of guidelines for and with children with disabilities.[11]

Despite providing novel evidence regarding associations between 24-hour movement guideline adherence and health outcomes among children with NDD, this study has several limitations. First, the NSCH involves parent-proxy responses and is prone to response bias. However, parental responses are necessary provided some children with NDD experience limitations in cognitive capacity. Additionally, self-reported information is beneficial since device-based measures are not feasible to collect in large population-based studies. Secondly, the study used a brief tool to assess the extent to which a child's medical condition(s) limit their ability to engage in daily activities. Classical test theory and psychometric properties of this tool are unknown. Although it would have been preferable to have a health care practitioner confirm the diagnoses for each child with a NDD and provide detailed information about their disability severity, there are trade-offs between breadth and depth within large, population-based studies. Third, the cross-sectional study design limits causal inference and our ability to delineate potential bi-directional relationships between 24-hour movement guideline adherence and health outcomes. Finally, the movement behavior-oriented questions asked in the NSCH did not necessarily capture specific intensity, volume or context. For example, physical activity did not qualify if it was moderate or vigorous intensity, while the highest response option for sleep duration was "11 or more hours". Some children with NDD may accumulate sleep as a recovery mechanism,[25] or sleep over and above the recommendations could be associated with depression.

In conclusion, among a nationally representative sample of children living in the United States, we found that children with NDD were significantly less likely to meet the 24-movement guidelines when compared to TD children. Findings suggest this is a vulnerable group that

requires more attention, particularly towards disability severity, in efforts to promote a lifestyle consisting of healthy movement behaviors. [4,6]Moving forward, research examining associations between 24-hour movement guideline adherence and various health indices is needed to develop appropriate guidelines for children with NDD.

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Author Contributions:

DB and PM contributed to the conceptualisation of the study. DB and PM developed the analytical approach with the support of BT. DB was responsible for data curation and performed all analyses with the support of PM and BT. DB, PM and BT interpreted the results. DB and PM drafted the initial manuscript. All authors critically reviewed and provided feedback on multiple iterations of the manuscript, and all authors approved the final version of the manuscript.
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Table 1. Demographic characteristics and 24-hour movement guideline adherence by group (weighted *N* = 33,971,453)

Demographic variables	Children with NDD (weighted *n* = 9,337,744)	TD Children (weighted *n* = 24,633,709)	*p* value
Age (years)	11.55 (11.40-11.70)	11.34 (11.23-11.44)	.027
Female	37.3 (35.0-39.6)	51.2 (49.7-52.8)	< .001
Race/ethnicity			< .001
Hispanic	25.1 (22.5-27.8)	28.2 (26.6-29.9)	
White	53.1 (50.7-55.5)	47.5 (46.0-48.9)	
Black	14.1 (12.5-15.9)	13.3 (12.2-14.4)	
Other	7.7 (6.8-8.7)	11.1 (10.3-11.9)	
Federal Poverty Level			.001
0-99%	22.5 (20.4-24.7)	18.1 (16.7-19.5)	
≥100%	77.5 (75.3-79.6)	81.9 (80.5-83.3)	
Parental Education			.074
Less than high school	11.0 (8.9-13.5)	12.5 (11.0-14.1)	
High school	22.0 (20.1-24.1)	18.7 (17.5-20.0)	
More than high school	67.0 (64.4-69.4)	68.8 (67.1-70.5)	
Disability Severity (limitations in daily activities)			
Never	53.0 (50.7-55.3)	-	
Moderate	31.8 (29.7-33.9)	-	
Consistent	15.2 (13.7-16.9)	-	
Neurodevelopmental Disorders			
Deafness	7.7 (550)	-	
Blindness	11.2 (693)	-	
Cerebral Palsy	2.5 (130)	-	
Down Syndrome	0.6 (79)	-	
Developmental Delay	39.8 (2201)	-	
Intellectual Disability	10.6 (471)	-	
Learning Disability	55.9 (3373)	-	
Autism Spectrum Disorder	27.5 (13.9)	-	

Attention Deficit Disorder/Attention Deficit Hyperactivity Disorder	68.2 (5024)	-
Epilepsy	6.8 (288)	-
Tourette Syndrome	2.6 (111)	-
Speech Disorder	38.4 (1901)	-

Values in table represent means (Age), unweighted counts (Neurodevelopmental Disorders) or weighted column proportion (%) with 95% confidence intervals in parentheses. NDD = neurodevelopmental disorders. TD = typically developing. Neurodevelopment Disorder diagnoses are not mutually exclusive.

Table 2. 24-hour movement guideline adherence for children with NDD compared to TD children.

	Physical Activity		Sleep		Screen Time		Total Guidelines Met				
							None	One	Two	Three	
Group	Proportion % (SE)	aOR (95% CI)	Proportion % (SE)	aOR (95% CI)	Proportion % (SE)	aOR (95% CI)	Proportion % (SE)	Proportion % (SE)	Proportion % (SE)	Proportion % (SE)	aOR (95% CI)
TD Children	23.8 (0.6)	1.0	62.7 (0.8)	1.0	58.5 (0.8)	1.0	14.9 (0.6)	36.8 (0.8)	36.7 (0.7)	11.6 (0.5)	1.0
Children with NDD[a]	21.2 (0.9)	**0.81 (0.71-0.93)**	57.6 (1.2)	**0.81 (0.72-0.92)**	47.6 (1.2)	**0.66 (0.59-0.74)**	21.0 (1.0)	40.2 (1.2)	30.1 (1.1)	8.7 (0.6)	**0.68 (0.62-0.76)**
Children with NDD by Disability Severity[a]											
Never[1]	24.0 (1.4)	0.98 (0.83-1.15)	58.3 (1.7)	**0.83 (0.71-0.97)**	49.6 (1.7)	**0.73 (0.63-0.85)**	19.7 (1.5)	39.5 (1.7)	30.1 (1.4)	10.8 (1.0)	**0.77 (0.67-0.88)**
Moderate[2]	18.3 (1.3)	**0.65 (0.54-0.79)**	57.1 (2.0)	**0.81 (0.67-0.96)**	44.8 (2.0)	**0.58 (0.48-0.69)**	22.7 (1.8)	40.7 (2.0)	30.4 (1.9)	6.2 (0.7)	**0.60 (0.51-0.70)**
Consistent[3]	17.8 (1.9)	**0.64 (0.48-0.84)**	56.3 (2.7)	**0.75 (0.62-0.99)**	46.5 (2.9)	**0.62 (0.49-0.79)**	22.0 (2.0)	42.0 (2.7)	29.3 (3.0)	6.7 (1.2)	**0.60 (0.49-0.74)**

[a]Models computed separately with TD children set as referent.[1]weighted n = 4,945,852; [2]weighted n = 2,968,461; [3]weighted n = 1,423,431. Boldface indicates $p < .05$. Models adjusted for age, sex, ethnicity, household income and parental education.

Table 3. Associations between 24-hour movement guideline adherence and health outcomes.

Movement Guideline	Children with NDD			TD Children
	Anxiety aOR (95% CI)	Depression aOR (95% CI)	General Health Status aOR (95% CI)	General Health Status aOR (95% CI)
Physical Activity[a]	1.01 (0.78-1.30)	0.90 (0.63-1.27)	**1.28 (1.03-1.59)**	**1.51 (1.23-1.87)**
Sleep[a]	**0.74 (0.60-0.91)**	**0.64 (0.49-0.83)**	**1.35 (1.13-1.61)**	**1.43 (1.21-1.69)**
Screen Time[a]	**0.81 (0.66-0.99)**	0.76 (0.57-1.01)	1.17 (0.96-1.42)	**1.63 (1.36-1.94)**
Total Guidelines Met				
None[b]	1.0	1.0	1.0	1.0
One	**0.70 (0.52-0.94)**	**0.65 (0.47-0.89)**	**1.35 (1.07-1.70)**	**1.62 (1.26-2.10)**
Two	**0.59 (0.43-0.81)**	**0.54 (0.37-0.79)**	**1.81 (1.40-2.34)**	**2.21 (1.70-2.88)**
Three	0.73 (0.43-1.21)	0.50 (0.23-1.06)	**1.48 (1.03-2.12)**	**3.07 (2.15-4.38)**

[a]Guideline not met set as referent. [b]Meeting none of the 24-hour movement guidelines set as referent. Models adjusted for age, sex, race/ethnicity, household income, parental education and disability severity (Children with NDD only). Boldface indicates $p < .05$.